PSC
Planetarium Science Center
newsletter
3rd year | 1st edition
Planetarium Science Center
Science For All!

1st School Semester 2009|2010

In this edition...

A NEW BEGINNING!

As we start a new school year, we hope to start a new phase of joy and inspiration in our lives.

The summer, a time of relaxation, fun and joy, has come to an end. But that does not mean the end of fun and joy. The beginning of a new school year is a perfect opportunity to embark on a new adventure of joyful learning and inspiration.

Before the summer started, we celebrated the third Science Festivity, 1-3 April 2009, under the overarching theme "Energy". We also celebrated the World Environment Day (WED 2009) on 20 June and the seventh Eratosthenes festivity on 21 June 2009. We invite you to read about the newest addition to the PSC annual events, WED, in our Highlights section, Page 10.

The PSC Summer Program encompassed a colorful variety of exciting activities including a collection of workshops from a wide range of scientific and creative fields. It also comprised a diversity of programs, contests, competitions, lectures, videoconferences, fieldtrips, camps and festivities. The Program closes with an annual festivity on 3 September 2009.

This August, thanks to the Egyptian Ministry of Tourism, the BA Planetarium was reopened with a cutting-edge full-dome Digistar3 projection system featuring a rich set of real-time 3D astronomy features and a wide database of celestial bodies that enables the audience to explore the universe as never before.

Within our ongoing venture in seeking excellence and innovation, we here at the PSC always enjoy an opportunity to start afresh with a new beginning and approach. Within our new approach and on the occasion of the third year for the PSC Newsletter, the Editorial Team presents our readers with a new format, in which each issue will be dedicated to a theme relevant to concurrent global and local events.

In celebration of the conclusion of the International Year of Astronomy 2009, which celebrates the 400th Anniversary of Galileo Galilei, this issue is dedicated to Astronomy in general and particularly the 40th Anniversary of the historic first Moon landing by Man.

The new PSC Newsletter format offers pedagogical information about the PSC's new and upcoming activities, in addition to information about the most recent and significant activities, as well as feature stories revolving around the theme of the issue.

This issue, we are covering Planetarium and ALEXploratorium News (pages 2 & 6), in addition to the activities of the first School Semester 2009/2010 (pages 7-9). We are also offering a feature story inspired by the History of Science Museum on the subject of Egyptian Astronomy (pages 4-5).

This issue's PSC Dossier features the story of the 20th-century most outstanding achievement, the first landing on the Moon by a Man, from three points of view: then, now and beyond (pages 12-15). We are also offering a brief honorarium to Galileo (page 16).

This season, the PSC once again offers a new range of workshops and activities. Among the subjects the students will learn of within this season's workshops, the wonders of astronomy and the solar system, the secrets of the micro world, the nature of matter, the importance of adaptation and its influence on living organisms. The students will also learn some interesting facts about chemical reactions, how to conduct an electric current, as well as the importance of energy in our lives. Furthermore, they are going to acquire some biological knowledge of the human body, as well as some information about physical phenomena, such as density.

Successful ongoing PSC Programs will continue; including the Science Club, the Super Science Show, Fun with Science, Chess Club, ALEXploratorium and History of Science Museum contests, Darwin, Space Technology, and Discover Your Environment camps.

Other scheduled Events and Exhibitions include "Marconi","From Earth to the Universe", "Volta", and the "She is an Astronomer" conference. That is in addition to the 17th Annual Meeting of the European Society for Astronomy in Culture (SEAC 2009), 25-31 October 2009.

We invite you to visit our website at www.bibalex.org/psc regularly to read more and stay updated about all our activities.

It is time for a new beginning and we hope to inspire you to join us in a renewed adventure of discovery, learning, fun and joy.

By: Maissa Azab, PSC Publications Coordinator

A Whole New World!

How amazing it is to be able to take a break from everyday life and step, for a little while, into a world of adventure and amusement. It is still our world though; yet, it cannot be seen this way anywhere else. It is the world as seen only from inside a full-dome planetarium theater.

In this world, and this world alone, when the doors are closed and the lights are dimmed, we feel like our seats have turned into magic carpets, right out of our childhood fantasies. While we remain seated, we zoom through time and space on unique expeditions to explore the universe as Man cannot do in real life... Not yet anyway!

We journey to the past to see how our ancestors saw the universe at the dawn of time and discover man-made wonders that vanished from the Earth's surface thousands of years ago. We dive to the depths of the Earth's oceans and seas... climb to the tops of its mountains and volcanoes... peer inside our own bodies to see everyday miracles unfold before our eyes... we search in and out for answers to the endless marvels of this unique planet we inhabit.

Our curiosity drives us even farther... beyond our planet... through our Solar System with all its different celestial bodies, each with its own endless secrets, and into a vast universe of countless exquisite constellations and galaxies that seem to have no end, no matter how hard or deep we look.

Indeed, it is a fascinating world that that the Planetarium at the New Library of Alexandria offers its public. Since its inauguration in October 2002, the Planetarium has dazzled the public with various technologies, the most outstanding of which, up until recently, has been the large format IMAX film projection system with its massive images.

As of August 2009, thanks to the Egyptian Ministry of Tourism, the Planetarium now also operates a cutting-edge full-dome Digistar3 projection system with a rich set of real-time 3D astronomy features and a wide database of celestial bodies that enables the audience to explore the universe as never before. The new system will also enable the Planetarium Specialists who have already succeeded in producing the first Egyptian planetarium show, also the first to be produced entirely in the Middle East, to build shows from a simple-touch screen interface and watch their creations in the star theatre.

The Planetarium upgrading comes timely as the Bibliotheca Alexandrina prepares to host the 20th International Planetarium Society Conference in June 2010. The IPS conferences are the largest and most significant events in the world of planetariums where nothing but state-of-the-art technologies are exposed.

By: Maissa Azab, PSC Publications Coordinator

WHAT'S NEW?

Seven Wonders

30 Min. Full-dome Show

Ever wondered about the Seven Wonders?! What were they? How did they come to be? More importantly, why were they, and why do they remain, wonders?

Spectacular tombs of mysterious structures... A mystical oasis of multileveled gardens growing in the middle of the harsh desert... Colossal monuments towering hundreds of meters above ground... The ancient Seven Wonders are a universal riddle that continues to mesmerize the world with its enchanting mystery...

But no matter how wondrous they were, except for the Great Pyramid, none of the ancient Seven Wonders remain today. It is no wonder then that we turn our eyes from Earth to the skies where the wonders are everlasting...

In that vastly spread universe, spectacular stellar jewels form dazzling cosmic wonders that swirl and swarm through space... wonders that have triggered Man's imagination since the dawn of time, inspiring fantastical tales and luring him into a perpetual wanderlust to unravel the fascinating secrets that lie therein.

But the greatest wonder of all may be this tiny blue planet where we start our journey. This planet that may indeed be unique in all the universe, for it is the only place in this vast cosmos where we know life exists... Life of such variety, complexity and intelligence that it overwhelms the imagination... Life that can explore, understand, and construct the exquisite monuments of mankind...

Life that can ponder the mysteries and wonders of our planet and the universe beyond.

Stars of the Pharaohs

35 Min. Full-dome Show

From far out in space, its dark winding outline can be seen against the golden deserts of northern Africa.

From its sources in the heartland of Central Africa, the rift valley lakes, it flows northward thousands of miles forming a large fertile delta on the Mediterranean.

It's the world's longest river-the Nile.

Here, a great civilization arose; its monuments are as awe-inspiring today as when they were new... A magnificent legacy of massive buildings covered in pictures and writing... Buildings we can read today the way we read a book.

On the West bank of the Nile, the Cities of the dead and on the East the temples of the living gods... Structures that have lasted for thousands of years, enduring as the stars, while millions of homes and even the palaces of the pharaohs returned to the river mud from which they were built.

So overwhelming are they, and so accurate are their alignments that some people claim that they were observatories, possessed magical powers or were even built by aliens.

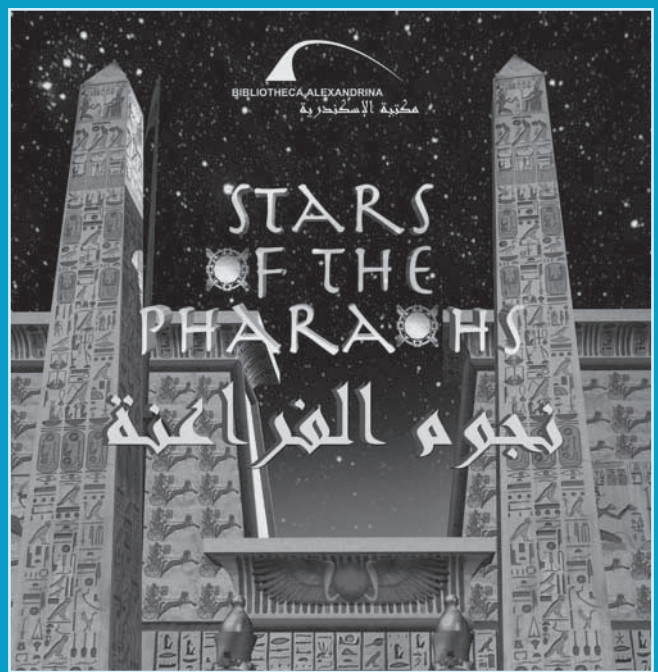
How much truth is there in these claims? How did the Egyptians see and use the stars, and what is their legacy to us?

The ancient Egyptians gave us the 24-hour day and the 365-day year, but they did not try like the ancient Greeks to explain in scientific terms how the sun, the planets and the stars moved, or even where they were.

For them, the heavens were the realm of the gods. The sky embodied the balance between order and chaos, between death and rebirth. The god kings lived on Earth and then journeyed to the heavens to reign forever with the imperishable stars.

To us, the stars are no longer a place of religious mystery. They are instead the doorway into a magnificent universe that is much more wondrous than the Egyptians could ever have imagined... a universe whose secrets we have only now begun to understand.

The Pharaohs imagined that they could travel to the stars. Now five thousand years later, we have embarked on the first steps of a journey which may make that dream come true.



New Horizons

23 Min. Full-dome Show

Five thousand years ago, when ancient Stonehenge was not so ancient, a magnificent apparition appeared in the sky.

To its builders, this heavenly sign might have expressed the delight of the gods or even their displeasure.

When this same celestial visitor returned to the skies of Earth at the end of the twentieth century, a few still thought it was a heavenly messenger, but most people realized that this was actually a comet-a distant member of our Solar System.

This amazing new show takes us on a breathtaking expedition through the Solar System and into the realm of comets, billions upon billions of them.

Icy mountains, they swarm around our now dim star. A gentle tug or gravitational push and they will fall inward, on a journey that can take thousands of years.

How did they get there?

For us Earthlings, our voyage of space exploration has barely just begun. Fresh mysteries, old questions, new sights, new worlds... beckon us constantly.

As long as curiosity remains in the human race, we will be drawn to explore, understand, and perhaps live on these New Horizons...

ALSO AVAILABLE

Human Body
40 Min. IMAX Film

Ring of Fire
40 Min. IMAX Film

Oasis in Space
25 Min. Full-dome Show

Stars Show
45 Min. Live Show
by the PSC resident astronomer

Visitors INFO

- For the Planetarium daily schedule and fees, please consult the Center's official website: www.bibalex.org/psc

- Kindly note that, for technical reasons, the Planetarium maintains the right to cancel or change shows at any time without prior notification.

The Dawn of Time

A Tale of Egyptian Astronomy

Adapted from the *Galileo, Images of the Universe from Antiquity to the Telescope* exhibition edited by Paolo Galluzzi; original text by Alessandro Roccati and Edoardo Detoma

Some information was also provided by Dr. Fatehi Saleh; Director, Center for Documentation of Cultural & Natural History (CULTNAT)

Rewritten and edited for the PSC newsletter by Maissa Azab and Ingy Hafez

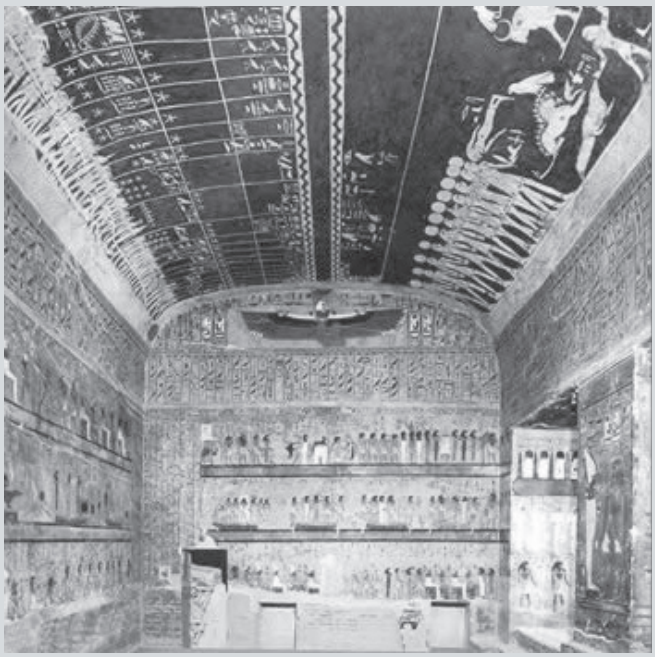
"The Egyptians, they said, were the first to discover the solar year, and to portion out its course into twelve parts. They obtained this knowledge from the stars."-Herodotus, History, Book II, 4

Ancient Egyptians were famous for their knowledge in the field of astronomy. The Egyptians' vision of what they saw in the skies took a mythological form that was closely bound to the definition of the religious structure. The Sun was identified as the ancient god who gave rise to creation and life.

Egyptian astronomers left to modern astronomy a fundamental legacy; two measurements that defined the evolution of astronomy and the everyday life of civilization. These were the yearly calendar as we know and use it today, and the division of day and night into 12 hours each.

In a world with no history, time was one of the first quantities measured. Measuring time originated in response to the needs of agriculture, the cycles of which were the basis for the transformation of human society. Therefore, the idea that the calendar was based on the annual solar cycle is doubtful; it is not clear whether the Egyptian calendar was of astronomical or agricultural origin.

A relationship was detected between earthly and celestial phenomena, leading to the division of time into repeated periods linked to the phases of the moon and river. The forthcoming occurrence of the flood was predicted by observing the rising of the star Sepdet (the Greek Sothis, known to us as Sirius). This was the link between the astronomical definition of the calendar and its purely agricultural origin. It connected the annual cycle to the religious cycles of death and resurrection, the daily cycle of the Sun from East to West, people's lives and the annual flood cycle.



As Egypt adopted a decimal numerical system, the duration of the Egyptians' 'vague' year was divided into weeks of 10 days, with a total of 36 weeks in the year. The length of the months, which in some ways linked to an archaic lunar calendar, was 30 days and they had three weeks each.

The months were gathered into three seasons known as 'Inundation'(Akhet), 'Emerging from the waters' or 'Growing' (Peret), and 'Great Heat' or 'Dryness', also known as 'Harvest' (Chemou), each comprising four months; all in all totalling 360 days, to which the Egyptians added five final days to complete the cycle of 365 days. However, the year was still missing a quarter of a day to complete the actual solar year; as time passed, a huge gap occurred.

The Egyptians' 'vague' year of 365 days survived in astronomical practice until precise measurements prompted its correction and replaced it in common usage with the Julian year(1). In this sense, over the centuries, the Egyptians' 'vague' year of exactly 365 days provided the link, via the Arabic astronomy, between the Greek and Ptolemaic astronomy and the development of the Copernican system at the height of the Renaissance.

The division of the day into 24 hours stemmed directly from the ancient Egyptian calendar structure. The first calendars were discovered in coffins of the 12th dynasty (1900-1800 BCE) from the Middle Kingdom. The study of these structures suggests that the original on which they were based is much older, dating possibly to 2830-2780 BCE. The inner lids of these coffins portray the so-called 'diagonal clocks' or 'star calendars', which in this context had a purely ritual function.

In the following years, the Egyptians developed clocks that measured time independently of the path of the stars. The appearance of sundials(2) and clepsydrae(3) in a papyrus of the 19th dynasty is proof of the introduction of the concept of hours of equal duration.

Other Egyptian cosmographic works are known only through copies or adaptations used as additional decoration, especially in the tombs dug in the Valley of the Kings in Thebes for the kings of the New Kingdom (c.1500-1100 BCE). These grandiose tombs were supposed to replicate the universe for the everlasting life of the buried pharaoh. They contained a detailed description of cosmological knowledge starting with the measurement of the path of the Sun. Some estimates are so accurate that they differ little from those of today, such as the caluclation of the circumference of the Earth. These decorations culminated in the depiction of the starry heavens in the room with the coffin. This more purely astronomical part is also recorded at Abydos, in the so-called Osireion, which was probably the tomb of Osiris.

Tradition has handed down the names of scholars who are thought to have cultivated religious astronomy, mainly for astrological purposes to foretell the future such as Nechepso and Nepheros. The Egyptian Museum in Cairo has a statue of an astronomer, Harkhebi, who lived in the 2nd century BCE, with a uniquely detailed hieroglyphic inscription that describes his expertise and various duties.

Moreover, the ancient Egyptians had knowledge of the twelve signs of the Zodiac. However, the Egyptians did not invent the twelve classic signs. These were created by the Babylonians; the Egyptians learned of them from the Greeks during the Ptolemiac period. The Egyptian zodiac recognized many of the same basic constellations, but they were imagined to be in different shapes than the ones common today.

Despite huge gaps, the documentation retrieved enables us to declare the Egyptians' astronomical science one of the great fields in which they excelled.

(1) The Julian Year:

In the year 46 BCE, Julius Caesar launched an ambitious plan to restore order to the lunar-based Roman calendar. At the time, the Romans were already in contact with Eastern civilizations and certainly with Egypt as the reform was entrusted to an Egyptian astronomer of the School of Alexandria, which in Hellenistic times was the hub of Mediterranean culture.

As the lunar calendar was based on a cycle of 354 days, the length of the months had to be modified by adding the missing days at the end of each month in such a way that the festivals would not be affected. Months of 31 and 30 days altered starting with March, the first month in the Roman calendar. February had 29 days to complete the cycle of 365; every fourth year, February had 30 days. Ninety days were added to the year 46 BCE to align the months with the proper seasons and the reform became effective in the year 45 BCE.

A further correction was required in the year 9 BCE as the Julian reform was not applied correctly, adding a leap day every three years instead of four. The leap year was omitted for sixteen years to offset the error. It was not until the year 8 CE that the Julian calendar was applied again as originally intended.

In the same period, the length of the month of August, dedicated to the Emperor Caesar Augustus, was changed so that he was not given a month that was a day shorter than the preceding one, July, which was dedicated to Julius Caesar. As a result February lost a day and its length became 28 days in normal years and 29 days in leap years.

(2) The Sundial:

Before the invention of mechanical clocks, timepieces used the Sun's motion to track time. The sundial is based on the fact that the shadow of an object will move from one side of the object to the other as the sun "moves" from East to West during the day. It consists of a vertical stick or pillar, where the length of the shadow it casts gives an indication of the time of day. It dates back to the Egyptian Period, around 1500 BCE; it was also used in ancient Greece and Rome. In central Europe, it was the most commonly used method to determine the time, even after the mechanical clock was developed in the 14th century, and until the 19th century.

(3) Clepsydrae:

Water clocks, or "clepsydrae", were invented in Egypt around 1400 BCE. They are better than sundials because they tell time at night as well as during the day, and they are also more accurate. A water clock might sound very complicated but actually it is not. It is composed of a little stand with a pot on the top and another at the bottom, with the pot at the top having a hole drilled in its side. The pot is then filled with water flowing out of the top pot down to the bottom pot. When the water is at a certain level, it is a certain time. The only disadvantage of the water clock is that it has to be continually refilled.

History of Science Museum

VISITORS INFO

Opening Hours

Saturday to Thursday	[from 09:00 am to 16:00 pm]
Friday	[from 15:00 pm to 18:00 pm]

Guided Tours Schedule

Saturday to Thursday
[10:00 am + 11:00 am + 12:15 pm + 13:00 pm + 14:15 pm]
Friday [16:45 pm]

- Museum entry fees are included in all Planetarium show tickets.
- For non-audience of the Planetarium, Museum entry fees are 0.50 EGP.
- Museum Tours are free for ticket holders.

A Discovery Adventure!

We breathe, we see, we hear, we touch and feel. We eat and drink; we think, talk, walk and work. We create art, we play sports, we gain weight and lose it; we fall ill and recover. We get married and have children who can look and even act like us.

Clouds form; it rains; it snows; the wind blows; and we feel cold. The sun comes up; the temperature rises; we feel hot and we sweat. Sometimes it is difficult to breathe; the earth might shake under us; mountains might errupt. Different trees, plants and flowers grow in some places but not others. Different living organisms roam the lands, fly in air, or inhabit the waters of oceans, seas, lakes or rivers.

Mankind evolves, increases in number, inhabits more land; and uses more resources. Man builds places wherein to live and work, invents machines to make his life easier, makes vehicles to travel in land, sea, air, and space; he needs more and more energy. Smoke rises into the atmosphere; the temperature rises; humidity increases; ice melts; climate changes; life on Earth changes too.

Why do any of these actions happen? How do they happen? What can happen as a result? The answer is in *SCIENCE*.

Life is a continuous and endless chain of miracles, all mysterious and all connected. Science is the never-ending quest for answers to the riddles of life; a game of hide and seek with consequences that can lead either to glory or misery and sometimes both at the same time!

Science is included in every single second of our every-day life, it is all around us and inside us… inside our bodies, in the ground we walk on, in the air we breathe, in the space around us and in millions of light years away. We need science to grow and move forward, we need it to understand what we are and where we live; to know our past, learn our present and make our future.

Science is the quesiton and the answer, an ongoing adventure that Man cannot tire of. It is an unequivocal adventure; intriguing, exciting and miraculous. We are all part of this adventure; it is in our best interest to be aware of what it is about and to be able to decide which role to play in it. If we want to, it can be one of the most interesting things to do.

At the Planetarium Science Center, science is easy to understand for everyone; the adult, the teenager, and certainly the child. In the ALEXploratorium, where science comes to life, the adventure is the source of fun as it is the essence of discovery… this adventure of discovery that continues to lure and entertain visitors.

The ALEXploratorium will be undergoing renovation work by the end of 2009 and is scheduled to re-open in a new look on 3 January 2010.

By: Maissa Azab, PSC Publications Coordinator

VISITORS INFO

Discovery Zone

The current Discovery Zone exhibit area where visitors can interact directly with the experiments on display is divided into five main themes: Physics, Biology, Chemistry, Astronomy and Games.

The Discovery Zone now also comprises:

- The ***Timeline*** banner, located in the entrance of the Discovery Zone and dedicated to highlighting 48 scientific milestones throughout history from 35000 BCE to the year 2000;
- The ***Nobel Laureates*** banners on display in the entrance of the main Discovery Zone exhibit area dedicated to honoring a few of the great scientists who have received the prestigious prize for achievements directly related to the themes adopted by the ALEXploratorium exhibits and activities; and
- The ***Kids Corner***, a special area where children under 6 years of age can safely have fun while their families enjoy the PSC activities.

Opening Hours

Saturday to Thursday	[from 09:00 am to 16:00 pm]
Friday	[from 15:00 pm to 17:00 pm]

Guided Tours Schedule

Saturday to Thursday
[10:00 am + 11:00 am + 12:00 pm + 13:00 pm + 14:00 pm + 15:00 pm]
Friday [15:00 pm + 16:00 pm]

Discovery Zone entry fees are:

Students	2 EGP
Non-students	4 EGP

Listen and Discover

Short and simple scientific documentary films of a lively nature that attract audience and help them understand scientific issues in an appealing and interesting manner.

- For the list of shows available at the "Listen and Discover" and the schedule, please consult the Center's official website: www.bibalex.org/psc.

- For reservation, please contact the PSC Administrator at least one week before the desired date.

- "Listen and Discover" show fees are:

DVD shows:

Students	EGP 1
Non-students	EGP 2

3D shows:

Students	EGP 2
Non-students	EGP 4

WHAT'S NEW?

THE WORKSHOP

Workshops are hands-on activities that allow students to get in direct contact with scientific phenomena while interacting with the PSC staff. Every season, ALEXploratorium specialists develop new ideas for the workshops they prepare for the students. Their main concern is to make the workshops enjoyable, besides being practical and useful for students. Through direct contact with the students, the specialists have developed an extensive knowledge of their interests and the appropriate methods to approach them.

This season, there are going to be a variety of workshops. Students are going to learn about different fields of science. Among other things, they will be introduced to some of the wonders of astronomy and the solar system, the secrets of the micro world, the nature of matter, the importance of adaptation and its influence on living organisms. The students will also learn some interesting facts about chemical reactions, how to conduct an electric current, as well as the importance of energy in our lives. Furthermore, they are going to acquire some biological knowledge during the human body workshop, and get some information about physics in the density workshop.

As always, we do our best to guarantee that the students enjoy their experience with us and come visit us every new season for a new variety of intriguing workshops.

- Registration for 1st School Semester 2009 / 2010 workshops starts on 1 October 2009; reservation is for groups only and it is to be made at least one week in advance
- Minimum number of participants per workshop is 15 students
- Maximum number of participants per workshop is 30 students
- ALEXploratorium Workshop fees are 2 EGP per student
- The workshop duration is 90 min

Astronomy (4-8 October 2009)

Astronomy is one of the oldest sciences. It is the scientific study of celestial bodies and phenomena. It is concerned with evolution, physics, chemistry, meteorology, and the motion of celestial objects, as well as the formation and development of the universe. In this classic workshop, students learn more about the Solar System through a variety of fun experiments, including the making of a solar system model and the construction of a rocket!
- Target age group: 12-13 years

Human Body (11–15 October 2009)

The human body is the entire physical and mental structure of a human organism. By the time the human reaches adulthood, the body consists of around 10 trillion cells. Groups of cells combine to form tissue, which combines to form organs, which work together to form organ systems. This workshop is about the human body and its enthralling wonders. It includes experiments about lung capacity, digestion, DNA, the skeleton, pulse, as well as embryonic stages.
- Target age group: 9-10 years

Chemistry (18–22 October 2009)

Chemistry is the science of chance. It looks at all the different kinds of substances and how they interact with each other. People in widely differing walks of life use chemistry every day. This chemistry workshop comprises some simple and fun scientific experiments that familiarize children with some chemical secrets, such as chemical reactions, atoms and molecules, the difference between compounds and mixtures, acid base reactions, among many other secrets.
- Target age group: 13-14 years

Energy (25-29 October 2009)

All forms of energy are stored through different ways in the energy sources that we use every day. These sources are divided into renewable sources that include solar energy, wind, geothermal energy, biomass, and hydropower; and nonrenewable sources that include fossil fuels: oil, natural gas, and coal. This workshop presents the different forms of energy, through interactive experiments that explain how energy is transformed from one form to another, and demonstrates energy properties and their applications in daily life.
- Target age group: 11-12 years

Adaptation (1-5 November 2009)

Adaptation is one of the basic phenomena of biology. It is the process where an organism becomes better suited to its habitat, and it is especially important for an organism's survival. The purpose of this workshop is to introduce a simple concept of evolution and adaptation. Students will be able to learn what adaptation is by studying the evolution of animals from different habitats.
- Target age group: 11-12 years

Electronics (8-12 November 2009)

Electronics is a very interesting branch of science and technology that deals with electric devices and the flow of electrons. At the end of this workshop, students will be able to identify the concept of an electric current, recognize the conditions for obtaining it and carry out activities to set up a simple electric circuit.
- Target age group: 13-14 years

Density (15-19 November 2009)

Density is a physical property of matter as each element and compound has a unique density associated with it; thus making it an important property of any matter. Understanding density helps us know the answer to many questions, one of which is: why do some objects float on water while others sink in it? This workshop introduces children to the theory of density and floating bodies through fun experiments.
- Target age group: 11-12 years

Micro-Organisms (22–26 November 2009)

In biology, an organism is a living system. A micro-organism is an organism that is microscopic; too small to be seen by the naked eye. The study of micro-organisms is known as microbiology. Micro-organisms are very diverse; they include bacteria, fungi, microscopic plants, such as green algae, and animals such as amoeba. Some micro-organisms are considered non-living, such as viruses and microbes that are exploited by people in biotechnology. What is a microbe? What is a virus? Which are good microbes and which are bad? In this workshop, students will learn the answers to these questions and more.
- Target age group: 12-13 years

Matter (29 November - 3 December 2009)

The word "Matter" refers to the substance of which objects are made. It is defined as anything that has both mass and volume. Matter can exist in several different forms, known as phases, which have chemical composition and physical properties. These phases include three familiar ones; solid, liquid, and gas; as well as more exotic states, such as plasmas, super fluids, super solids, Bose-Einstein condensates. During this workshop, students will learn the different forms of matter, and get to examine each phase of it.
- Target age group: 11-12 years

WHAT'S NEW?
Programs and Events

Science Club

(ongoing school outreach program)

An ambitious outreach project, the Science Club program has been adopted by the PSC to bring the hands-on concept to science learning within the formal education framework. It aims to establish scientific corners in different schools and train teachers to apply innovative communication methods through workshops and researches. The program aspires to stimulate curiosity, interest and enjoyment in science, in addition to enhancing experimental abilities and developing investigative skills.

- Target age group: 6-13 years
- Free of charge
- Participation is for schools only; for registration, please contact the PSC Administrator for details

Super Science Show

New Format (ongoing)

The PSC team introduces a new phase of excitement and science learning to students. The Super Science Show is a dynamic and highly motivational activity that gets children involved in exciting hands-on experiments, in the fields of physics, biology, and chemistry, that stimulate infectious enthusiasm. This ever-intriguing show allows children to use a variety of materials, such as balloons, bouncing balls, balance board, water, liquid Nitrogen, dry ice and soda cans. Prior reservation is required.

- Target age group: 6-12 years
- Show duration: 60 min
- Maximum number of participants: 50
- Registration starts on 1 October 2009
- Show fees inside the BA are EGP 100
- Show fees outside the BA are EGP 300
- For reservation, please contact the PSC Administrator at least one week before the desired date

Fun with Science

(ongoing)

In collaboration with the BA Young People's and Children's Library, the PSC offers the Fun with Science program, which applies a series of fables containing valuable messages that aim to provide children with a scientific basis, enabling them to make use of scientific facts as creative tools.

This season, there are three interesting fables: The King of Hearts, where students will gain information about the human heart and the heart of whales; The Strongest Tree, where they will discover the role of sunrays, ants, mushrooms and bacteria in growing trees; and Cold Feet, through which they will discover facts about humidity, as well as strawberries and radish.

A major theme of the program is the introduction of «systems thinking»; children learn that everything is interconnected. The first part of the program is based on storytelling, while the second part focuses on hands-on scientific activities.

- Target age group: 6-12 years
- Number of sessions/week: 2
- Session duration: 2 hrs
- Maximum number of participants: 25
- Registration starts on 1 October 2009
- PSC workshop fees are EGP 2 per student per session
- Young People's and Children's Library entry fees are EGP 0.50 per student per visit
- For reservation, please contact the PSC Administrator at least one week before the desired date

Chess Club

(ongoing)

Chess is an exercise of infinite possibilities for the mind; one which develops mental abilities used throughout life: concentration, critical thinking, pattern recognition, strategic planning, creativity, analysis, synthesis, and evaluation, to name a few. Chess is also a highly effective tool for teaching problem-solving and abstract reasoning. Learning how to solve a problem is actually more important than learning the solution to any particular problem. Through chess, we learn how to analyze a situation by focusing on important factors and by eliminating distractions. To that end, the Planetarium Science Center (PSC) is launching this new program that aims at developing the mental capacity and analytical skills of children.

- Target age group: 8-15 years
- Program duration: 3 months
- Number of sessions/week: 2
- Session duration: 2 hrs
- Maximum number of participants: 25
- Registration starts on 1 October 2009
- Fees (following interview): EGP 150
- Program starts on 15 October 2009
- For additional information and registration, please contact the PSC Administrator

ALEXploratorium Contest

(ongoing)

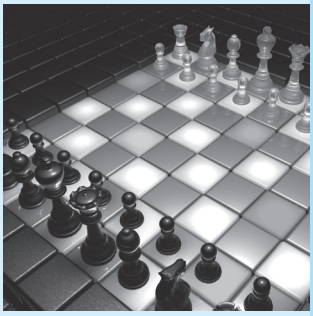
The ALEXploratorium contest is a science-related contest that helps students of different age groups to interact with essential scientific topics through teamwork. The contest provides students with an opportunity to test their knowledge and mental abilities through exploring the world of science. It also encourages them to participate in the process of science communication and share their knowledge with each other. The contest is divided into: the Human Body, Computer Games, and the Timeline.

- Target age group: 12-16 years
- Contest duration: 1 hr
- Maximum number of participants: 25
- Fees: EGP 2 per student
- For reservation, please contact the PSC Administrator at least one week before the desired date

History of Science Museum Contest

(ongoing)

The History of Science Museum transcends the traditional museum concept of static display in its quest to simplify national and regional scientific



heritage. The PSC team offers its visitors this energetic interactive contest that is based on games and quizzes about the information found within the Museum.
- Target age group: 8-16 years
- Contest duration: 1 hr
- Maximum number of participants: 25
- Fees: EGP 2 per student
- For reservation, please contact the PSC Administrator at least one week before the desired date

Darwin

(ongoing)

Celebrating the Darwin Year, the PSC is organizing a variety of activities to commemorate the centennial of Darwin's birth and the 150th anniversary of the publication of his most important book "The Origin of Species". The Darwin program aims at getting students to explore his life with all its disappointments, excitements, failures and successes. The program includes activities that familiarize students with Darwin's way of thinking, and engage them in some situations that faced him; thus, helping them develop their cognitive and creative skills. Moreover, the students will be more familiar with the basic theories of evolution and natural selection, which are still the bases of modern science.
- Target age group: 12-16 years
- Number of participants: 15-30
- More information will be posted shortly on the Center's website

Space Technology Program

(ongoing)

Understanding Space is essential to face 21st-century challenges, such as: climate change, natural disasters, security, communication, and scientific development in general. The Space Technology program offered by the PSC simplifies this field to students via multiple activities including lectures, workshops, fieldtrips, and research projects.
- Target age group: 15-21 years
- Session duration: 3 hrs
- Number of participants: 10-20
- Program fees are EGP 100 per participant
- For additional information and registration, please contact the PSC Administrator.

Discover your Environment Camps

Through this program, initiated in the winter of 2008, the PSC organizes a variety of environmental camps to various locations in Egypt, with the aim of introducing young students to the environment in Egyptian deserts and allowing them to interact with it. The program helps students identify wildlife patterns as well as the region's biodiversity, in addition to offering them a diversity of astronomical activities. Discover your Environment Camps include Elbahareya Oasis, Siwa, Saint Catherine, and many others.
- Target age group: 10-16 years
- Information about the camps will be posted on the Center's website.

Save the Date!

Marconi Event and Exhibition

(15 October 2009)

To celebrate the end of the Egypt-Italy Year of Science 2009, the Library of Alexandria, in collaboration with the Italian Embassy and the Italian and American Friends of the Library, will host the «Marconi» event in October 2009. This event will host Marconi's family to present his inventions. Moreover, an exhibition about those inventions will be presented during the event.
- Target age group: Open
- Free of charge

From Earth to the Universe

(23 October – 23 November 2009)

This exhibition is a collection of astronomical images showcasing the most dramatic views of our universe. The images will represent the incredible variety of astronomical objects that are known to exist such as planets, comets, stars, nebulae, galaxies and the clusters in which they congregate.
- Target age group: Open
- Exhibition ticket: EGP 5

Volta

(15 November – 15 December 2009)

The ALEXploratorium Discovery Zone will be displaying exhibits about the inventions of Alessandro Volta who discovered and specified several aspects of electricity, one of which is the Voltage and its measurement unit Volt, named in his honor and in appreciation of his efforts.
- Target age group: Open
- Exhibition ticket: EGP 5

She is an Astronomer

(8-9 December 2009)

Promoting gender equality and empowering women is one of the United Nations Millennium Development Goals. She is an Astronomer will promote gender equality in astronomy, and science in general, tackling bias issues by providing a web platform where information and links about gender balance and related resources are collected.
- Information about the conference will be posted shortly on the Center's website.

BE Positive! ACT Now... SAVE the Environment!

By: Ingy Hafez; PSC language Specialist

What do you think is the best way to show appreciation for our planet? Actually there are many ways to do it; just take the decision and go for it!

"The activist is not the man who says the river is dirty; the activist is the man who cleans up the river". Ross Perot

Yes! It is not enough to dream of making the world a better place; what is more important than the dream itself is trying to make it come true. That's why the Planetarium Science Center (PSC) at the Bibliotheca Alexandrina (BA) is taking a step forward towards realizing a universal dream; the dream of saving the environment.

This year, the PSC initiated an annual event in celebration of the World Environment Day (WED), on 20 June 2009 at the BA Plaza. In fact, the United Nations (UN) initiated this event in 1972. The whole world celebrates this day every year in the month of June, stimulating the public's respect for the environment.

This year, we celebrated that day under the overarching theme announced by the UN *"Your Planet Needs You, UNite to Combat Climate Change"* to make the public aware that no matter how trivial their actions may seem to be, they could tremendously affect our environment. Recognizing the importance of the event, the Ministry of State for Environmental Affairs, the Ministry of Education, in addition to civil society organizations have all decided to join hands with us to maximize impact and reach all society sectors.

The "Environmental Awareness" village, on the BA plaza, was divided into four zones, each of which related to WED's 2009 theme. The Activity zone, comprising a variety of educational games, was divided into three parts: a resources part introducing children to the sources of environmental pollution; a part tackling the consequences of pollution, while the third discussed solutions.

In the BA zone, the PSC and some affiliated centers cooperated to present environmental sciences through interactive exhibits and the Super Science Show.

As for the Community zone, it was divided into twelve sections dedicated to our partners, sponsors, civil society organizations, and the industrial sector, to shed light upon their real contributions towards the environment.

The Exhibition zone was where "The Arctic and Antarctica, Italian Research in Poles" was on display for the public as well as the results of children's recycling contests, their creations, and the "Sustainable City" models among others.

Our main concern was to shed light on our daily behavior, especially our negative habits, and try to figure out how to change these habits to become more positive and less harmful to the environment. WED2009 aimed mainly at highlighting current environmental crisis, empowering people in order to become active agents of sustainable development, as well as helping change their negative attitudes towards the environment.

A wise man once said: *"We do not inherit the earth from our ancestors; we borrow it from our children"* so, we always have to think of the next generation; of our children and their future.

Think Big.. Act now! Reduce energy consumption, reuse some materials, and recycle to save money and keep the earth clean.

Come and join us next year, where you can have fun and enjoy a variety of interactive, hands-on activities, suitable for all ages and cultural backgrounds. Share our dream to keep our planet clean and safe. Help make the world a better place.

So, go for it! Protect our planet today and every day!

For additional information, please visit our website: www.bibalex.org/psc

Look out for our next issue, 2nd School Semester 2009 / 2010, coming out later this year where we will be discussing the issue of Biodiversity.

The International Year of Astronomy

By: Dr. Fatehi Saleh;
Director, Center for Documentation of Cultural & Natural Heritage-CULTNAT

On the occasion of 400 years since Galileo invented the first man-made telescope that drastically changed the scientific perception of mankind to the universe, the UNESCO together with the International Astronomical Union- IAU have launched the year 2009 as the International Year of Astronomy- IYA 2009. Accordingly, events were organized and scheduled throughout the year on local, national, regional and international levels to celebrate the magnificent impact of Galileo's work on the history of science as well as on the history of humanity.

At the time of Galileo, they invented the optical lenses and extended their use to spying tasks; the king or the prince in his palace would use a tube with two lenses (that became the binoculars later on) to watch what people were doing in the gardens. Galileo, passionate by science and the theories of Copernicus, decided to use the lenses in a different way; he built a tube out of leather sheets of about one meter long, and fixed two appropriate lenses at both ends to form the first telescope ever. With this primitive telescope Galileo made four important observations.

First, he found that Jupiter is surrounded by four moons that are revolving around it and not around Earth. Second, he discovered that Venus had different phases (like those of the moon) related to its position in relation to the Sun; this meant that Venus was revolving around the Sun and not around Earth. Third, he saw the details of the surface of the Moon with its flat areas (Mare) and mountains (Craters) and drew these details in a series of sketches. Finally, he watched Saturn and discovered the rings around it for the first time.

Until the time of Galileo, human beings thought the universe to be Geocentric (Planet Earth is the center and all celestial bodies are rotating around it including the Sun, the Moon, and the five planets known at the time: Mercury, Venus, Mars, Jupiter and Saturn, as well as the sphere of stars). From Galileo's observations, especially the first two, he concluded that the universe is not Geocentric but indeed it is Heliocentric (centered around the Sun and not the Earth). He also concluded that the Earth does not only revolve around the Sun but it also rotates around its own access once everyday.

Since these discoveries were against the existing knowledge and the inherited religious beliefs, Galileo was condemned by the church and had to deny his discoveries to escape execution. He was consequently imprisoned and isolated in his own house until the day he died in his seventies.

People often use the story of Galileo when they talk about discrimination and ignorance because it is such an evident example of how anybody that comes up with a new idea, thought or theory or even an interpretation that is different to the existing common knowledge, might be subject to isolation, discrimination or censorship up until today.

This has always happened and is still happening in science as well as in religion and politics; the legendary Egyptian writer Taha Hussein was accused of atheism when he wrote a book about the Jahely poems and of course all the stories of the different prophets bare the same situation.

International Year of Astronomy

IYA 2009

The Universe, Yours to Discover!

The International Year of Astronomy (IYA2009) has been a global celebration of astronomy and its contributions to society and culture. The aim of the Year is to stimulate worldwide interest, especially among young people, in astronomy and science under the central theme "The Universe, Yours to Discover!". IYA2009 events and activities are meant to promote a greater appreciation of the inspirational aspects of astronomy that embody an invaluable shared resource for all nations.

The Planetarium Science Center (PSC), an innovative facility of informal education and science communication, is dedicated to increasing awareness, understanding and appreciation of science, especially among children. In celebration of IYA2009, the Center has organized a series of programs, events, exhibitions, workshops, lectures, conferences, competitions and camps, all related to the theme of the Year.

The PSC organized the "Astronomy Olympiad" competition, an opportunity for applying basics of astronomy, mathematics, science, computer science, social studies, and language to solve some challenges, where students demonstrate their creativity, as well as their problem solving and teamwork skills through hands-on activities, research and observation. "Astro-Camp", a 4-day camp, was the reward for the three first place winning teams in the Astronomy Olympiad. The children got the chance to learn more about astronomy from specialists, through educational games, observations, lectures and quizzes.

In collaboration with the National Authority of Remote Sensing and Space Science "NARSS", the PSC has developed the "Space Technology" program that aims to simplify satellite components and applications, through a number of activities such as lectures, hands-on activities, research and fieldtrips. Another program, the "Universe Awareness" (UNAWE) is an international outreach activity that uses the beauty and grandeur of the Universe to inspire young disadvantaged children; it materializes the skies, making it more tangible to the children's imaginative minds. Moreover, the ongoing "Zoom Earth" program is concerned with observation of Earth from space by means of satellites; in addition to "Astro-Club", an ongoing series of observational fieldtrips, where students get to know more about the solar system, planets, galaxies and constellations.

The PSC has also organized a series of free events such as "100 Hours of Astronomy", a global event where children got the chance to discover the Universe through a number of public activities, as well as the "International Day of Astronomy", where PSC specialists conducted a number of astronomical interactive games.

Fitting in the IYA2009 celebrations, Eratosthenes annual festivity is one of the recurrent events organized by the PSC in recognition of Eratosthenes, the Greek scientist and third librarian of the Ancient Library of Alexandria. The festivity gives children of the 21st Century the chance to conduct the 2000-year-old experiment developed by Eratosthenes to measure the Earth's circumference.

Besides programs and events, a number of exhibitions were hosted during the Year, which also coincides with the Egypt-Italy Science Year (EISY 2009); among these is the "Heavenly Pages" exhibition that displays unique volumes by some of the most prominent European astronomers from the 15th to the 19th Century. Another IYA2009 exhibition is "From Earth to the Universe", a collection of astronomical images showcasing the most dramatic views of our universe and representing the incredible variety of celestial objects that are known to exist such as planets, comets, stars, nebulae, galaxies and the clusters in which they congregate.

The IYA2009 has also witnessed a number of scientific workshops, series of lectures, as well as videoconferences that aim to bring astronomy closer to the students and increase their awareness of its importance and its exciting aspects. The year-long celebration also includes the European Society for Astronomy in Culture Conference (SEAC'2009) meant to demonstrate the chronological evolution of astronomy throughout history as well as the rise and fall of different civilizations, under the theme "From Alexandria to Al-Iskandariya, astronomy and culture in the ancient Mediterranean and beyond". "She is an Astronomer" is a conference that sheds light on the significant role of female astronomers and tackles the gender equality challenge in science; it is directed at professional as well as amateur astronomers and students, in addition to the generally interested public.

The vision of the International Year of Astronomy 2009 is to help citizens all over the world rediscover their place in the Universe through the day and night-time sky, and thereby engage a personal sense of wonder and discovery. All humans should realize the impact of astronomy and basic sciences on our daily lives, and understand better how scientific knowledge can contribute to a more equitable and peaceful society.

By: Ingy Hafez; PSC language Specialist

One Giant Leap for Manki

THEN ... The Race to the Moon

Sources: (NASA's website - www.nasa.gov)
Robert C. Seaman's, Jr.; PROJECT APOLLO, The Tough Decisions, Monographs in Aerospace History No. 37 • SP-2005 - 4537
Material compiled and edited for the PSC newsletter by Maissa Azab; editing assistance by Ingy Hafez

NASA's logo
Images Ceadit NASA

What is NASA?

Man's first landing on the moon is, first and above all, an accomplishment of the National Aeronautics and Space Administration (NASA). Introductions are thus in order.

Since its beginning in 1958, NASA has accomplished many great scientific and technological breakthroughs in air and space. NASA technology also has been adapted in many ways by the private sector. NASA remains a leading force in scientific research and in stimulating public interest in aerospace exploration, as well as science and technology in general.

More importantly, our exploration of space has taught us to view Earth, ourselves, and the universe in a new way. While the tremendous technical and scientific accomplishments of NASA cleary show how humans can achieve unbelievable things, yet keep us humbled by the realization that Earth is just a tiny "blue marble" in the cosmos.

The Long Bumpy Road Begins

By 1960, NASA programs were already providing interesting and useful results. The Echo balloon, NASA's first passive communications satellite could be seen overhead on clear nights. The Television Infrared Observation Satellite (TIROS) was in orbit, providing useful information for the Weather Bureau.

Seven astronauts had been recruited and trained, and they were prepared to orbit Earth. Technicians and engineers were preparing the Mercury capsule, a cone-shaped one-man spacecraft, the boosters named Redstone and Atlas required for the flight of the spacecraft, and the launch facilities for 90-minute flights around the world.

Plans had been discussed for an Apollo Program to include manned flights circling the Moon. A Committee on Space noted that space exploration had captured the imagination of the peoples of the world and reported that it was important to maintain American superiority in space.

However, in the section discussing the idea of Man in Space, the report stated that by placing a high priority on the Mercury Project, NASA strengthened the popular view of its importance as compared with the "acquisition of knowledge and the enrichment of human life". The report expressed great concern about the possible failure of Mercury and the resulting possible loss of life.

The Echo balloon, NASA's first passive communications satellite

The Challenge

The first launch of Mercury, an unmanned mission, had sufficiently successful results to send a chimpanzee, but not a human, into space.

At the beginning of 1961, Ham the chimpanzee, was strapped down in Mercury Redstone (MR-2), ready for liftoff. Happily, when Ham returned to Earth, he appeared in good condition and readily ate an apple and half an orange. Could human beings have done as well?

A manned lunar landing task group was established. The group found that no inventions or breakthroughs were required to ensure safe manned lunar flight. Their report stated that Mercury would have most of the systems required in the future. They expected that many of the systems for lunar landing would grow out of this effort.

From a biological point of view, the group recommended that studies be carried out quickly on the effects of weightlessness and radiation on humans. It noted that these environmental conditions would become increasingly important as astronauts extended their time in orbit and as missions moved farther from Earth and its protective atmosphere. The group felt that the manned lunar landing could occur as early as 1968, and as late as 1971.

Ham's Retrieval

Competition Heats Up

On the other side of the World, Sergey Korolev was the prime mover of the Soviet space program, from its beginning until his death in 1966. After the war ended, he was the mastermind behind satellite launches using the Soviet ballistic missile program.

Sputnik, the first man-made object to orbit the Earth, was an instant success that led the way for Korolev and his team to embark on a broad-scale space endeavor. He struck again on 12 April 1961, when Yuri Gagarin orbited Earth and landed safely receiving great acclaim in the Soviet Union and around the world. The US Congress and President Kennedy were very upset.

May 1960 started with the promise that NASA was going to be tested in the eyes of the world by Alan Shepard's Mercury flight; and, if that was successful, NASA was going to embark on a lunar program even before the US had sent an astronaut to orbit Earth.

The ride of ***Freedom 7*** was smooth, and the voice communication clear for the first 45 seconds. Then, the spacecraft started rocking, getting harsh about 90 seconds into the flight. Alan's head was bouncing so hard that he could not read the flight instruments.

Maximum freefall acceleration, known as g forces, occurred after 2 minutes. Alan was traveling at the desired speed face-forward; then, 3 minutes into the flight, the capsule automatically turned completely around in preparation for reentry.

Now it was time for the most important task, determining whether a human could control the capsule. Switching to manual control, Alan was pleased to find that he could control the spacecraft's movement about all three axes.

As Alan landed on board Freedom 7, he felt that the thud at impact was similar to that of a plane landing. Upon examination, doctors found that Alan had suffered no ill effects, and, as he reported himself, weightlessness was "quite pleasant".

Alan Shepard

kind, the 40th Anniversary

The Grande Finale of the Space Race

Between 1961 and 1968, the Soviets and the Americans raced fierecely to the Moon. At the start of 1968, NASA was rapidly getting closer to its goal of a manned lunar landing within the decade. Before the historic landing, there would be two unmanned spaceflights, Apollo 5 and Apollo 6, and four manned flights. Apollo 7 was the first manned flight of the program; it occurred in October 1968. All flight objectives were achieved.

Earth Rising

On 21 December, Apollo 8 lifted off. A voice boomed "Ignition", followed by "Liftoff". Apollo 8 cleared its tower. The sound was overwhelming. It was not just heard, it was felt overall, from the low-frequency rumble to the high-pitched crackling. The monster roared upwards amidst much cheering as the world watched intently until it disappeared from view.

There were five television transmissions from Apollo 8, some of which were of the lunar surface that looked "like dirty beach sand", showing likely landing sites and mountainous areas.

The most spectacular image appeared as Apollo 8 came from behind the Moon, and the astronauts saw the blue Earth appearing to rise above the lunar horizon and one of them took the photograph we have all seen many times.

The beautiful Earth shone gloriously in sharp contrast to the dull lunar surface. This photograph is a graphic reminder, for all to admire, of the treasure we inhabit. If Apollo 8 inspires us to conserve our planet, it is worth many times the cost of Man's lunar travels.

Living in Space

In mid-January 1968, the Soviets launched Soyuz 4 and Soyuz 5 the next day. After the cosmonauts conducted a variety of experiments, they performed the first rendezvous between two spacecrafts. Two cosmonauts in Soyuz 5 put on their spacesuits with a new "regenerative life-support system", left their spacecraft and joined the cosmonaut in Soyuz 4. The Soviets demonstrated "the world's first experimental cosmic station".

On 3 March 1969, Jim McDivitt, Dave Scott, and Rusty Schweickart went through a series of complex maneuvers with Apollo 9. It was the first test of the Lunar Module with astronauts in space. The astronauts first flew in the Command Module for several days, performing housekeeping. They then separated from the third stage to redock with the Lunar Module.

On the third day, Jim and Rusty entered the Lunar Module and conducted the first test of the lunar descent stage. On the fifth day, they reentered the Lunar Module, separated from the Command Module and went through a simulated Moon landing.

After 6.5 hours of "time on the Moon", the astronauts returned to the Command Module for docking and return to Earth. The first test of a manned Lunar Module was most successful, achieving all major objectives. NASA was now ready for lunar landing operations.

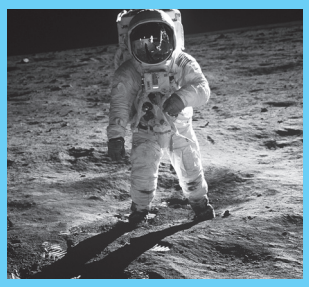
The Final Test

The Apollo 10 spacecraft lifted off on 18 May 1969. The flight went by the book, with minimal corrections required during the translunar voyage. The crew provided 72 minutes of color television footage of Earth as it receded behind them.

The crew had no difficulty identifying landmarks. After separation from the descent stage, the ascent stage went into a violent swinging, but the Commander took over manual control and achieved the proper position. Rendezvous and docking were achieved without any incidents.

This view of the rising Earth greeted the Apollo 8 astronauts as they came from behind the Moon after the lunar orbit insertion burn

Boot print on the Moon



Buzz Aldrin on the Moon

One Small Step for a Man

Apollo 11 was scheduled for liftoff at 9:32 am. The flight proceeded in a sequence nearly identical to that of Apollo 10. On the quarter-million-mile journey to the Moon, there were four television broadcasts, with the longest lasting 96 minutes. Viewers could observe Earth, the Moon, and the opening of the hatch between the spacecraft modules, as well as housekeeping and food preparation.

The Eagle was separated from Columbia over the far side of the Moon and descended towards the surface. The location was 4.6 miles downrange of the planned location, so the landing point was significantly shifted. The feeling was tense in the control and also behind the glass where a handful of guests were observing.

It was soon noted that the Eagle was headed for the center of a crater containing boulders measuring 5-10 feet in length. Neil Armstrong, the Commander, raced beyond the crater by hand-controlling position and making adjustments with the engine. He could extend the flight by 60 seconds before fuel shortage would require an abort. The clock was closing on zero when dust and shadows appeared in the foreground and suddenly Neil announced "Houston, Tranquility Base here-the Eagle has landed".

Two hours after landing, the crew requested a walk on the Moon right away rather than 4.5 hours later, as originally planned. Shortly thereafter, Neil opened the hatch and descended Eagle's ladder. As at least one-fifth of the world watched, he reached the lunar surface while saying "One small step for a man, one giant leap for mankind".

Neil next filmed Buzz Aldrin's descent onto the Moon, and the two together unveiled a plaque while reading its inscription "Here men from planet Earth first set foot on the Moon July 1969 A.D. We came in peace for all mankind".

Bulk samples of the lunar surface were then collected, and seismic equipment and a laser reflector were installed. After further photography, the astronauts returned to the lander, closed the hatch, and enjoyed 7 hours of rest.

Apollo 11 returned to Earth by the same route as Apollo 10. Landing occurred in the Pacific, 15 miles from the USS Hornet, with the US President heading the welcoming committee.

Handshakes were not possible. There was concern that lunar pathogens might infect Earth and that Earth microorganisms might contaminate the lunar samples. So two-way biological barriers were created, one to protect the lunar samples and the other to protect life on Earth. The lunar rocks then were flown immediately to the Lunar Receiving Laboratory in Houston. The three astronauts could talk and wave to the President from their "mobile quarantine facility", but there were no pats on the back.

An estimated one million people viewed the Apollo liftoff from the Florida coast, including over 3,000 accredited press and TV commentators, and their interest held through the lunar landing and return. Congratulatory messages were printed in newspapers around the world.

Further Reading:

- NASA's Apollo 40th Anniversay website:
http://www.nasa.gov/mission_pages/apollo/40th/index.html

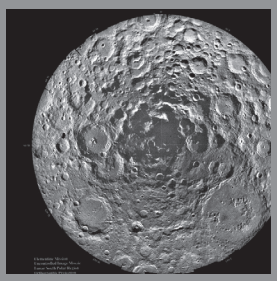
NOW... Back to the Moon?

Probes may go, but astronauts will have to wait

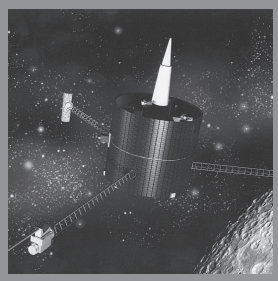
Original article by Mark Alpert in 2002; from the Scientific American website. Article rewritten, updated and edited for the PSC newsletter by Maissa Azab

Scientists who study Earth's Moon have two big regrets about the six Apollo missions that landed a dozen astronauts on the lunar surface between 1969 and 1972. The biggest regret is that the missions ended so quickly with so much of the Moon still unexplored. Researchers also regret that the great success of Apollo led to a common misunderstanding: because astronauts have visited the Moon, there is no reason to go back.

In the 1990s, however, two probes that orbited the Moon, Clementine and Lunar Prospector, raised new questions about Earth's airless satellite. One stunning discovery was strong evidence of water ice in the always shadowed areas near the Moon's poles. Scientists believe that comets left water and organic compounds on both Earth and its Moon, well-preserved ice at the lunar poles could provide clues to the origins of life. Just as important, was the finding of a vast basin stretching 2,500 km across the Moon's far side. Carved out by an asteroid or comet collision, the South Pole Aitken Basin is 13 km deep into the lunar crust that may expose the Moon's mantle. It is the largest impact crater in the entire solar system.



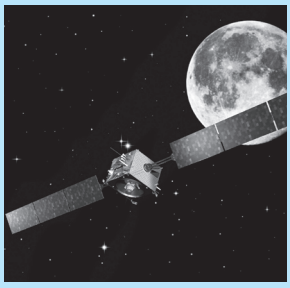
The Moon as pictured by Clementine
Courtesy of NASA



The Lunar Prospector Probe
Courtesy of NASA

Thanks to rock samples collected by Apollo astronauts, lunar geologists know that impact basins on the Moon's near side were created about 3.9 billion years ago. South Pole Aitken is believed to be the Moon's oldest basin, so determining its age is crucial. If it turns out to be not much older than the near-side basins, it would support the theory that Earth and its Moon endured a relatively brief, but intense bombardment, about half-a-billion years following the creation of the Solar System.

These discoveries have put the Moon back on the exploration agenda. The European Space Agency (ESA) launched the lunar orbiter SMART-1 in September 2003. SMART-1 is the first European spacecraft to travel to and orbit the Moon. As well as testing new technology, SMART-1 compiled the first comprehensive inventory of key chemical elements on the lunar surface. It also investigated the theory that the Moon was formed following the violent collision of a smaller planet with Earth four-and-a-half-thousand million years ago.



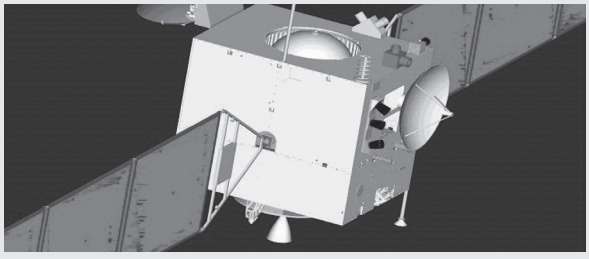
SMART-1, ESA's first mission to the Moon
Courtesy of ESA

The Moon as pictured by SMART-1
Courtesy of ESA

ESA's next ride to the Moon is the lunar orbiter Chandrayaan-1, a mission of the Indian Space Research Organization (ISRO). Successfully launched in October 2008, Chandrayaan-1 carries eleven experiments, two of which are European and are direct descendants of SMART-1 to study the mineralogy and the chemical composition of the lunar surface. Chandrayaan-1 is still in flight.

In September 2007, the Japanese space agency launched the lunar orbiter SELENE, later renamed Kaguya. The primary objective of the mission was a global survey of the Moon, obtaining data on elemental abundance, mineralogical composition, topography, geology and gravity, and to develop technologies for future lunar exploration. Results from SELENE have revealed details about why the lopsided lump of rock orbiting Earth is so unbalanced. Kaguya ended its mission as planned, impacting the Moon on 11 June 2009.

Chang'e-1, a bold new mission to the Moon, was launched by the Chinese National Space Administration (CNSA) in October 2007. Chang'e-1 has four mission goals to accomplish. The first is to make three-dimensional images of many lunar landforms and outline maps of major lunar geological structures. This mapping will include the first detailed images taken of some regions near the lunar poles. Chang'e-1 is also designed to analyze the abundance of up to 14 chemical elements and their distribution across the lunar soil and lastly it will explore the space weather between the Earth and the Moon.



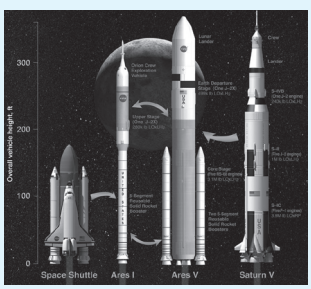
Chang'e-1 - Courtesy of ESA

As for NASA, it has added to its agenda and budget the New Frontiers Program in 2003. New Frontiers is a program to explore the Solar System with frequent, medium-class spacecraft missions that will conduct high-quality, focused scientific investigations designed to enhance our understanding of the Solar System. The high-priority scientifc goals identified by the study related to the exploration of Venus, Jupiter, the south polar region of the Earth's Moon including the Aitken Basin, Pluto and other Kuiper Belt objects, and comets.

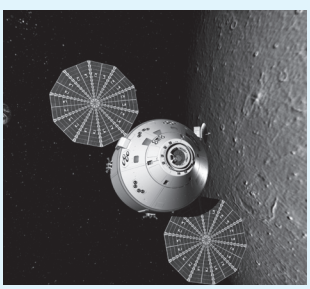
As for Man returning to the Moon, President Barack Obama has affirmed the broad goals for human spaceflight that his predecessor put forward in 2004, among which: develop a replacement line of rockets named Ares, return to the Moon by 2020, and go to Mars, perhaps in the mid-2030s. The program is known as Constellation.

The goal of Constellation is to establish an outpost for a new generation of space-explorers. The Orion vehicle is a key component of the Constellation Program, NASA's ambitious multibillion dollar effort to build a space transportation system that not only transports humans to the Moon and back but also resupply the International Space Station (ISS) and eventually place people on the planet Mars.

Man is returning to the Moon; this time to stay.



A comparison of Launch Vehicles including
Courtesy of NASA



An artist's rendering of the Orion vehicle in space
Courtesy of NASA

& BEYOND

The Next Step for Mankind

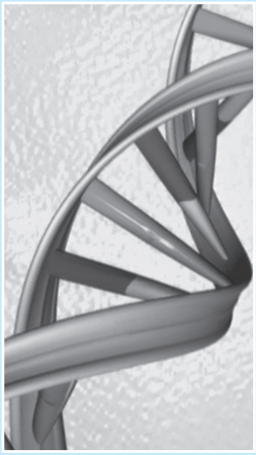
Source: The Science Coalition (http://sciencecoalition.org/)
Material compiled and edited for the PSC newsletter by Maissa Azab; editing assistance by Ingy Hafez

On the horizon are secrets of the universe, cures for diseases, "holistic reinvention"of vehicles, and an understanding of the human brain. The Science Coalition reports;

On **20 July 1969**, the United States achieved a historic first when Apollo 11 astronauts became the first humans to land on the moon. In anticipation of the anniversary of the first moon walk, The Science Coalition asked university researchers to reflect on that event and share their thoughts about the next frontiers in science.

While each response is unique and reflective of the background of the respondent, together they clarify that there are many exciting new horizons in science. Research in such areas as energy and climate change, curing human disease, understanding the human genome, and answering questions about the Universe are leading us to new frontiers.

"We are about to answer some of the deepest and constant questions humankind has always asked: How did the Universe begin? Are we alone? What is our cosmic destiny? Like putting a man on the moon, answering these big questions would be part of a journey to **find our place in the Universe and extend our presence beyond Earth**". Michael Turner, Professor of Astronomy & Astrophysics, University of Chicago, USA.



"The pressing questions are those pertaining to energy. Specifically, **clean energy**. Not surprisingly, the answer is in unlocking the power of molecules and large chemical structures to potentially create the very conditions where it would be possible to use sunlight to convert carbon dioxide to clean fuels that recycle carbon. Ultimately, producing hydrogen economically and storing it safely for use with only water as a byproduct". Omar Yaghi, Director, UCLA Center for Reticular Chemistry; Founder, UCLA Clean Energy Network.

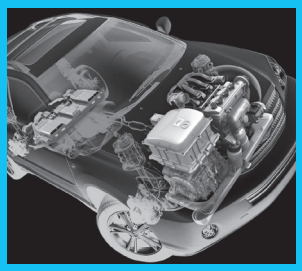
"The greatest scientific challenges facing our world involve the **production and distribution of energy. ..Nuclear fusion**, having already demonstrated impressive progress over the past 50 years, is about to make the next step toward energy production with the international ITER project, which will demonstrate controlled nuclear fusion. It would take a 'moon race' level project to move fusion energy from a scientific challenge to an implementation challenge. With vast supplies of fusion fuel, an energy-based economy is feasible". Dr. Earl Scime, Chair, Department of Physics, Eberly College of Arts and Sciences, West Virginia University.

"With the complete DNA sequences of every citizen in hand, we would have an unprecedented ability to study the entire range of human diseases, to determine how diet and lifestyle factors interact with our genes to affect our health, to understand precisely how genes influence our risk for cancer and infectious diseases, and a host of other questions related to human health. We could also start to deliver on the promise of **'personalized medicine'**, in which treatments could be customized to each person's genome." Steven L. Salzberg, PhD, Director, Center for Bioinformatics and Computational Biology, University of Maryland.

"The next great scientific frontier is at the interface between **nanoscience and medicine.** Over the next decade, research will likely contribute to significant breakthroughs in our understanding of cell biology and disease at the molecular level, providing a roadmap for new diagnostic and therapeutic strategies that could revolutionize healthcare and medicine". Peter C. Searson, PhD, Director of Johns Hopkins Institute for NanoBioTechnology.

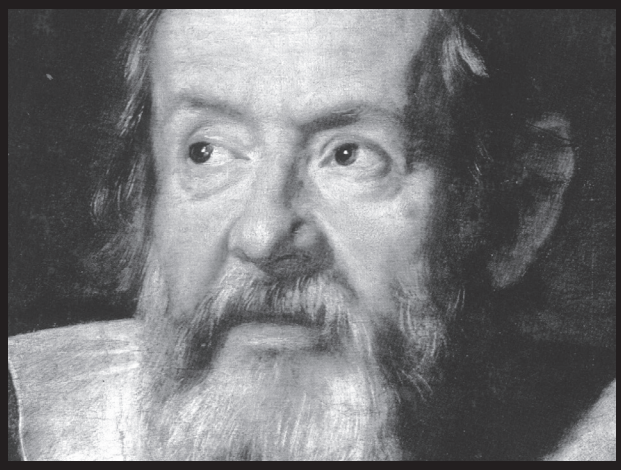
"The next 'moon landing' will be a new science-driven way of approaching automobiles. The future is in **Carbon Neutral Vehicles (CNV);** breaking down each element and function of the vehicle to find ways to eliminate greenhouse gases. This means from its fuels, to how it runs, to how it interacts with other systems like the electrical grid, to the parts that make the vehicles, to the policies that guide the vehicles use. There is a revolution to find new ways to give that vehicle throughout its life cycle a tiny environmental footprint". Dennis Assanis, Director of the Michigan Memorial Phoenix Energy Institute and the W.E. Lay Automotive Laboratory at the University of Michigan.

"Understanding global warming is a major concern of science. Right now the focus is on Plan A, reducing the production of carbon dioxide. However, the range of uncertainty in future atmosphere is large and the potential danger is great. In the coming decade, we will learn a great deal about our understanding by comparing the current predictions to future data. In the face of such risk, it will be wise for science to begin developing a **"Plan B" for global warming.** This could take the form of more aggressive interventions if the efforts to cut back on carbon output are not enough. For example, active blocking of sunlight above the atmosphere might be necessary. Achieving this would be an enormous scientific and engineering challenge". Adam Riess, PhD, Professor, the Henry A. Rowland Department of Physics and Astronomy, The Johns Hopkins University.



Galileo Galilei, astronomer and physicist (1564-1642)

HEAVENS THROUGH A LENS



Sources:
- Institute and Museum of the History of Science website
- BBC's Historic Figures webpages
- The Galileo Project, Rice University, USA
Edited for the PSC newsletter by Maissa Azab

"I do not feel obliged to believe that the same god who has endowed us with sense, reason and intellect has intended us to forgo their use".-Galileo Galilei

Born in Pisa, Galileo was the son of Vincenzo Galilei, a music scholar, and Giulia Ammannati. He began to study medicine at the University of Pisa but changed to philosophy and mathematics; he held the mathematics chair there from 1589 to 1592. He was then appointed to the chair of mathematics at the University of Padua, where he remained until 1610. During this time he worked on a variety of experiments, including the speed at which different objects fall, mechanics and pendulums.

On Motion

At the University of Pisa, Galileo learned the physics of the Ancient Greek scientist, Aristotle. However, he questioned the Aristotelian approach to physics. Aristotelians believed that heavier objects fall faster through a medium than lighter ones. Galileo eventually disproved this idea by asserting that all objects, regardless of their density, fall at the same rate in a vacuum. To determine this, Galileo performed various experiments and he wrote down his discoveries about motion in his book *De Motu*, which means "On Motion".

Mechanical Devices

In 1592, while teaching at the University of Padua, he frequently visited a place called the Arsenal, where Venetian ships were docked and loaded. During his visits to the Arsenal, he became fascinated by nautical technologies. In 1593, he was presented with the problem involving the placement of oars in galleys. He treated the oar as a lever and correctly made the water the fulcrum. A year later, he patented a model for a pump. His pump was a device that raised water by using only one horse.

The Pendulum

In 1602, Galileo made his most notable discovery about the pendulum: the period or time in which a pendulum swings back and forth does not depend on the arc of the swing. Eventually, this discovery led to Galileo's further study of time intervals and the development of his idea for a pendulum clock.

The Telescope

Galileo invented many mechanical devices other than the pump, such as the hydrostatic balance. But his most famous invention was the telescope. In the spring of 1609, Galileo made a spyglass that magnified three times with lenses bought in a spectacle-maker's shop. He set out to make instruments with greater light-gathering power and higher magnifications, but this meant he had to learn to grind and polish his own lenses.

By the end August, he had succeeded in making a spyglass that magnifies about eight times. But it was not until late 1609 that he had made better and more powerful telescopes, up to 20-powered, and he could begin a detailed research project.

With this telescope, he made many astronomical discoveries. These included mountains and valleys on the surface of the moon, sunspots, the four largest moons of the planet Jupiter and the phases of the planet Venus.

His discoveries proved the Copernican system which states that the Earth and other planets revolve around the Sun. Prior to the Copernican system, it was held that the universe was geocentric, meaning the Sun revolved around the Earth.

The Inquisition

In 1614, Galileo was accused of heresy for his support of the Copernican theory. In 1616, he was forbidden by the church from teaching or advocating these theories.

In 1632, he was again condemned for heresy after his book 'Dialogue Concerning the Two Chief World Systems' was published. This set out the arguments for and against the Copernican theory in the form of a discussion between two men. Galileo was summoned to appear before the Inquisition, a permanent institution in the Catholic Church charged with the eradication of heresies, in Rome. He was convicted and sentenced to life imprisonment, later reduced to permanent house arrest at his villa in Arcetri, south of Florence. He was also forced to publicly withdraw his support for Copernican theory.

Although he was now going blind he continued to write. In 1638, his 'Discourses Concerning Two New Sciences' was published with Galileo's ideas on the laws of motion and the principles of mechanics. Galileo died in Arcetri on 8 January 1642.

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