Seeking What Works

The IPS Education Committee

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We need your participation

In my June column, I discussed two planetarium participation projects of the Education Committee in detail: 1) An online survey to gather information about education at planetariums and 2) Collection of teaching videos from planetariums to make an archive. The success of the two projects depends on your help.

Please, if you are either a single worker at a small planetarium or one of many education specialists in a large facility, participate in both of these projects by answering the questions on the survey and by preparing a teaching video; many ideas for the video also are in my June column.

Oded Kindermann in Argentina (okindermann@gmail.com) is collecting the video, and you can do a number of things to get your work to him.

Let him know the details of your video, including identification of video format, length of video and any sections, concept(s) covered, age/grade and level of the students (normal, advanced, slow learners), where lesson was given (planetarium, classroom, observatory, museum exhibit, or other space), and what the students have seen or studied prior to this lesson (an introduction, follow-up, part of a series of lessons).

If your video is a clip of less than 15 Mb, you can send it directly to Oded with media formats of .mov or .mp4 (preferred). But Oded thinks that YouTube or Dropbox might work even better for all video lengths, or a video can be posted on the participant's website. Oded shares the following:

Dear Planetarium Colleagues,

For those who do not know me, I have been an IPS member since 2012. It has been a pleasure and an honor to be part of this amazing society.

I am the kind of person who likes to work with others in a common project in order to enrich and benefit an organization. Since I became a member of the IPS community, I have wanted to make a contribution. Last year I joined the IPs Education Committee. With the help and support of others on this committee, I bring to you this project. It can be a wonderful project, one in which we all can create a legacy that we transfer to future generations of planetarians. I welcome your participation in this project. I very much hope that you will be motivated to contribute and will urge others to participate and contribute. Together we can help and serve our planetarium society.

Best regards,

Oded E. Kindermann,
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Italian education program

Simonetta Ercoli of Italy (Email: mirus7678@gmail.com) reports on the nature of astronomy education in her country. Simonetta, who is an active member of the IPS Education Committee, is the first to prepare a report on a country or region's astronomy and science education. I hope that we can share details of astronomy education in many countries in future Planetarian issues. The online survey, discussed above, will provide information to help make this possible.

Italian schools are organized in the following way:

- Primary School (five years): Student ages are 6-10 years
- Middle School (three years): Student ages are 11-13 years
- Secondary School (five years): Student ages are 14-19 years

There are national requirements for education in Italy. The group that determines and disseminates information about requirements is MIUR, the Ministry of Education, Universities and Research, located at Viale Trastevere, 76/a 00153 Roma. The Italian national curriculum can be found online at: hubmiur.pubblica.istruzione.it/web/istruzione/home. The Italian national curriculum was influenced by the OCSE/OECD (Organization for Economic Cooperation and Development)-PISA (Program of International Student Assessment) system.

Assessment of teachers and their teaching of the national curriculum is accomplished by periodically checking knowledge and skills of the students, noting the overall quality of the schools. The group responsible for evaluation is the National Evaluation System (SNV).

The main astronomy content at each level is shown in Table 1.

Teaching is developed in different ways according to the plan of each teacher team:

Another opportunity to share

In addition to the educational videos being sought by the Education Committee, the IPS Portable Planetarium Committee, along with he Astronomical Observatory Serafino Zani, sponsors "Pages of Stars." This annual competition seeks to build a collection of short audio clips (maximum 3-5 minutes each) that can easily be shared among planetarians using mp3 files.

Planetarian colleagues from around the world are invited to prepare a short text, in English, that can be read under a planetarium dome.

The text can be:

- an astronomical and scientific commentary
- a classical Greek (or another culture's) sky story
- an original story or a poem (any kind of topic) with some astronomical details or with an event that happens under the night sky (including the name of some stars or constellations or other sky objects visible with the naked eye

The author (or a collaborator of the author) must read the text aloud, in English, and record this story as an mp3 file. A committee, selected by the IPS Portable Planetarium Committee in collaboration with the Astronomical Observatory Serafino Zani, will select the winners, and the text of the best entry will be published in the Mobile News column of *Planetarian*, while the three best works will be made available on the IPS Pages of Stars webpage.

The winner(s) will also receive an Award Certificate on the occasion of the "Day of Planetaria," which occurs annually in March.

The yearly deadline for applications is December 31.

For full details, check "Pages of Stars" on the IPS website at www.ips-planetarium.org/?page=portablecom, for contact Susan Reynolds Button, sbuttonq2c@gmail.com, or Loris Ramponi, osservatorio@serafinozani.it or megrez58@gmail.com. ☆

Table 1

Subject	School year	Astronomy contents
Primary school	3rd	Getting bearings in space through the cardinal points
	4th	Basic astronomy contents: constellations, and the life of stars Myths and legends of the stars
	5th	Basic contents about the solar system, Earth, and the moon
The astronomy contents are parts of either the geography or the science syllabus. The approach to astronomy is for students to find bearings and understand their spatial location, starting with living space and then moving to understand geographical space and planetary space.		
Middle school	3th	Historical development of astronomy; formation of the solar system and its organization; key features of the sun; Earth and its movements; main features of the moon and phenomena related to it; space missions: rockets, satellites, space probes; observation of the sky: day and night, direct and indirect
Some astronomy contents are carried out by the literature teacher in the geography syllabus and other ones by the math teacher in the science syllabus. The approach is based on both observation and description.		
Secondary school	1st	Celestial sphere and astronomical measurements; celestial objects; the sun and its energy; the solar system and main features of its planets; the minor bodies of the solar system; genesis of the Earth and its movements; origin of the moon and lunar phenomena
New reform requires astronomy to be taught by the science teacher in the first year of course. The approach is based on observation and description, with an introduction to essential ideas of the experimental method. The use of measurement units and criteria for collecting and recording data are covered. The physics teacher treats more in-depth astronomy in the fifth year course, focusing on the principles, models, formal laws, and on the relationship between the various factors involved in a particular phenomenon and between different phenomena.		

classroom lessons, workshops at the school or at scientific museum, problem solving, lessons in the field, scientific tours , etc.

The new reformed curriculum emphasizes the Earth, moon, and the solar system, which is different from the previous curriculum. At the middle school level there is now a very simple approach to stars, star evolution other than the sun, the Milky Way, and other galaxies.

Historical ideas about the solar system, including ideas of Copernicus, Kepler, and Galileo, are taught by literature teachers within the history syllabus in middle school. In secondary school, science teachers discuss these historical ideas in depth during the first year.

The electromagnetic spectrum is introduced in the primary school, first as observation. The topic is expanded within the first physics course in middle school. In secondary school, physics teachers cover the topic in depth during the third or fourth year.

In the fifth and final year of secondary school the physics teacher is expected to cover many topics about stars and the universe.

Many schools have several in-depth projects relating to astronomy, which are operated in cooperation with local public or private associations and observatories. For example, my colleagues and I present astronomy workshops at each school level according to the lesson plans of science and literature teachers. This school year we organized a very interesting project for a primary school in Rome, in which many amateur astronomy associations took part. Although the text describing this project is in Italian, there are many photos of our project at: www.starlightgroup.it/index/php/regione-lazio-progetto-on-demand-presso-ic-ennio-quirino-visconti-di-roma-cup-f97e13000770009.html.

Mathematics and non-astronomy science topics in different primary and middle school years shows understandings that can be integrated with astronomy, when possible. See Table 2.

Because subjects taught at different secondary schools are very different and are quite diverse even within the same school, it is not possible to make a similar summary for secondary school subjects.

The Italian national curriculum does not require or suggest attendance at a planetarium. For each school the person who decides on a planetarium visit is different. In general, individual teachers or curriculum specialists decide to make the trips.

In general, primary school teachers meet once a week to plan the week's activities. In middle and secondary schools, at the beginning of the year teachers divide into committees and then meet monthly to arrange activities. Within these meeting arenas, planetarium lessons would most likely be arranged.

It should be noted that the majority of Italy's planetariums are small and portable, and these present educational programs as requested by teachers. The large Italian planetariums present primarily public programs.

A map of all Italian planetariums can be found at www.planetari.or/it/index.php?option=com content&view=article&id=60&Itemid=154

MUIR, national science teacher associations, and universities sponsor local and regional meetings. The meetings are sometimes for teachers only and sometimes for all science education professionals

Many planetariums suggest activities for classrooms, and here are many educational publications with lessons and activities. Some Italian websites for schools that have good astronomy activities include:

- www.media.inaf.it/category/scuole
- www.spazioallescuole.it
- didattica.ual.it
- www.sait.it
- www.vialattea.net

Teaching in Rio de Janeiro

At the end of May I travelled to Rio de Janeiro for a week to teach as part of a teacher workshop. Celso Cunha, the director, invited me to give presentations during "The First Workshop on Education in Museums and Planetariums" at the Rio Planetarium. The workshop was held at the Museum of the Universe, a large complex that includes two planetariums and many outstanding exhibits, operated by the city of Rio de Janeiro.

Rio teachers were the primary participants, although I also had the pleasure of meeting a number of planetarium professionals from both the Rio and other Brazilian planetariums. It was an honor and challenge to use the largest planetarium in the Southern Hemisphere, the Carl Sagan Planetarium, to present an interactive planetarium lesson about seasons. That planetarium has a tilted dome, so we needed to infer the true horizon from horizontal dome panels.

After seeing seasonal changes in Rio, we "traveled" to my own home latitude at Cleveland, Ohio, near 40 degrees north. There is a dramatic difference on December 22 between the view from Cleveland and the view at Rio's latitude of about 23 degrees south. In Rio, the sun makes an almost zenith passage on December 22, the Brazilian summer solstice.

The name in Portuguese for the noon sun at the zenith is "sol a pino." Normally this event occurs on December 10 and again on January 2nd. People, especially the media, often refer to hot days in Rio as days of "sol a pino," even if the sun really is not at the zenith. Juan Barrio, current president of the Brazilian Association Planetariums, made a good point: in Rio,

Table 2

Subject	School year	Contents for Primary school
Math	1st	Arithmetic: Natural numbers , ordinality, cardinality, recursion, comparison, measurement, positional value, operations Geometry: orientation, representation of paths, shapes, symmetries, relationships, measurement, data Prediction: comparison of sizes, the unconventional measurement, relations of order and equality, classification on the basis of an attribute
	2nd-3rd	Arithmetic: Regularity, reading and writing natural numbers, positional value, operations and their properties Geometry: Classification of lines, nomenclature corners, distinguish regions and boundaries, nomenclature of basic plane figures, classification of geometric figures Relationships, measurement, data, and prediction: Reading and understanding of data; data representation with graphs, tables, charts, and diagrams; argument on the criteria chosen to realize and classify laws
	4th-5th	Arithmetic: Fractions and decimals, property transactions, severability and primes Geometry: Triangles, quadrangles, polygons, perimeters and areas, reference systems, plane and solid figures, rotations and symmetries Relationships, Measurement, Data, and Prediction: Major international units of measurement; the arithmetic mean, the fashion and the median; reading and understanding data; statistical acquisition; graphical representations
Science	1st	Direct observation of plants and animals, their oral description and iconic representation
	2nd	The seasons, matter and its member, the three kingdoms of nature
	3rd	Water, air and soil; the sun, light and heat Classification of animals and plants according to their characteristics Foodchains and ecosystems
	4th	Key concepts of biology, interaction between organisms, the environment and related issues Knowledge of simple physical and chemical phenomena Lexical knowledge of each discipline Analysis of the fundamental discoveries in human history
	5th	Systematic study of the human body and its functions (from the cell to the equipment) Reflection on behaviors regarding the health of people and the environment Study of the systems of the human body: movement and support, nourishment and energy, coordination and control of the body, reproduction and birth

Subject	School year	Contents for Middle School
Math	1st	Arithmetic: sets, numbers and decimal numbering; operations with numbers; mathematical problems; powers; other numbering systems; divisibility; GCD (greatest common divisor) and LCM (least common multiple); fractions, operations and problems with fractions; elements of statistics Geometry: measurements, first elements of geometry, straight lines in the plane, polygons, triangles and quadrilaterals
	2nd	Arithmetic: square root, ratios and proportions, proportionality, elements of financial mathematics Geometry: equivalence and equidecomposability, the Pythagorean theorem, isometries and not isometric transformations, circumference and circle, inscribed and circumscribed polygons
	3rd	Algebra: sets, relationships, logic elements, relative numbers, literal calculate, equations, mathematical functions and the Cartesian plane, probability and statistics Geometry: the theorems of Euclid, solids (polyhedrons and solids of revolution)
Science	1st	Physics/Chemistry: matter and states of aggregation Geology: water, air and soil Biology: living things, the plant kingdom, the animal kingdom
	2nd	Physics: basic elements of physics (motion, forces, levers) Chemistry: basic elements of chemistry (atoms, molecules) Biology: the human being and his systems (coating, support, muscular, digestive, circulatory and excretory), the principles of food and nutrition
	3rd	Physics: energy and its sources, electricity and magnetism Geology: history and evolution of the Earth Biology: theories of evolution, nervous system, reproductive system, genetics

seasons are not very pronounced.

Besides seasons, I also directed some discovery-based planetarium learning on moon and planet topics. I spoke at length on the value of astronomy education, on the value of the planetarium in teaching basic astronomy topics, on student developmental learning, and on some best practices for astronomy and planetarium teaching. I focused on interactive astronomy learning. In one kinesthetic model, teachers came to the front of the planetarium to model the dynamics of a stable star, an expanding star, and a contracting star.

Rio Planetarium astronomer Bruno Mendonca was very helpful in coordinating my planetarium lessons and other presentations. Together we designed a seasons worksheet for Rio's latitude, with Portuguese labels, that I used in one presentation.

Jorge Rocha prepared wonderful paper flipchart templates for me to draw the correct observed seasonal sun paths, while teachers drew the paths on their own worksheets. Rubens Villela, also an astronomer at the Rio Planetarium, operated the Zeiss projector for our interactive lessons.

Translator Ana Lyra from the American Consulate in Rio de Janeiro was extremely important to the success of the presentations. An earphone system allowed me to speak in English while she translated into Portuguese. For questions and comments from teachers, she translated into English for me.

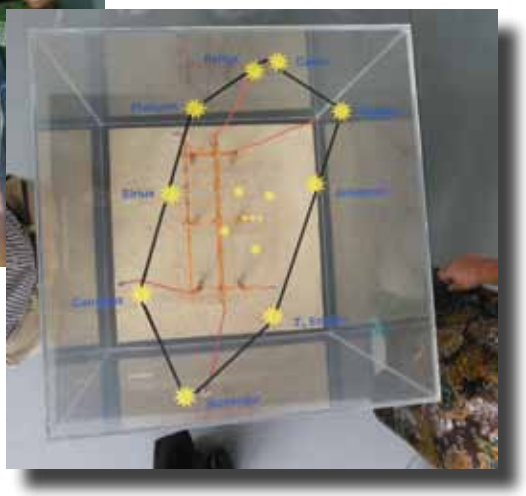
The coordination with the American consulate was handled by Carla Wachneidt, who, with Bruno, was able to help me understand the nature of the Brazilian educational system: elementary, secondary, and university divisions and federal versus private schools and universities.

Meeting teachers in Brazil

It was wonderful to meet teachers and hear of their experiences with the planetarium and the needs of their students. In an opening panel session, chaired by Cunha, teachers and special representatives discussed their experiences and perspectives on planetarium education. Astronomer Alexandre Cherman quietly translated main points of the panel discussion for me.

Elementary teacher Roberto Antunes stressed how valuable the planetarium was to his students, specifically how the visits expanded their horizons and provided a connection to the future. Secondary teacher Elizabeth Vieira reported on a program in which students from a prison attended planetarium programs. The prison visits were very successful; the planetarium had a deep impact on the students and seemed to change their attitudes.

An important point made by panel member Mario Chagas, representative from the Brazilian Institute of museums, was that too



Above: Jeanne Bishop with students leaving Santa Cruz (Brazil) Digistar Planetarium following demonstration and question period. Photo by Leandro Guedes. Right: Exhibit at the Santa Cruz Planetarium/Museum illustrating native Brazilian tribe belief that people came to Earth from the stars. Men and women are believed to come from different stars. Photo by author.

often we make a large distinction between formal and informal education. The goals for both classrooms and museums/planetariums are the same and we hope the outcomes of learning and inspiration will take place in both. Mario added that it is important to bring more women into science, including astronomy.

Maria Helena Steffani, planetarium director at the Federal University of Rio Grande do Sul, representing the Brazilian Association of Planetariums, noted that currently there are 80 planetariums in Brazil. Cunha, analyzing attendance at the Rio Museum and Planetarium, finds that 50% of the 7 million attendees are repeating, while 50% are new. Transportation has been a major concern in getting students to the museum and planetarium, but he expects the completion of a new transportation stop close to the museum will help this problem.

I was able to go with Guedes to the Santa Cruz Planetarium and Museum. Lilian Valdoski, the teacher there, and Leandro, showed me the very interesting exhibits describing the cosmological beliefs of native Brazilian groups. At Santa Cruz, as in Rio, there are excellent visual and descriptive astronomy and other science exhibits. I was most impressed with the interactive periodic table of the elements, consisting of element cubes that can be rotated to show many types of information.

Following a multimedia presentation for students who were about age 10 in the Digistar theater, Leandro invited the students to ask me questions. Leandro interpreted their Portuguese into English for me, I responded in English, and Leandro interpreted my answers into Portuguese for the students. The students were very enthusiastic, and they asked excellent questions, including how the solar system and the Earth's atmosphere originated, what it would be like to approach a black hole, and how stars form and go through their lives. The students came with their English teacher, and the teacher told me she was delighted that the students had the opportunity to hear me speak English.

Cherman hosted me on a photo expedition to tourist locations, including the famous statue of Christ the Redeemer and Sugarloaf Mountain. The pictures will be incorporated into a fulldome planetarium presentation. The panorama of Rio seen from each of these locations is breathtaking.

Cunha and his family graciously showed me many other beautiful locations in Rio, driving along the ocean on a beautiful day. On one evening Celso and other Rio Planetarium staff tried to have a telescope observing session in a favela location. We drove to the Providencia Favela, but there was a huge rainstorm—the only non-perfect situation in an otherwise wonderful week. ☆

(5272) Dickinson = 1981 QH2
Discovered 1981 Aug. 30 by E. Bowell at the Anderson Mesa station.
Named in honor of Terence Dickinson, Canada's foremost popularizer of astronomy. Dickinson is author of several books, notably *Night Watch*, *The Universe and Beyond*, *Exploring the Sky by Day* and *Exploring the Night Sky*, which received the New York Academy of Sciences Children's Science Book Award in 1988. He reaches a wide Canadian audience every week with his astronomy column in *The Toronto Star* newspaper and on Canadian Broadcasting Corporation programs. From 1973 to 1975 he was editor of *Astronomy* magazine, and he has held scientific positions with the Ontario Science Centre in Toronto, the Strasenburgh Planetarium in Rochester, New York, USA and the McLaughlin Planetarium in Toronto. Dickinson teaches astronomy at St. Lawrence College in Kingston, Ontario. Name suggested and citation provided by C. J. Cunningham.

(5174) Okugi = 1988 HF
Discovered 1988 Apr. 16 by M. Yanai and K. Watanabe at Kitami.
Named in honor of Susumu Okugi (b. 1952), director of the software division of Goto Optical Laboratory. Under his direction numerous automated planetarium programs have been developed. In this way, he has contributed much to the popularization of astronomy and space science.

(5180) Ohno = 1989 GF
Discovered 1989 Apr. 6 by T. Fujii and K. Watanabe at Kitami.
Named in honor of Keiko Ohno (b. 1959) for her activities in promoting the public awareness of the study of astronomy and space science. As a software developer at Goto Optical Laboratory she has produced many computerized planetarium programs.