PSC Planetarium Science Center newsletter
3rd year | 2nd edition
Planetarium Science Center Science For All!

2nd School Semester 2009|2010

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Back to Nature...

By: Maissa Azab, PSC Publications Coordinator

Life on Earth faces a crisis of historical and planetary proportions. Unsustainable consumption in many northern countries and crushing poverty in the tropics are destroying wild nature. Biodiversity is besieged. [www.biodiversityhotspots.org]

This might be a shocking statement to start our new edition of the PSC Newsletter, which coincides with the beginning of a new year. It is true that we have always focused on the bright side of things going on around us as we try linking them to science and fun, which is the Center's main goal. However, it is also our objective as a Science Center to raise attention and awareness of what truly goes on in the world, especially major issues that are affecting our life and future on Earth, our one and only home.

Humans are an integral part of nature. Our fate is tightly linked with biodiversity; the huge variety of other animals and plants, the places they live and their surrounding environments, all over the world. We rely on this diversity of life for the provision of food, fuel, medicine and other essentials we simply cannot live without. Yet this rich diversity is being lost at a greatly accelerated rate because of human activities. This impoverishes us all and weakens the ability of the living systems, on which we depend, to resist growing threats such as climate change. [http://www.cbd.int/2010/about/]

2010 has been declared the International Year of Biodiversity by the United Nations, under the slogan "Biodiversity is life, Biodiversity is our life". The Year 2010 is a celebration of life on Earth and of the value of biodiversity in our lives; it is also an invitation to take action to safeguard the variety of life on Earth: Biodiversity.

In 2010, the PSC reaffirms its commitment to global issues affecting all human life on Earth and communicates them to the local public through participating in the IYB 2010 by organizing and conducting a variety of activities to raise awareness and understanding of biodiversity, its vital significance, the critical dangers it faces and the measures we can take to prevent them.

As an integral part of the PSC, the Newsletter Editorial Team dedicates this issue to Biodiversity and discusses different asspects of it in its various sections. In this issue, we also take a look at the human side of the PSC as we unravel the exciting story of the Planetarium Team, the first staff members of the Center, as well as the inspiring success story of a young Director.

We hope you enjoy reading the issue and that you join us in working on the protection of that home that hosts us together with all life forms; Earth.

A Turning Point...

By: Ayman Elsayed, PSC Deputy Director

I stopped many times while attempting to write these few words, finding it difficult to write the introductory article of the PSC Newsletter. Maybe because this is the second time for me to write this article, and I do not wish to repeat my words; or maybe because we feel at the PSC that the coming year, the Center's eighth since the opening, is expected to be a turning point in our endless journey.

The truth is, the past year has raised the bar for us. For the first time, we reached one thousand participants in the Summer Program. And, in April, we organized a tremendous Science Festivity that hosted 20,000 visitors for the first time.

We are aware that success is not a matter of numbers; quality is always our target, not the quantity. However, numbers are an indicator of the public's evaluation of our work; it is not only an honor that gives us pride, but it is also a huge responsibility that we are happy to bear on our shoulders. This feeling increases with every passing day because we have the utmost respect for our public, who trusts in our activities and always expects more from us.

With the beginning of the new year, we also celebrate the inauguration of the ALEXploratorium after renovation. In this new phase, our visitors will enjoy a new collection of exhibits, new workshop rooms, a new "Listen and Discover" auditorium with 2D and 3D technologies, in addition to a gift shop. Our ongoing programs; the Chess Club and Fun with Science; as well as our annual events; Intel Bibliotheca Alexandrina Science and Engineering Fair (IntelBASEF) in March, the Science Festivity in April, and both the World Environment Day and Eratosthenes in June, are continuing with us.

Another success we look forward to achieving is that by the end of this school year, the Science Club would be in one hundred schools under the guidance and supervision of the PSC. This outreach program, part of an agreement between the Center and the Ministry of Education, will give the opportunity to both students and teachers to improve their capabilities, gain new skills, and get involved in the fascinating world of science and technology.

With great enthusiasm we move ahead and with your visits, participation and encouragement we make a difference.

Under the Dome

By: Maissa Azab, PSC Publications Coordinator
In collaboration with:
Mohamed Ibrahim and Yasser Hussein, Senior Planetarium Specialists

In the first year of the new millenium, before there ever was a Science Center at the Bibliotheca Alexandrina (BA), there was only a curious, planet-like sphere suspending mysteriously near the colossal new landmark that was rising like a phoenix from the sands of Alexandria and taking the shape of the eternal Sun disk. The Sun of Knowledge was reborn; its small spherical companion in its invisible orbit around it, feeding on its light to come to life and reflecting it unto the World around.

A Curious Sphere

In the last years of the past century, the dream was finally coming true; the Library of Alexandria was being rebuilt to recapture the spirit of its ancient predecessor as the beacon of culture and knowledge in Egypt. The Library's building was designed and built to be fresh, modern and unique; so has its purpose been laid out. The Library is to be Egypt's Window on the World and the World's Window on Egypt.

The New Library is destined to transcend the role of a mere reading area that features an enormous display of books and offers a sanctuary for only researchers to dwell on their papers in isolation from the masses. In fact, it was planned to intrigue and capture those same masses; local, regional and international.

Part of this multilayered and highly sophisticated compound has been this spherical structure. Unfamiliar in both design and function as its only local predecessor had faded a long time before without really ever shining, the majority of the Egyptian public had no prior knowledge of such facility. Egypt has finally witnessed its first modern-day Planetarium.

The Beginning

The first members of the Planetarium Team are the only Planetarium Science Center staff members who had been part of the original BA staff witnessing the actual rise of the Library from the sand. They watched the construction of this curious sphere without knowing that one day the responsibility of bringing this structure to life would be on their shoulders.

Rising to Egypt's, as well as the World's, expectations of the New Bibliotheca Alexandrina, the Planetarium was supplied with the highest levels of video, as well as IMAX, projection technologies available at the time. Taking on the responsibility of bringing this prominent and novel part of the massive project to function was nothing short of a challenge that required courage, enthusiasm and talent in absorbing so much in so little time.

A challenge; indeed it was. The Team had to supervise and help in the installation of sophisticated equipment that they had no prior experience of, but which was about to become their sole responsibility to operate, maintain and troubleshoot. The Team's enthusiasm to broaden their horizons and expand their areas of expertise encouraged them to take on the challenge. They worked relentlessly with the experts from the supplier company in both Egypt and the United States to learn and train on managing the complicated equipment. Day and night they worked until it was time to put it all to the test.

The Test

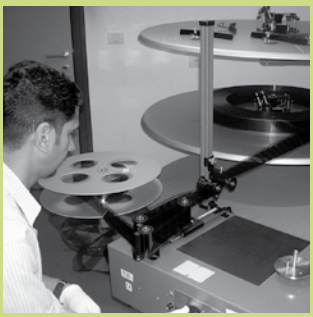
The day was 10 September 2001; the Planetarium opened its doors to the public for the first time. It was the soft opening and admission was free of charge. The public's reaction was unexpected and unprecedented. Although the public did not really know what they were about to experience, they came in swarms. The waves of public carried away everything in its path, including the free admission vouchers booth!

The tension inside was tangible, but only behind the operating console. The Team members stood silently in sheer anxiety for 22 minutes; the duration of the show. The system was still in trial phase and anything could happen at any instant. Finally, the credits were up and it was over. The public was ecstatic and the Team sighed in relief. The Planetarium had succeeded in surprising and amazing the public and that was the Team's reward for all the anxiety and stress of the previous weeks; the Team's goal was accomplished.

Reality Check

Nevertheless, neither the soft opening nor the official inauguration a year later on 16 October 2002 were by any means the end of the road; it was only the beginning. For eight years since the first opening, the Planetarium Team has faced one challenge after the other. They realized that the challenge was not really the installation or the operation of the machinery; it was far beyond.

The first challenge the Team faced was the public's misconception of what to expect at a Planetarium. For years, people wondered about the mysterious sphere and made up a multitude of assumptions about what it was. Some of the assumptions were really absurd but the most common misconception was confusing the Planetarium for an observatory.



For those who believed so, it was disappointing at first to realize they were not going to see the actual stars. However, after experiencing the Planetarium and seeing the exquisite images around them so vividly; so much so that they thought they could actually touch them; they realized that, that too was a unique and rewarding experience and so they kept coming back.

Other misconceptions about the Planetarium used to be about the type of shows it offered. Some audiences anticipated long scientific documentaries; others considered it another movie theater.

The truth is, Planetarium shows are meant to educate through entertainment; they are exciting and full of extraordinary images but they usually last from 20 to 45 minutes to achieve the desired impact without overwhelming or boring the audience. The Planetarium theater is 14 meters in diameter and comprises 100 seats. During show time, it is completely dark to allow the audience to get enveloped by the breathtaking images moving all around.

For the Planetarium administration, the top priority has always been to make sure the audience's experience is memorable and unique. To guarantee that, it was crucial to secure the audience's right to comfort and enjoyment without being disturbed during the few minutes of the show. The Planetarium guidelines were drafted to fulfill this specific goal.

Breaking Barriers

As time went by, the Egyptian public's awareness grew and their enthusiasm towards the Planetarium grew as well. For the Planetarium Team, it was a relief but there was no time to rest. The Team's awareness of the public also grew, and keeping the public intrigued and satisfied was a time consuming challenge they faced over and over. Besides keeping the Planetarium running smoothly, new shows had to be selected carefully, purchased, installed, translated, edited and dubbed into our native Arabic; all to expand the range and variation of themes offered to the loyal public.

For eight years, in addition to a traditional Star Ball, slide and video projection systems, the Planetarium had operated with an IMAX 8/70 projector that only allowed a maxmimum of two large-format films at a time. However, through the unrelenting efforts of Planetarium Specialists, an innovative technical modification; the pure outcome of their observation, expertise and creativity, was successfully implemented so that the IMAX projector could show up to five films at a time. The Planetarium Team's locally designed and executed invention saved the Library of Alexandria thousands of dollars worth of major reconstruction work and new equipment that would have been otherwise required to give the same results.

The Challenge Continues

It is indeed a fascinating world that the Planetarium at the New Library of Alexandria offers its public. Over the course of eight years, it was only natural that the Planetarium had to rejuvenate itself over and over again to keep up with the rapidly developing world of Planetarium technology and to keep attracting the audience.

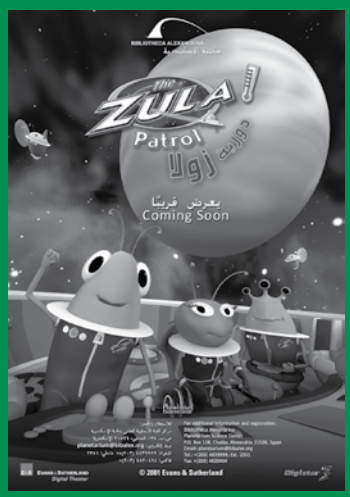
The most recent development the Planetarium underwent was the replacement of the half-dome video projection system with the cutting-edge full-dome Digistar3 system in the summer of 2009. The new system comprises a rich set of real-time 3D astronomy features and a wide database of celestial bodies that enables the audience to explore the universe as never before.

The new system enables 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 create shows from a simple-touch screen interface and watch their creations in the star theater. The BA Planetarium's attempt at bringing the industry of planetarium show production to the region is aimed at producing scientific shows that are directly related to our culture. It is yet another step forward on the Center's road to bringing the world to the region and showcasing the region's rich heritage and exporting it to the world.

The Planetarium upgrading comes timely as the Bibliotheca Alexandrina prepares to host the 20th International Planetarium Society (IPS) conference in June 2010. The IPS conferences are the largest and most significant events in the world of planetariums.

The Planetarium Team is both proud and excited about the conference because it is the first to be hosted by an African or an Arab country. It is indeed a unique opportunity to be exposed to the latest state-of-the-art technologies on the global level as well as present the local and regional experience to the world. The Team intends to introduce its first show productions at the conference.

COMING SOON



AVAILABLE SHOWS

Seven Wonders
30 Min. Full-dome Show

New Horizons
23 Min. Full-dome Show

Stars of the Pharaohs
35 Min. Full-dome Show

Solarmax
45 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

SHOW TIMES

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.

Biodiversity: A Long Evolutionary Road!

By: Maissa Azab, PSC Publications Coordinator; and Ingy Hafez, PSC Publications Specialist
In collaboration with Reda Kandil and Magui Elshirawi, PSC Programs and Events Specialists
Biodiversity in History is adapted from "The Science Book", edited by Peter Tallack, published by Weidenfeld & Nicolson, 2003

Earth today, with all the biological richness we feel around us, is the result of 4 billion years of evolution. Although the origin of life has not definitely been established by science, some evidence suggests that life may already have been well established a few hundred million years after the formation of Earth. Until approximately 600 million years ago, all existence consisted of simple single-celled organisms.

The term "Biodiversity" was first used by wildlife scientist and conservationist **Raymond Dasmann** in a book advocating nature conservation. The term was not widely adopted for more than a decade, when in the 1980s it came into common usage in science and environmental policy. The term is the contracted form of "Biological Diversity"; it may have been coined by **W.G. Rosen** in 1985, while planning the National Forum on Biological Diversity to be held in 1986, and first appeared in a publication in 1988 when entomologist **E.O. Wilson** used it as a title for the proceedings of that forum.

Biodiversity and the Arab Muslim World

In fact, the earliest known treatises dealing with environmentalism and environmental science were Arabic treatises written by Al-Kindi, Al-Razi, Ibn Al-Jazzar, Al-Tamimi, Al-Masihi, Avicenna, Ali Ibn Radwān, and Ibn Al-Nafis. Their works covered a number of subjects related to pollution, such as air and water pollution, soil contamination, municipal solid waste mishandling, and environmental impact assessments of certain issues.

Ibn Radwān, an Egyptian physician; and **Ibn Butlān**, an Iraqi poet who left a series of works devoted to practical application and healthy lifestyle, were behind a famous verbal and written controversy. A faithful disciple of Hippocrates, Ibn Radwān criticized Ibn Butlān for not paying attention to the climatic differences between the cities. In his book "Kitāb daf' madār al-abdān bi'ard Misr" (On the Prevention of Bodily Ills in Egypt), he defends the general level of health within Cairo, a city which Ibn Butlān judged less hygienic than Baghdad. From here, the concern about the environment was triggered into further research and studies.

Al-Jahiz (781-869) was the first Muslim biologist to develop a theory of evolution. He wrote on the effects of the environment on the likelihood of an animal to survive; he was the first to describe the struggle for existence. Al-Jahiz was also the first to discuss food chains and an early adherent of environmental determinism, arguing that the environment can determine the physical characteristics of the inhabitants of a certain community and that the origins of different human skin colors are the outcome of the environment.

Biodiversity in History

320 BCE: The Birth of Botany

Theophrastus (c. 372-287 BCE) was a pupil of Aristotle, who in 322 BCE produced two botanical works, *Historia Plantarum* (Natural History of Plants) and *De Causis Plantarum* (Reasons for Vegetable Growth), which remained the most authoritative treatises on the subject for more than 1,500 years.

Both works contain a wide-range of observations on plants, including aspects of morphology, anatomy, pathology, seed germination, grafting and propagation, crop cultivation and medicinal use. Theophrastus's sources of botanical information seem to have come from the garden at the Peripatetic school of philosophy ('the Lyceum') in Athens, possibly the first botanic garden in history. In his books he classified almost 500 plants, establishing some taxonomic groupings that still persist, and gaining the admiration of the great 18th-century taxonomist Carolus Linnaeus, who described him as the "Father of Botany".

Year 50 CE: Medicinal Plants

Until the rise of the pharmaceutical industry in the late 19th century, most medical remedies came from plants; medical students learned botany as a routine part of their studies. The roots of this approach arose in antiquity, the classical source for which was *De Materia Medica,* by a Roman army surgeon, **Pedanius Discorides**.

Dioscorides was said to have lived "a soldier's life", and certainly travelled widely in the Mediterranean region, compiling information on local plants and knowledge on how to gather, store, prepare and use them in the best possible way. He recorded detailed information about his plants, including habitats, physical characteristics and which parts of them were best exploited in treatment. His monograph described a multitude of medicinal plants, among them cinnamon, belladonna, juniper, lavender, almond oil, ginger and wormwood.

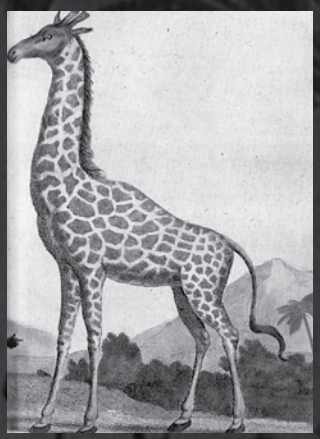
Year 1673: Microscopic Life

Antoni van Leeuwenhoek was one of the great amateur scientists. His single-lens microscopes with a magnification of up to 250 times, allowed him to see what no one had seen before. In 1673, van Leeuwenhoek described "infusoria" (protozoa) teeming in water; human spermatozoa; the flow of blood through capillary vessels; the detailed organization of muscles, nerves, bone, teeth and hair; red blood cells and plant cells; and the fine structure of 67 species of insect, including tiny creatures parasitic on fleas. His most remarkable discovery was made in 1683; bacteria from his mouth. Bacteria were not to be seen by other scientists for more than a century.

Year 1809: Acquired Characteristics

Jean-Baptiste Lamarck believed in the doctrine of the inheritance of acquired characteristics, now known as "soft heredity", but it was merely an incidental feature of his philosophy of nature, and he shared it with virtually all his contemporaries. However, unlike most of his peers, Lamarck used this notion of soft heredity in the service of a theory of evolvutionary change. In 1809, his *Philosophie Zoologique* placed all the elements of his long and systematic study of the cosmos into a final form.

This mature statement of a lifetime's study offered a grand vision of how the world had developed. Animals, Lamarck argued, possess a quality he called *besoin*, translated as "need" or "want". His most famous example was that of the giraffe's long neck, gradually created by this species' "need" to graze on the leaves at the tops of trees. Generations had produced the characteristic form of the giraffe, able to fill an ecological niche.



Lamarck's notions of organic change over time challenged geologists and biologists; he himself coined the term "biology"; until Darwin offered another version. Although natural selection offered a more compelling mechanism, even Darwin drew on notions of soft heredity, and so was "Lamarckian" in that sense.

Year 1859: Darwin's *Origin of Species*

On 27 December 1831, **Charles Robert Darwin** started on a five-year voyage around the world. Not only was this voyage destined to change Darwin's life, but also, more importantly, it was destined to change Man's view of his place in nature. In September 1835, Charles Darwin arrived at the lonely Galapagos Islands. His job was to collect specimens of plants and animals, and make notes about the rocks and climate.

In his famous book, Charles Darwin introduced two main theories. One is that all species of life on Earth have arisen by evolution from other pre-existing species; a theory that contradicted religious doctrines and have since been the center of much contraversy.

The second is that the process that drives evolution is "natural selection": some individuals in a population have more offspring than others; offspring tend to inherit the attributes of their parents; so later generations contain more of the sort of individual, that in previous generations, left more offspring. The individuals who leave the most offspring tend to be those best adapted to the local conditions. So natural selection causes living creatures to evolve to be well-adapted for life; another controversial conclusion.

Year 1865: Mendel's Laws of Inheritance

Offspring clearly resemble their parents, and this fact alone means that there must be some biological mechanism of inheritence. The starting point for our modern understanding of that mechanism is provided by some experimental crosses between strains of the garden pea conducted by an Austrian monk, **Gregor Mendel**.

Working in his monastry at Brünn (now Brno, in the Czech Republic), Mendel began with two pea strains, differing in an observable characteristic such as flower color; one strain had purple flowers while the other had white flowers. He cross-bred them, and the offspring were all purple. He then cross-bred the offspring among themselves and found that the second generation had purple and white flowers in a 3:1 ratio.

Mendel explained the result by suggesting that coloration is controlled by two kinds of "factor"; a pea plant inherited one factor from each parent. The purple factor was "dominant" to the white flower, so all the first generation plants were purple. However, one-quarter of the second-generation plants inherited two white factors and was white.

Mendel's theory was little appreciated for 35 years because it was thought to be a rule about a few properties of peas rather than a general theory of inheritance. We now know that much of inheritence is controlled by pairs of genes inherited such as Mendelian factors.

Year 1889: Measuring Variation

Biologists divide the differences that can be seen between members of a single species into two categories: discrete and continuous. Some attributes, such as eye color, come in discrete types; other attributes, such as height, show more continuous variation. We need to understand the amount of variation and how it is inherited to explain evolution and to improve agricultural crops and livestock.

Modern scientific research on continuous variation, known as "biometry", can be traced back in large part to the work of a Victorian polymath, and cousin of Charles Darwin, **Francis Galton**. Galton found that populations often showed a "bell curve" distribution. For example, there are many individuals of roughly average height and decreasing numbers of individuals as we look away from the average to the tall and short extremes. Galton reported his findings in his 1889 book Natural Inheritance and named this distribution the "normal distribution". The normal distribution arises when something is influenced by a large number of independent factors, each of small effect, whether it be a "plus", adding to the trait; or a "minus"; subtracting from it.

Galton's explanation of how continuous variation is inherited turned out to be incorrect; our modern understanding of it came later when biologists applied Mendel's theory to Galton's biometrical observations.

Year 1918: Neo-Darwinism

In the early 20th century, it seemed that Mendel's theory only applied to discrete traits, whereas evolution consists mainly of changes in continuously variable traits. It was not until the 1910s that mathematical biologists showed that Mendel's theory could explain all the facts that had become known since Francis Galton about continuous traits. They were then able to show that natural selection could work well with Mendelian inheritance. This work was mainly accomplished in the late 1910s and 1920s by biologists **R. A. Fisher, J. B. S. Haldane** and **Sewall Wright.**

They were so successful that in retrospect, Mendel's theory can be seen to have saved Darwin's theory of natural selection. The combination of Mendel's and Darwin's theories is variously referred to as Neo-Darwinism, the synthetic theory of evolution, and the modern synthesis.

Year 1923: Crop Diversity

Nikolai Vavilov devoted his life to the study of crops; he undertook over one-hundred expeditions to collect crop plants in 64 countries. He assembled the world's largest collection of seeds, numbering some 200,000 specimens, over 40,000 of them varieties of wheat. His concept of crop species, "centers of origin", assuming that they originated in areas where they are most diverse, became important in modern efforts to collect and conserve crops, although these centers of diversity are more likely to reflect human influences than their biogeographical origins.

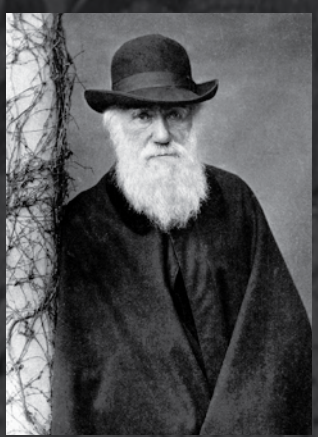
Vavilov is commemorated at the Vavilov Institute of Plant Industry in St. Petersburg, which houses one of the world's greatest collections of crop plant seeds. Such centers around the globe are vital resources for breeding new crops to feed a rapidly increasing population in a changing environment.

Year 1939 and 1972: DDT

The insecticide DDT (dichlorodiphenyltrichloroethane) was discovered in 1939 by the Swiss chemist **Paul Müller** who showed it was active against lice, beetles, mosquitos and several other insect pests. DDT's first major success came when it was used to control a serious outbreak of typhus; a life-threatening infection carried by lice; during World War II. DDT was also effective in wiping out the various species of mosquito that carry malaria. Müller received the Nobel Prize for Physiology or Medicine in 1948 for the contribution DDT had made to public health.

In 1962, **Rachel Carson** sounded a warning note in her ground-breaking book Silent Spring: DDT came with an environmental price tag; its chemical stability, initially seen as a desirable property, makes it very persistent in soil and water. All species of wildlife was suffering toxic effects, Carson wrote. There are now suspicions that DDT accumulates in human tissue too and may lead to disease. DDT has been banned in the USA and other developed countries since 1972.

To Be Continued on Page 16



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 Simple Twist of Fate!

By: Ayman Elsayed, PSC Deputy Director

It was a few weeks after my graduation that I was destined to start my career. It was not my first time to visit the Library of Alexandria as I had previously participated in Friends of the Library meetings. Nevertheless, it was with mixed emotions that I arrived here for my first job interview.

During the fifteen-minute interview, Ms. Hoda Elmikaty; the Director of the Planetarium, which was all there was in the very beginning; introduced me for the first time to the idea of a Science Center. I then visited the 100 m^2 annex to the Planetarium that was the whole Discovery Zone at the time with its handful of imported exhibits.

My greatest surprise was the person who guided me on this 'mini' tour; the person who would become my partner in launching the first local Science Center. It was no one other than my college colleague, Mohamed Elsayed, a freshgraduate like myself. Together, we were responsible for the newly acquired 1500 m^2 area provided by the Library to become what has since been known as the ALEXploratorium, a name inspired by the famous Science Center in San Francisco; the Exploratorium.

During my first days at the Library, in early 2002, I thought of my job at the Center as a temporary occupation, after which I would return to the field of my study; Electrical Engineering. But that did not alter my focus on my work; I was committed to gaining not only new experiences but unique ones as well, and that was exactly what I was doing by developing the Science Center from scratch.

The first of many successes to follow was the inauguration of the Center in October 2003. The ALEXploratorium featured the newly planned 600 m^2 Discovery Zone, a Workshop space and an Auditorium. It was the outcome of our hard work in planning and executing every single detail; a huge experience indeed. But it was only the beginning.

Talented and motivated people from all kinds of study backgrounds joined us to explain the hands-on exhibits to our visitors, design and fabricate new exhibits and exhibitions, create and animate workshops, develop and conduct programs, organize and host events, not to mention reaching out to schools and other social communities as well as communicating with the public through our digital and printed publications.

Our mission; to Promote Science and Technology, among children and the public at large, was not just a phrase to use in proposals and speeches. It was the seed we planted, then nourished with every passing day until it became rooted in our community; extending its branches East, West, North and South.

Today, eight years after that fateful day in 2002 and before I turn thirty years of age, I am honored to be the Deputy Director of the PSC; this small Science Center that has become the undeniable Egyptian pioneer and expert of informal science communication, member and co-founder of a number of international science centers networks, and a key player in several local, regional and international projects and initiatives.

Without knowing it, my perception of my career had shifted and it has become my professional, as well as personal, goal to 'Promote Science and Technology' so that many others would be inspired to make it their career to study and develop science and technology.

Over the years, I have realized that it is not that important to love everything about what you do, but it is so important to believe in it. Belief is the engine that keeps us going; it is the source of our motivation and creativity.

Discover life!

By: Maissa Azab, PSC Publications Coordinator
In collaboration with the PSC Design and Fabrication Unit

Life is a continuous and endless chain of connected mysteries; science is the ongoing quest to decipher it.

Science is everywhere inside and around us; in our bodies, in the ground we walk on, in the air we breathe, in the skies above us and in the space surrounding us for incalculable light years. We need science to grow and move forward, to understand what we are and where we live, to know our past, understand our present and make our future.

At the PSC, we offer the visitors an amazing adventure to reveal some of the wonders of science in an atmoshpere of amusement. Indeed, it has been an ongoing challenge to keep the ALEXploratorium fresh and exciting to visit again and again over the years.

With the passing of years, not only has the number of our visitors increased, but the PSC has also expanded its range of activities and initiatives. Naturally, the PSC Team as well has grown in capacity, knowledge and experience through their own work as well as numerous local and international trainings and conventions.

Putting their acquired experience and knowledge, in addition to the best of their own imagination and ability, to hard work, the PSC Design and Fabrication Team has redesigned the ALEXploratorium to reinforce the discovery concept through three zones: Discover Yourself, Discover Your Environment and Discover Your Universe.

Upon entering through the Information area, the visitors get a glimpse of the "Discover Your Environment" zone through a seethrough wall contouring the corridor that leads to the gate of the first zone; "Discover Yourself". The gate, the House of Mouth, is the first exhibit of the zone that revolves around the Human Body, with special emphasis on the Five Senses; Taste, Smell, Sight, Hearing and Touch; the zone also features a part about Genetics with an iconic DNA exhibit.

The visitors then exit to the "Discover Your Environment" zone through the Suspension Bridge. The next exhibit is the iconic Talking Earth, after which the visitor can experience the Motion section focusing on Mechanics and featuring Pulleys, Levers and an Archmides Screw, among other exhibits. In the same zone, there is also the Life section with exhibits about Plants, Food Chains, Healthy Eating and Population.

Afterwards, the zone continues on with the Waves and the Energy sections featuring the Laser Musical Instrument, Magic Carpet, Generating Electricity Using Human Power, the Electronic Board, Saving Electricity, as well as Clean and Renewable Energy.

Following that is the Elements section with exhibits such as the Water Spinner, Viscosity Tubes, the Periodic Table and the Be Curious digital microscopes. Before leaving the zone, the visitor gets to experiment with Volcanoes, Earthquakes, Water Cycle and Climate Change.

The visitors then move on to the "Discover Your Universe" zone through the Planetarium-resembling gate. There, visitors get to know their Weight on Each Planet; check out various Space Shuttles and a Space Station; learn about Finding Latitude, Day and Night, Moon Phases, the Center of Gravity and Sound in Vacuum. The iconic exhibit of this zone is the Moving Solar System simulating the Sun and Planets with their relative sizes, colors and motion.

The visitor then ends this exciting adventure with a few fun games: Distortion Mirrors, Illusions, Color Glasses, Brainteasers and Computer Quizzes. In addition to all the new exhibits, there is the new "Listen and Discover" auditorium now with a 75-seat capacity and featuring up-to-date 2D and 3D projection technologies, as well as three new workshop spaces. To conclude the visit, guests can stop by our all-new Giftshop for souvenirs to remember us with until they come back to visit.

DISCOVERY ZONE

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]

Entry Fees

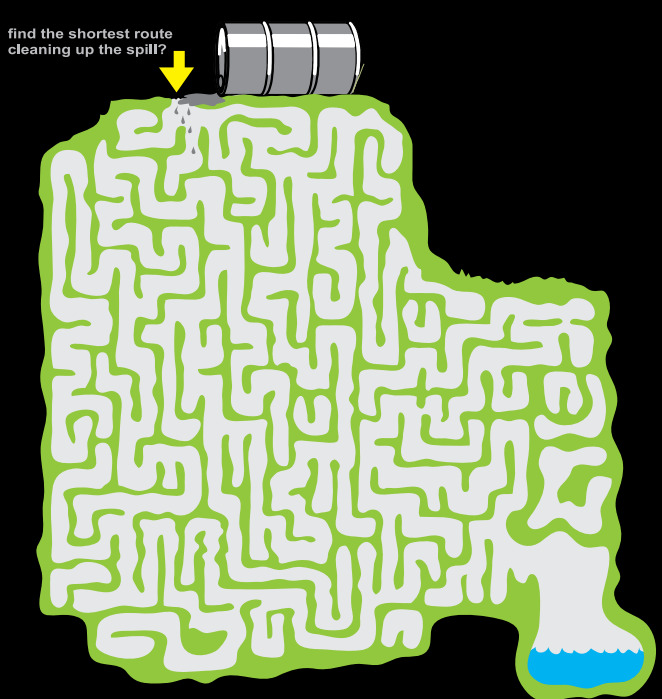
Students	2 EGP
Non-students	4 EGP

LISTEN AND DISCOVER

- 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.

Show fees

DVD shows:	Students	1 EGP
	Non-students	2 EGP
3D shows:	Students	2 EGP
	Non-students	4 EGP



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, the power of plants, and the importance of sustainability. The students will also learn some interesting facts about crime scene investigation, and how to collect and analyze evidence. Besides, they are going to acquire some biological knowledge during the human body workshop, and get some information about chemistry and physics as well. On the occasion of the International Year of Biodiversity (IYB 2010), students will enjoy some new workshops; unraveling the secrets of marine life, exploring genetic traits and comparing them, as well as getting acquainted with ecosystems and life cycles.

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.

- 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.
- Workshop duration is 90 min.

Plant Power

This workshop aims to provide students with an opportunity to learn more about the plant kingdom and its value for humans. Using games, experiments, and stories, the workshop informs children about the vital role of these organisms in the treatment of numerous diseases; hence, their impact on our daily life.
- Target Age Group: 6-9 years

Astronomy

Astronomy is one of the oldest sciences. It is the scientific study of celestial bodies and phenomena. It is concerned with the evolution, physics, chemistry, meteorology, and 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: 9-12 years

Human Body

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 close to 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: 9-12 years

Chemistry

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 on daily basis. This chemistry workshop encompasses a variety of simple and fun scientific experiments that aim to familiarize children with some chemical secrets, such as chemical reactions, atoms and molecules, acid base reactions, the difference between compounds and mixtures, among many other secrets.
- Target Age Group: 9-12 years

Sustainability

Sustainability is maintaining Earth and its natural resources to continue to provide a home for humans and all its life forms. In ecology, sustainability is how biological systems remain diverse and productive over time. For humans, it is the potential for long-term wellbeing, which depends on the wellbeing of the surrounding environment; thus, the responsible use of Earth's resources. In this workshop, children learn to take care of Earth and the creatures living on it.
- Target Age Group: 9-12 years

Food Chain

Whether it is a hawk at the top of the food chain or a bacterium at the bottom of it, all living organisms are vital to the survival of the whole ecosystem. There are dozens of connections linking each organism with a number of others forming, not only food chains, but also food webs. In this workshop, students learn more about ecosystems and life cycles getting acquainted with the terms "food chain" and "food web".
- Target Age Group: 9-12 years

Marine Biodiversity

It is almost certain that life originated in the oceans; today, marine biodiversity is threatened by human activities. This workshop introduces children to marine life in Egypt through a variety of activities showcasing the nature of marine organisms. An outdoor activity, the workshop includes a trip to the aquarium.
Target Age Group: 9-12 years

Criminal Scene Investigation Workshop and Trip

During the workshop, students get the chance to become modern detectives for a while. They learn about crime scene investigation through various hands-on activities related to forensics and tackling sciences such as chemistry, biology and text analysis. Each time, the animator describes a crime to the participants who are then required to collect and analyze evidence in order to reach a suspect. Moreover, students visit the evidence lab to watch how forensic specialists work.
- Target Age Group: 12-15 years

Genetic Diversity

This workshop includes several hands-on activities, one of which introducing students to the concept of genetic variation within a population. This activity is divided into three stages; observation and comparison of traits within a group, active demonstration of how increased diversity contributes to greater survivability, then reinforcement of the concept through a game in which participants play the role of a herd of deer coping with changes in the environment over the course of time.
- Target Age Group: 12-15 years

Ecosystem Services

Biodiversity is the variety of life on Earth. In this workshop, children get acquainted with biodiversity, its significance for life to continue, as well as its three main levels; ecosystems, species and genes. Diversity of ecosystems provides essential benefits and services to human society like food, clothing, shelter, fuel and medicines, among others. After exploring the concept of biodiversity, the workshop focuses on the different ecosystems around the world, with special emphasis on Egyptian ecosystems.
- Target Age Group: 12-15 years

Programs & Events

Super Science Show [Ongoing]

Introducing a new form of science learning that is pure entertainment, the Super Science Show is a dynamic and highly motivational activity that gets children involved in a variety of amusing and exciting hands-on scientific experiments that stimulate infectious enthusiasm. The intriguing show tackles several physical, chemical and biological phenomena by allowing children to use a diversity of objects and materials, such as balloons, bouncing balls, balance board, water, liquid Nitrogen, dry ice and soda cans.

- Target age group: 6-12 years
- Show duration: 60 min.
- Maximum number of participants: 50
- 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 Young People's and Children's Libraries, this program applies a series of fables containing valuable messages to provide children with a scientific basis and enable them to make use of scientific facts as a creative tool. A major theme of this 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.

This season, there are three fables: The King of Hearts, about the human heart and the heart of whales; The Strongest Tree, about the role of sunrays, ants, mushrooms and bacteria in growing trees; and Cold Feet, with facts on humidity, as well as strawberries and radish.

- Target age group: 6-12 years
- Number of sessions/week: Twice
- Session duration: 2 hrs
- Maximum number of participants: 25
- PSC workshop fees are EGP 2 per student per session.

-Young People's and Children's Libraries 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]

In cooperation with the Egyptian Chess Federation, this program aims to develop the mental capacity and analytical skills of children. Chess is an exercise for the mind; it develops valuable mental abilities such as concentration, critical thinking, pattern recognition, strategic planning, creativity, analysis, synthesis, and evaluation, to name a few. Chess is a highly effective tool for teaching problem-solving and abstract reasoning through analyzing situations by focusing on important factors and eliminating distractions.

- Target age group: 6-16 years
- Program duration: 3 months
- Number of sessions/week: Twice
- Session duration: 2 hrs
- Maximum number of participants: 25
- Fees (following interview): EGP 150

- For registration, please contact the PSC Administrator.

Space Technology Program [Ongoing]

Understanding Space is essential to face 21st-century challenges such as: climate change, natural disasters, security, and communication, among others. The program approaches the field through multiple activities including lectures, workshops, fieldtrips, and research projects.

- Target age group: 15-21 years
- Duration: 3 hrs
- Number of participants: 10-20
- Program fees are EGP 100 per participant.

-For registration, please contact the PSC Administrator.

H1N1 Awareness Program (1 January - 28 February 2010)

The 2009 outbreak of H1N1 flu is the result of a new strain of influenza commonly known as Swine Flu; a respiratory infection that has spread to humans. It can cause mild to severe symptoms and has already reached the level of a pandemic. The PSC is reaching out to the community to raise awareness of the disease and to contribute to the improvement of public health in the local community through a variety of media.

- Target age group: 6-12 years

Baharia Oasis Camp (29 January - 2 February 2010)

Scientists have chosen the Egyptian Western Desert as one of the most similar areas to planet Mars in terms of soil, rock structure, atmosphere and groundwater. The Baharia Oasis is also famous for the civilizations and significant events that it has witnessed including the Pharaohs, the Romans and World War II.

This camp is organized during the midyear vacation to provide young students with an opportunity to interact with the nature and biodiversity of the Western Desert through identification of wild life and bird migration patterns. Participants will also learn some secrets of the stars and galaxies through observation of the Saharan skies.

- Target age group: 13-18 years

El-Fayom Camp (6 February - 9 February 2010)

El-Fayom is a unique example of environmental and cultural diversity. This camp allows students to interact with this environment; it aims is to develop children's team working and scientific problem solving skills. The camp activities are multidisciplinary and tackle astronomy, history, geology and botany.

- Target age group: 13-18 years

QUOTES

"There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved." **Charles Darwin, Origin of the Species, 1859**

"In the long history of humankind (and animal kind, too) those who learned to collaborate and improvise most effectively have prevailed." **Charles Darwin**

"It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change." **Charles Darwin**

"The value and utility of any experiment are determined by the fitness of the material to the purpose for which it is used, and thus in the case before us it cannot be immaterial what plants are subjected to experiment and in what manner such experiment is conducted." **Gregor Mendel**

Nanotechnology friend or foe?

By: Ingy Hafez, PSC Publications Specialist

There has been much debate on the future implications of nanotechnology; it is said that it has the potential to produce many new materials and devices in a diversity of fields; medicine, electronics, energy, just to name a few. On the other hand, nanotechnology raises a variety of controversial issues, a common side effect to introducing new technologies; one of the most talked about has been concern over toxic and environmental impacts of nanomaterials, as well as the impact on global economics. These concerns have led to a debate among scientists and governments on whether special regulations on using nanotechnology are required.

So, what is nanotechnology after all?

Technically speaking, nanotechnology is the study of controlling matter on the atomic and molecular level. It involves developing materials or devices within the size of nanometers; a nanometer equaling one billionth of a meter.

In her lecture on nanotechnology entitled "New Designs for Future Applications" at the Bibliotheca Alexandrina, Dr. Mona Bakr, National Institute of Laser Enhanced Science (NILES) at Cairo University, talked about different aspects of nanotechnology; its origin, its structure, as well as the different shapes and colors it can take. Dr. Bakr explained how "nano", now a familiar prefix, means the building of material atom by atom, just like building a house block by block. When she was asked if nanoparticles could be considered now the smallest building unit of matter, she stated that nanomaterials are composed of a group of atoms the properties of which we can control but that the atom is still the smallest building unit of matter.

Some of the audience confused nanotechnology with femtochemistry. Dr. Bakr corrected them by explaining that nanotechnology is the ability to see, measure, manipulate and manufacture things on a scale of 1 to 100 nanometers, while femtochemistry is the study of chemical reactions on extremely short timescales, approximately 10^{-15} seconds; the now famous femtosecond. Moreover, she spoke briefly about what is called the "Attosecond", which is the next dream to chase in future years. The attosecond is a unit equal one quintillionth (10^{-18}) of a second; one thousandth of a femtosecond. The attosecond will help us monitor the movement between electrons inside the atom. Dr. Bakr concluded her speech by calling for the unification of all fields of science to work together as one team in order to reach the highest level of advancement.

Nanotechnology, a solution for poverty?

In a one-on-one interview with Dr. Bakr, we asked her about the controversy on nanotechnology. She said that it started ten years ago; before that, the term did not exist although there were other terms such as nanoparticles. To her, it is not a technology in the common sense of the word; it is more of freshman chemistry. Dr. Bakr asserts that nanotechnology can be the solution to poverty as well as an opportunity for developing countries to catch up with global advancement.

Other global views reaffirm Dr. Bakr's conviction in the hope of nanotchnolgy. "Nowhere is the promise of nanotechnology stronger than in water treatment. Nanofiltration techniques and nanoparticles can reduce or eliminate contaminants in water and could help deliver a key Millennium Development Goal, halving the proportion of people without sustainable access to safe drinking water by the year 2015", as reported by the Science Development Network (SciDev.Net).

"Nanotechnology has the potential to generate enormous health benefits for the more than 5 billion people living in the developing world," says Peter Singer, McLaughlin-Rotman Centre for Global Health and Professor of Medicine at the University of Toronto. In 2005, Professor Singer's group published a study identifying and ranking the top ten nanotechnologies most likely to benefit the developing world in the near future. At the top of the list were applications related to energy storage; production and conversion; enhancement of agricultural productivity; water treatment; and the diagnosis and treatment of diseases.

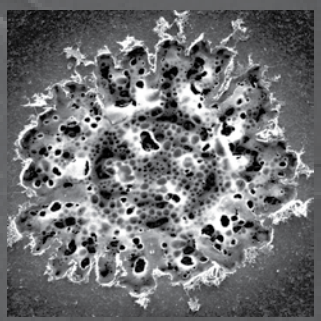
The group also showed that a surprising amount of nanotechnology research and development activity is ongoing in several developing countries, and that those nations are directing their nanotechnology innovation systems to address their more pressing needs. "Countries like Brazil, India, China and South Africa have significant nanotechnology research initiatives that could be directed toward the particular needs of the poor," said Andrew Maynard, Chief Science Adviser for the Project on Emerging Nanotechnologies.

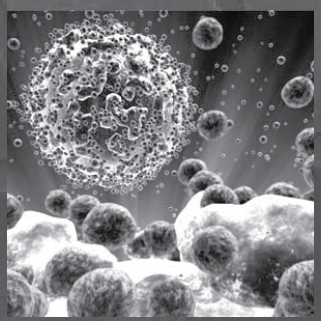
An escalating debate

When we asked Dr. Bakr about the dangers of nanotechnology, she said: "Everything in our lives can be a double-edged weapon; for example, we can use the knife to cut food or to kill someone! The important thing is to know and choose how to use our resources. It is possible to create invisible weapons that could penetrate the human body, bombs, as well as chemical and biological weapons. But on the other hand, we can use nanotechnology to benefit from solar energy, in water desalination, purification of factory wastes, and giving some materials, such as iron, steel and ceramics, very strong mechanical properties, in addition to endless other peaceful applications. As for handling nanomaterials, I have been working in the field for 12 years and I have not been affected negatively by it."

Intrigued by Dr. Bakr's talk and lecture, we delved further into the subject and discovered that there are quite some opponents to the idea of nanotechnology in general and the study of nanoparticles in particular. The opposition basically relies on the fact that the small size gives nanoelements unique optical, electrical, and chemical properties, which raises concerns of unforeseen effects in the body.

A variety of studies with animal models have shown that nanoparticles can trigger damage in living tissues [*Science*, 18 June 2004]. A research group found out that applying nanoparticles on some cells caused damages in the DNA. However, another research team claims that this happens as a result of applying excessive amounts of nanoparticles. It has been pointed out that this is a regular occurrence in the nanotechnology area because the field is pretty much interesting and it plays into people's fears about new technology; "we need to be much more careful in interpreting these results," one of the team members said.





Nanotechnology, a global dream

During our interview with Dr. Bakr, we asked her how she thinks youth could be encouraged to study nanotechnology, she replied: "Encouraging the young to study nanotechnology is what concerns me at this stage... If the government added a part to the curriculum of high schools that defines nanotechnology and how to design, fabricate and process materials, as well as control their properties, in a simple interesting manner, I think that will encourage the students to study in this field… I hope to promote nanotechnology through the media, as well as educational programs and conferences such as those organized by the Bibliotheca Alexandrina, because we need to develop science and technology in our country to enhance our economy if nothing else."

Dr. Bakr also relayed to us how she got interested in the study in the first place. She said that her father was obsessed with science and scientific studies; bringing her lots of scientific books and magazines since childhood. However, she told us that the actual factor that triggered her enthusiasm towards science was a scientific article by Dr. Zeweil she had read a long time before.

Dr. Bakr concluded her talk with us with an inspiring statement: "We do not create science; we discover it."

Where will the debate lead us? Is Nanotechnology tomorrow's solution for today's problems? Which side of Nanotechnology will win; good or evil? These are the questions that should concern us at the moment because the answers affect us all.

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It is worth mentioning that the PSC has initiated a series of lectures on the topic of Nanotechnology, starting with a lecture by Dr. Mostafa Elsayed; Julius Brown Chair, Regents Professor, and Director of Laser Dynamics Laboratory, USA; under the title "Nanotechnology, a Look into the Future". Dr. Elsayed was honored with numerous prestigious awards in recognition of his outstanding scientific research; such as the ACS Langmuir National Award in Chemical Physics, the ACS Local Section Awards, and the 1990 King Faisal International Prize in Sciences. Prof. Elsayed is an elected member of the US National Academy of Sciences; he is also an elected fellow of the American Academy of Arts and Science (AAAS), and the American Physical Society; and an associate member of the Third World Academy of Sciences.

To learn more about Dr. Elsayed's and Dr. Bakr's lectures, please visit the Center's website.

Science Festivity 2010

Quench Your Thirst For Knowledge!

By: Rana El Deeb, PSC Publications Specialist

Love science? Tired of regular learning methods? Looking forward to having fun?

The BA invites you to the Science Festivity 2010 where you can enjoy it all; have fun and learn more about science. It is an event that introduces science to the public and gets the public involved in science in an exciting way. In the Science Festivity, textbooks and lessons are replaced by games, contests, and experiments. It is the place where science is fun.

The Science Festivity is a market-like event where schools, universities, as well as NGOs offer science to the public for free. For three consequent years, the PSC has successfully organized the Science Festivity, now one of the Center's most prominent and highly anticipated annual events attracting nearly 20,000 visitors in 2009. In 2010, the Science Festivity will be back for the fourth time to give the public a new and unique taste of science.

Each year, the Science Festivity has an overarching theme, around which activities, including hands-on exhibits, experiments, games, and sessions revolve. In 2007, the theme was "Environment and Health", followed by "Technology" in 2008 and "Energy" in 2009. This year, the main theme is "Water" with a number of sub-themes including: environment (water cycle, clean energy and water pollution), biodiversity (life underwater and outside it), agriculture (plants and irrigation), engineering (hydropower, energy and industry), chemistry (water properties, types of water and water analysis), and astronomy (water in the universe).

The heart of the Science Festivity is the 'Science Village' held on the BA Plaza on the first two days and at Antoniadis Gardens on the third day. It encompasses booths where the exhibitors; including institutions, associations, companies, as well as international organizations; introduce their respective inputs concerning the theme using mainly interactive and hands-on exhibits. The 'Science Village' hosts the 'Super Science Show', where the public can have more fun, and the 'Science Café', where they get a chance to discuss subjects related to the main theme with experts of the field.

The Science Festivity is organized by the BA and partners that are invited to share this experience and hold their own Science Fair. In 2010, the BA will be partnered by Saint Marc College, the French Cultural Center, Goethe Institute, and the British Council in Cairo and Alexandria, among others. Each partner will hold its own Science Fair at non-coinciding dates during the month of April so that the public has an extended opportunity to enjoy the experience in various locations.

The BA Science Festivity 2010 will take place on 31 March and 1 April, from 9:30 am to 4:30 pm, at the BA Plaza, and on 2 April, from 1:00 pm to 6:00 pm at Antoniadis Gardens.

Why Should We Care?

By: Marwa Gaber; PSC Programs and Events Specialist

Biodiversity is the very heart of our life. It is the extraordinary variety of living creatures and ecological communities growing and interacting with each other all over the world. It is the richness and complexity of species and ecosystems throughout the planet continually acquiring and honing the adaptations necessary for survival under constantly changing conditions.

Biodiversity includes plants and animals, as well as the processes and inter-relationships that sustain them. Plants absorb and convert nutrients from the soil in order to grow. In turn, they produce oxygen for humans and animals to breathe and survive. Insects, birds, and other pollinators feed on nectar from flowers; in doing so, they also cross-fertilize the flowers. Benefits to ecosystems include climate and water regulation, the creation and protection of soils, reduction of floods and soil erosion, shoreline protection, and providing natural controls of agricultural pests.

It is useful and indeed necessary to remind ourselves that a healthy human environment depends entirely on biodiversity. Everything we eat, wear and produce on this planet is ultimately dependent on its biodiversity, yet we behave as if it hardly matters. While we ponder over the question of whether there is life on Mars, we seem to have forgotten that only a fraction of an estimated 10 million to 20 million species on Earth have been found and described, while countless others, both known and still undiscovered, are driven to extinction. We are now losing wild species at a rate that has been estimated to be 100 to 1000 times faster than the prehistoric background rate.

We humans have come a long way in gaining our independence from the whims of Mother Nature. We have learned how to build shelters and clothe ourselves. Through agriculture and irrigation, we can control our own food supply. We have built schools, hospitals, computers, automobiles, airplanes and space shuttles. So what is the big deal if a bunch of plants, animals and simple organisms die out?!

The problem with loss of biodiversity is that Earth functions like an incredibly complex machine; there are no unnecessary parts. Each species, from the lowliest microbe to humans, plays a part in keeping the planet running smoothly. In this sense, each part is related. If a lot of those parts suddenly vanish, then the machine, that is Earth, cannot function properly.

For example, the crops we grow through our clever use of agriculture are enabled by the nitrogen present in the soil. This nitrogen nourishes and strengthens our crops; but where does it come from? Worms, bacteria and other life found within the soil decompose vegetation; in doing so, they produce the nitrogen that crops need. This is also how nutrient-rich compost is made. If these species were killed off, then our crops would not grow properly.

This is true for ocean ecosystems too. The ocean, along with land-based plant vegetation, plays a major role in absorbing carbon dioxide (CO_2). The ocean does not absorb this CO_2 on its own. It relies on organisms such as phytoplankton; microscopic aquatic plant life; to absorb the CO_2. Loss of phytoplankton means we lose adequate levels of breathable air.

Even some of our own modern advances in technology depend on nature. Modern medicine owes much to the properties found naturally in plants and bacteria. Medications such as painkillers, penicillin and inoculations are based on natural organisms. The structure of these living organisms has been analyzed and synthesized to produce some medications; but others, such as antibiotics, still use the actual organisms. In total, this accounts for one-quarter of all the prescription drugs. However, if Earth suddenly lost its hearty biodiversity, drugs that have yet to be discovered would also be lost. Thus, threats that put biodiversity in danger are threatening to humanity itself.

Even if we humans could find a way to overcome a catastrophic loss of biodiversity, our existence on Earth would certainly be changed for there is a critical economic aspect to biodiversity as well. Services provided for humanity by Mother Nature vary from ecotourism and pollination to soil formation and pharmaceuticals, just to name a few.

These services would still be required, with or without a diverse global ecosystem. As the resources that provide them dwindle, humans would have to replace them in order to survive. Stocks of these resources would quickly and significantly increase in value; competition would develop with wealthier and better armed countries inevitably winning. Life, indeed, would change for humanity as a result of biodiversity loss. It would quickly get worse.

So, How Bad Is It?

Biodiversity is disappearing at an alarming rate. Some predict that 50% of all mammals and birds will be extinct within the next century.

Over the past centuries, the documented extinction rates has been approaching 1,000 times the background rate or rate at which species have been becoming extinct for the past 65 million years, since the major extinction event that closed the Cretaceous Period and the Mesozoic Era, which coincided with the loss of the last surviving dinosaurs. This was the fifth major extinction event in Earth history, a time when two-thirds of all terrestrial organisms that existed at that time disappeared and the character of life changed permanently. If present trends continue, the current extinction rate can climb to 10,000 times the background rate during the next century.

If proof were needed that conservation work is more urgent than ever, the recently published 2009 "Red List" of Threatened Species describes the situation clearly. The Red List, from the International Union for the Conservation of Nature (IUCN), highlights the alarming ongoing rate of biodiversity loss around the world. More than one-third of the 47,677 species assessed in the latest list are currently threatened with extinction.

The harsh truth is that this decline is mainly the outcome of human activity; such as deforestation, overfishing, pollution and our copious, climate-changing greenhouse gas emissions. The good news is, this means it is largely in our control, and we can stop it; but only if we all work urgently and together.

Biodiversity & Human Health

By: Dr. Reem Sassy; PSC Programs and Events Specialist

Human health is dependent on biodiversity and on the natural functioning of healthy ecosystems. The world's rich biodiversity is the foundation of environmental equilibrium, which is crucial to safeguarding human health. Biodiversity also provides us with models for medical research that help us understand human physiology and deal with disease.

Human actions such as pollution, deforestation and increase in population cause habitat fragmentation, degradation and eventual loss. The results are the extinction of numerous useful species and the proliferation of new and already existing harmful ones as well as pathogenic microorganisms; such as viruses and bacteria; leading to outbreaks of infectious diseases. Furthermore, biodiversity loss could cause antibiotic resistant diseases, nutritional deficiencies due to lack of food variety, water contamination, and poor air quality with subsequent increase in respiratory tract infections.

Malaria, for example, has become more widespread in the Amazon region, where deforestation creates areas of standing water thus forming breeding sites for the type of mosquitoes that plays a predominant role in the transmission of the deadly species of plasmodium(1), which causes malignant malaria in humans with high rates of complications and mortalities.

On the other hand, diseases such as bilharzia can be naturally fought by conserving the biodiversity of fresh-water snails. The presence of different snails in the area where parasite eggs are released from infected individuals can cause the miracidia(2), which is the small free-living larval stage of schistosomes (the type of flatworms that causes bilharzias), to enter the wrong snail and hence die without reproducing; thus interrupting the cycle of the disease.

Furthermore, the World Health Organization (WHO) estimates that 80% of people in developing countries rely on traditional medicines derived mainly from nature for the treatment of a large number of common diseases. Just one example is the cone snail(3); beautiful but deadly because of its venomous toxins, it shows great promise as a source of new medically important substances such as ziconotide(4), which is a non-opioid(5) and non-NSAID(6) analgesic agent, that are used to relieve severe and chronic pains.

Dr. Aaron Bernstein, Harvard Medical School and the Center for Health and Global Environment, explains: "Cone snails, which have 700 species, may represent the greatest treasure trove of potential medicines of all organisms on Earth, but because they live on or near coral reefs, they are in danger". They are in danger because the coral reefs are greatly damaged by various human practices such as overexploitation, dynamite fishing and climate change threats.

Not only that, human mental and psychological health is also greatly affected by biodiversity. Seeing nature or being outside lowers stress levels, calms heart rates, and diminishes road rage. In the presence of natural light, workers are happier and more productive and students do better on tests. More surprisingly, a new study from the University of Sheffield contributes an unexpected detail to this research; the extent of psychological benefits people gain from walking in a park correlates directly to the extent of biodiversity in that park!

It is critical for us as humans to realize the impact we have on biodiversity and that at the same time there would be no human existence without it. If no changes are made in the ways we use resources on Earth, biodiversity loss will continue until human lives can no longer be sustained. It is only through proper education and solidarity of nations in taking the proper actions towards the preservation of biodiversity, that the human race will be able to sustain life on Earth.

Glossary

1. Plasmodium: the parasite responsible for malaria infection. There are over 200 known species of plasmodium; at least 10 of them infect humans while others infect animals. The parasite always has two hosts in its life cycle; a mosquito vector and a vertebrate host.

2. Miracidia: a small free-living larval stage of the flatworms that cause bilharzia in humans. It is released from eggs that are shed in the faeces of its vertebrate host.

3. Cone snails: medium-sized to large sophisticated predatory sea snails that have cone shaped shells. These snails hunt and immobilize prey by launching a poison in a harpoon-like action.

4. Ziconotide: a very potent pain-relieving agent that is derived from the toxin of the cone snail species "*conus magus*" that is used nowadays in the relief of severe and chronic pains without any addictive effects.

5. Non-opioid analgesic agents: drugs that principally have pain-relieving and anti-inflammatory actions. They are mild forms of painkillers that do not produce tolerance or physical dependence and are not associated with abuse or addiction.

6. NSAIDs: the abbreviation of Non-Steroidal Anti-Inflammatory Drugs that have pain-relieving and anti-inflammatory effects. The most prominent members of this group of drugs are aspirin, ibuprofen, and naproxen.

Where Did We Go Wrong?

While extinction is a natural process; generally, a species will last for an average of 2 million to 10 million years. However, species and ecosystems today are threatened with destruction at a rate rarely seen in history as a result of human actions, five of which are major threats to biodiversity.

Invasive Alien Species (IAS): Species not native to an area; they arrive there via trade, transport, travel or tourism, all of which have increased greatly because of globalization. These species are harmful to native biodiversity in a number of ways; by becoming competitors, predators or parasites, or by spreading disease.

Climate Change: Land life is destroyed by fires, floods and insect plagues, all of which are expected to become more frequent. Marine life is also affected by the rise in sea temperatures and increased acid levels due to the increasing concentration of dissolved atmospheric carbon dioxide. Not to mention the serious impact on polar ecosystems; thawing frost and losses of ice sheets.

Habitat Change: Thousands of years of human activity; habitat destruction, degradation, and unsustainable management; have reduced forest coverage from around 50% to 30% of total land area, and deforestation continues at an alarmingly high rate. Almost 70% of Mediterranean forests and woodlands were lost by 1990. In the Caribbean, average hard coral cover has declined from about 50% to 10% in the last three decades, and some 35% of mangroves have been lost in the last two decades. In the Arctic, the average annual sea ice extent has declined by about 8% in the past 30 years, with a loss of 15% to 20% in summer sea ice extent over the same period.

Overexploitation: Humanity has always relied on nature for survival, and exploitation of species for food, clothing, and shelter has, in the past, always been sustainable. Today, many species are hunted, trapped or killed above their rate of replacement.

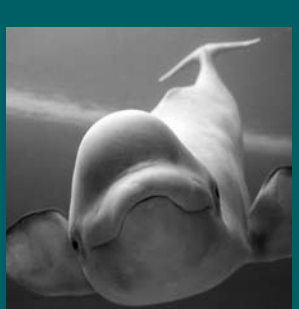
Pollution: Pollutants in air, water, and soil influence organisms in many different ways; from altering the rate of plant growth to changing reproduction patterns, and in extreme situations, leading to extinction. Excess pollutants can also leave species weakened and susceptible to other drivers of biodiversity loss.

Sadly, humans depend on nature to dispose of waste products. As a result, our oceans, rivers, lakes, air and land have become repositories for industrial and personal waste. The incredible volumes of pollution currently being dumped into the environment overwhelm the Earth's capacities to absorb, transform or break down these materials. Some materials take thousands of years to decay, and may become more toxic as they decompose, resulting in long-term environmental damage.

Pollutants dumped into the environment do not just disappear, or remain suspended; they enter the tissues of living things. They are then passed through the food chain, increasing in toxicity; a process known as bioaccumulation, now painfully evident.

In the St. Lawrence River in North America, levels of PCBs, mercury, lead and DDT are at extreme levels in beluga whale populations. A top predator on the food chain, they collect the toxins from all the organisms that they eat. The toxins are then passed down to next generations from mothers to offspring. This extreme level of toxicity leads to increase in diseases such as cancer.

Man-made pollutants can have devastating impacts on living creatures of all shapes and sizes; but amphibians are often the first creatures to show signs of stress from pollution. Scientists have found that commonly used chemicals such as pesticides, herbicides and fertilizers are decimating frog populations. The reduced abundance and diversity of frog species are a warning signal about the impacts of pollution.



Beluga Whale

Red-Eyed Tree Frog

Giant Gyre[1]

Biodiversity & The Environment

By: Nihal Soliman, PSC Programs and Events Specialist
And: Ingy Hafez, PSC Publications Specialist

Have you ever thought how our environment affects our health, our lives and everything around us? Does it really have a great impact on living organisms? If you think so, then you have to consider what could destroy this environmental balance!

Strolling through the average supermarket, shoppers find hundreds, if not thousands, of items to make their lives easier; diapers, shampoo bottles, disposable razors, unbreakable soda bottles, etc. Unless specifically requested, even the bags we carry our goods in are often plastic. To humans, these are items of comfort rather than necessity; but to marine life, they are a floating minefield.

When plastic reaches the water, whether in the form of plastic bags or fish nets, it poses a threat to the animals that depend on the oceans for food. For example, a floating plastic bag looks like a jellyfish to a sea turtle, and bits of plastic look like fish eggs to seabirds; also, drifting nets entangle birds, fish and mammals, making it difficult, if not impossible, to move or eat.

As our consumption of plastic mounts, so does the danger to marine life.

Crisis

Most of us have never heard of the "Giant Gyre"; a vast expanse of garbage in the middle of the ocean. As what is "out of sight, is out of mind", we are unable to fathom how harmful, even deadly, this disastrous waste vortex is.

Stretching from about 500 nautical miles off the Californian coast, across the northern Pacific, past Hawaii and extending as far as Japan, lies the world's largest rubbish dump; a "plastic soup" of waste floating in the Pacific Ocean and growing at an alarming rate across a huge area and held in place by swirling underwater currents.

Charles Moore, an American oceanographer who discovered this 'Great Pacific Garbage Patch', estimates that about 100 million tons of wreckage is circulating in the region. Marcus Eriksen, Research Director of the US-based Algalita Marine Research Foundation, which Moore founded, said: "The original idea people had was that it was an island of plastic garbage that you could almost walk on. It is not quite that; it is almost like a plastic soup!"

The "soup" is actually two linked areas on either sides of Hawaii; the Western and Eastern Pacific Garbage Patches. About one-fifth of the junk, which includes everything from footballs and kayaks to Lego blocks and carrier bags, is thrown off ships or oil platforms; the rest coming from land.

Professor David Karl, an oceanographer at the University of Hawaii, said that more research is needed to establish the size and nature of the plastic soup. "Plastic trash is going somewhere and it is about time we get a full account of its distribution in marine ecosystem; more importantly, its impact on them." Prof. Karl said.

Impact On Marine Biodiversity

According to the UN Environment Program, plastic debris leads to the death of more than one million seabirds annually, not to mention more than 100,000 marine mammals. Shockingly, syringes, lighters and toothbrushes have been found inside the stomachs of dead seabirds that mistake those objects for food. More dangerously, plastic pollutants act as sponges for man-made chemicals such as hydrocarbons and DDT, which then enter the food chain.

What happens is that when plastic waste photodegrades into smaller and smaller pieces, it concentrates in the upper water column; ultimately, becoming small enough to be ingested by aquatic organisms that live near the ocean's surface. Plastic waste thus enters the food chain through its intense concentration in the Neuston; organisms floating on top of water (epineuston) or right underneath its surface (hyponeuston). Some plastics decompose in the ocean within one year of entering it, leaking potentially toxic chemicals such as Bisphenol A[2] and derivatives of polystyrene[3].

Marine plastics facilitate the spreading of invasive species that attach to floating plastic in one region and drift long distances to colonize other ecosystems. Gyres also influence the distribution of marine organisms, by trapping them, or pushing them around. "Marine life that relies on currents for transportation is particularly influenced," Dr. Gary Froyland, UNSW Mathematician and Research Team Leader said. "If outside the gyre, it is likely they will be transported around it; however, once entering the gyre, they are unlikely to leave it."

"The water in the gyres does not mix well with the rest of the ocean, so for long periods these gyres can trap pollutants, nutrients, drifting plants and animals, and become physical barriers that divert even major ocean currents," Dr. Froyland added. "In effect, they provide a kind of skeleton for global ocean flows. We are only just beginning to get a grip on understanding their size, scale and functions, but we are sure that they have a major effect on marine biology and on the way that heat and carbon are distributed around the planet by the oceans," he concluded.

The Cleanup

Photodegradable[4] plastics become weak and brittle when exposed to sunlight for prolonged periods. Biodegradable plastics are made from cornstarch, so bacteria and other organisms eat away at the plastic, breaking it up into smaller pieces. However, neither of these however solves the problem of plastic in the oceans since they are only broken into smaller pieces; thus,

This plastic ring, could be from a milk container got stuck around this turtle when it was a baby.The turtle could not do anything to get out of it, so its body grew around it.

The remnants of a Laysan Albatross chick which was fed plastic by its parents resulting in death

creating an even more dangerous situation for the animals.

Perhaps the most effective method right now for solving the persistent plastic problem is beach cleaning. Coastal cleanups assemble volunteers to collect trash that has washed up on the beach, or has been left by beachgoers to be carried out by the surf, and remove it from the marine cycle.

Since the crisis was deteriorating, there has been several attempts to clean up the mess. In April 2008, Richard Sundance Owen, a building contractor and scuba dive instructor, formed the Environmental Cleanup Coalition (ECC) to address the issue of pollution in the North Pacific. ECC is collaborating with other groups to come up with methods to safely remove plastic and persistent organic pollutants from the oceans.

The JUNK raft project was a trans-Pacific sailing voyage from June to August 2008, to highlight the plastic in the patch, organized by the Algalita Marine Research Foundation. Meanwhile, launched in March 2009, project Kaisei aims to study and cleanup the garbage patch. In August 2009, two vessels from the project, the New Horizon and the Kaisei ships, embarked on a voyage to research the patch and determine the feasibility of a commercial scale collection and recycling operation.

Moreover, the SEAPLEX expedition, a group of graduate students from the Scripps Institution of Oceanography, spent nineteen days on the ocean researching the garbage patch and its effects on marine life. They gathered samples and spread awareness of the patch; two essential steps to the beginning of the clean-up process.

What Can We Do?

All this trash had to come from somewhere, and we humans are the only ones who use all this junk. By throwing plastic bottles or other garbage on the ground or in the water, we are killing our environment and destroying biodiversity. Fish, birds and animals mistake this plastic trash for food. This trash enters their bodies and suffocates them, or messes up their digestive system to say the least.

We can participate in saving the environment and maintaining biodiversity by practicing a few conscious habits:

- Avoid excessive packaging when deciding on purchases or look for alternative materials;
- Use paper bags, glass bottles, milk and juice in cardboard boxes;
- Recycle garbage;
- Educate others enhancing "voluntary compliance through awareness"; or
- Get involved! Start a coastal cleanup in your own area.

Glossary

1. Gyre: a term referring to any type of vortex in the air or sea, even man-made; it is most commonly used to refer to major ocean systems. An oceanic gyre is any large-scale system of rotating ocean currents, particularly those involved with large wind movements.

2. Bisphenol A: an organic compound with two phenol functional groups; it is a building block of several plastics and plastic additives.

3. Polystyrene: one of the most widely used kinds of plastic. It is an aromatic polymer made from the aromatic monomer styrene; a liquid hydrocarbon that is commercially manufactured from petroleum by the chemical industry.

4. Photodegradation: degradation of photodegradable molecules caused by absorption of photons, particularly wavelengths found in sunlight, such as infrared radiation, visible light and ultraviolet light.

The theme of World Environment Day (WED) 2010 is "Biodiversity: Connecting with Nature". Why don't you make a life-changing decision and join us in the cause?

Biodiversity IN Egypt

By: Marwa Gaber, PSC Programs & Events Specialist
In collaboration with: Moataz Ibrahim, PSC Programs & Events Specialist

Egypt has been endowed with a unique variety of ecosystems and a corresponding variety of wildlife. Because of its generally dry hot climate and arid terrain, much of the fauna and flora is desert adapted and often hard to find.

Egyptians have utilized wildlife resources since ancient times. No other culture has left behind such detailed documentation of its wildlife. There are rock drawings dating back to prehistoric times, and the Pharaohs left us an abundance of wall paintings, reliefs and mummified animals. The records show wild animals being hunted for food and sport, kept as pets and worshiped as gods. The Ancient Egyptians understood and appreciated the animals that were integral to their culture and way of life.

In modern times, since the passage of the relevant law 102 of 1983, twenty-seven protected areas have been declared in Egypt. The Protected Area Network (PAN) represents most of the habitats and ecosystems of Egypt. However, there are other important hotspots, which will be included in the future. Plans are in place to increase the number of Protectorates to 40 and the land area covered to 17% by the year 2017. Recently the Northern Red Sea Islands; Umm el-Dabadib and Gilf Kebir, have been added to Egypt's PAN.

Biodiversity, outstanding landscapes and geological formations are all included in PAN. Four protected areas have been designated for their geological significance and unique landscapes, notably the White Desert. Cultural heritage in every part of Egypt, also receives high consideration. Local people and their cultures, together with potential utility for eco-tourism are also important aspects of the protected areas.

Much effort has been invested in the management of protected areas, so that they fulfill their objectives. Many of the sites now have effective management plans, infrastructure, and equipment and are run by professional staff.

As Egypt enters the new millennium, the problems that face its environment and natural heritage are becoming more and more challenging. With the increase in the Egyptian population (now almost 77 million), pressure on natural resources is greater than ever before. Egypt is not different from perhaps the majority of countries in the world, which face similar challenges, but certain climatic and geographic factors (e.g. extreme aridity) probably make the challenge greater.

Biodiversity: A Long Evolutionary Road!

Year 1953: The Double Helix

Deoxyribonucleic acid (DNA) is the most important molecule of our time. In 1951, **James Watson** and **Francis Crick** worked together on the structure of DNA; they deduced it using one chemical clue and the method of X-ray diffraction.

DNA is too small for its structure to be observed directly; X-ray diffraction is an indirect method of working out the structure of such very small entities. The chemical clue came from a rule that had been noticed by **Erwin Chargaff**. DNA contains four kinds of subunits, symbolized by the letters A, C, G and T; Chargaff discovered that the amount of C equals the amount of G; and the amount of A equals the amount of T. This suggested to Watson and Crick that DNA has two strands, with G in one strand bound to C in the other; and A bound to T. X-ray diffraction showed them that the strands had a helical shape; DNA is a double helix.

This DNA structure suggested how the molecule could be reproduced by unwinding the strands and using one strand as a master-copy to produce new strands. It also suggested that DNA could contain biological information with the sequence represented by the letters A, C, G and T; setting a code, which was cracked within a decade or so setting the stage for modern molecular genetics.

Year 1969: Five Kingdoms of Life

Historically, life forms were categorized as either animal or plant. Biologists encountered some creatures, such as mushrooms, that violated the distinction, but they forced them into one group or the other. Mushrooms are fungi, but until recently, biologists classed fungi as plants; more accurately as "plants that do not photosynthesize".

Then there were microbes; some microbes could photosynthesize so they were defined as algae and grouped with plants; while others seemed to be more like animals so they were defined as protozoa and grouped with animals. However, in the 19th century, biologists discovered bacteria, even smaller microbes, but no one managed to define these as either animals or plants.

The old notion of dividing life forms into either animal or plant was finally laid to rest in 1969 when American ecologist, **Robert Whittaker**, proposed his five-kingdom classification: animals, plants, fungi, protists and bacteria. The first four are "eukaryotes"; they are cells; one cell in the case of protists; with a distinct nucleus. Bacteria are "prokaryotes"; their single cell has no distinct nucleus.

Year 1996: Dolly the Cloned Sheep

On 5 July 1996, a very special lamb was born in the small village of Roslin, near Edinburgh. "Dolly" had been cloned from a single cell from the udder of a six-year-old ewe. Dolly was unique because she was created from an adult cell; instead of having a mother and a father and inheriting half her genes from each parent, she was the genetic double of the unknown ewe that donated the udder cell. What is astonishing about Dolly is that the reprogramming of the genes in the donor nucleus was involved; that is, creating Dolly involved persuading the gene pattern in an udder cell to revert to that of the embryonic state.

Year 2000: Human Genome Sequence

On 26 June 2000, the completion of the "working draft" of the human genome was announced several years ahead of target; the draft was completed in 2003.

Every cell of every living organism contains a copy of its instruction manual, the genome, divided between 23 pairs of chromosomes and written in a four-lettered (A, C, T and G) chemical code of DNA. The mapping of the genome makes it easier to find genes.

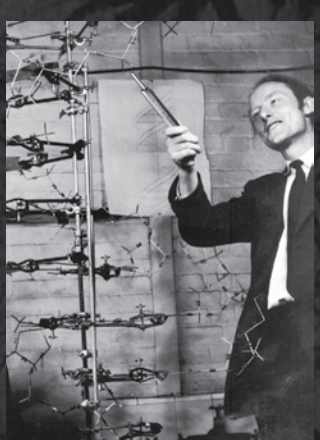
2010 International Year of Biodiversity

Biodiversity is life
Biodiversity is our life

The URL is: http://www.cbd.int/2010/welcome/

It looked as if there are 30,000 or so genes, accounting for just around two per cent of the entire genome. Mutations that lead to disease have already been discovered in around 1,100 genes, such as those responsible for Huntington's disease, cystic fibrosis and inherited breast cancer. Many more are now being discovered, accelerating the pace of research into common diseases with a genetic basis, such as cancer, heart disease, diabetes and asthma. The sequence itself contains vital clues to human evolutionary history.

Completed in 2003, the Human Genome Project (HGP) was a 13-year project, the goals of which were to identify all the approximately 20,000-25,000 genes in human DNA; determine the sequences of the 3 billion chemical base pairs that make up human DNA; store this information in databases; improve tools for data analysis; transfer related technologies to the private sector, and address the Ethical, Legal, and Social Issues (ELSI) that may arise from the project.



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Edited by:
Maissa Azab
PSC Publications Coordinator

Ingy Hafez
PSC Publications Specialist

For more information and reservation, please contact:
PSC Administrator
planetarium@bibalex.org
ALEXploratorium@bibalex.org
TEL:+203 4839999
EXT: 2350, 2351
FAX: +203 4820464

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