VIDU 22-1-2

Editorial

'Vidurava' is the science magazine of the National Science Foundation. Our objective is to disseminate scientific information to the public, particularly to school children. Yet, merely imparting scientific knowledge is not the sole aim. We endeavor to go beyond.

The intention of the National Science Foundation, and its journal *'Vidurava'*, is to build a nation empowered to think scientifically. Only if you develop the habit of scientific thinking, you will apply the advances of science for the benefit of the society.

Getting accustomed to think scientifically is far more difficult than just memorizing scientific principles and facts. What is scientific thinking? Making decisions based on hard evidence that can be proved beyond doubt, rather than on rumors, suspicions, beliefs and hearsay is what scientific thinking is all about. A scientifically thinking person may have to go against his or her own beliefs, even against the populist view, to think along proven scientific concepts to arrive at the right conclusion.

There is no permanency in science. Science will not hesitate to take up a new concept if the alternate view is proven beyond doubt, even if it is against a widely accepted, time-honored concept. It will do so, provided the new concept withstands robust scientific reasoning based on proven facts. That is the scientific method. That is the strength of science.

Mankind has progressed so far, because there were people who were not afraid to think scientifically against all odds. They are the people whom we today recognize as great scientists.

Our joy is to see you, the reader of *'Vidurava'*, becoming a scientific thinker, one who is skilled and courageous to think scientifically and have the strength to seek the truth. In fact, scientific thinking is a voyage seeking the truth. The scientist embraces the truth and rejects the fallacy fearlessly.

If this edition of *'Vidurava'* would enrich your knowledge, deepen your understanding and entice you to think scientifically, we would consider our mission accomplished.

Thusitha Malalasekera

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HOBBIT newly found our tiny ancestor

When scientists discovered the hobbit remains, they thought it was the skeleton of a child. There was no record of human adults that were that small. The discovery of *Homo floresiensis* is considered one of the most spectacular discoveries in paleoanthropology.

The word hobbit reminds us of the tiny creatures that appeared in the famous novel, the Lord of the Ring. Hobbit became even more popular after the production of the award winning film based on one of the books in the series. However, this article is not to discuss about the imaginary hobbit, but to discuss the fossil skeletons of the miniature humans recently discovered. This discovery was done by Australian and Indonesian researchers in a cave in Flores, an island east of Bali, midway between Asia and Australia. The skeleton was named *Homo floresiensis* after the island where it was found.



Directions in human evolution

Paleoanthropologists (scientists who study human fossils), think that the modern humans and the modern apes have evolved into two different directions from a common ancestor who lived nearly five to six million years ago. The four modern apes, Gibbon, Orang-utan, Gorilla and Chimpanzees are considered as our closest relatives among other animals. The Chimpanzee shares 98.5% common genes with the modern man.

It has been identified that the hominid fossils belong to two difference Genera. The earlier Genus was named *Australopithecus* (Southern man) because the first discovered fossil was found in the southern part of Africa. Even these early hominids expressed three important characteristics that distinguished it from apes.

These are

1. Small canine teeth
2. Bipedal walking (walking on two feet)
3. Gradually increasing size of the brain

The most popular fossil belonged to the Genus *Australopithecus* was the female fossil Lucy, discovered in Ethiopia in 1974.

The Genus *Homo,* to which the modern humans belong, evolved two and a half million years after the first emergence of the Genus *Australopithecus*. It is believed that the hominids belonging to both Genera, *Homo* and *Australopithecus,* must have shared the earth for at least half a million years. The significant difference between these two Genera is that the hominids of the Genus *Homo* had considerably larger brain size than the members of Genus *Australopithecus*.

The Genus *Australopithecus* was completely extinct nearly 1.6 million years ago. Subsequently, the Genus *Homo* evolved further to form the modern man. Scientists have identified three major eras of the Genus *Homo*. They are *Homo erectus, Homo sapiens neandertalensis* and *Homo sapiens sapiens,* the modern man.

Size of our ancestors

The height of the individuals of the Genus *Australopithecus* ranged from 4 feet to 5' 2". They showed erect posture and walked on two feet. Members of the Genus *Homo* have expressed those

features in a more advanced manner. Their height ranged from 5' to 5'6" on average.

Recently discovered tiny human species *Homo floresiensis*

Paleoanthropologists, and, most of the biologists in general, were surprised at the discovery of the fossils of a tiny human species that lived 13,000 years ago in South East Asia. Scientists believe, with this new finding, the story of human evolution will expand towards new dimensions. The first discovered fossil of *Homo floresiensis* was 1 meter (3 feet) in height and weighed 25 Kg. It was of a 30 year old female who lived 13,000 years ago! Subsequently, a large number of fossils belonging to the same species were excavated from the area.

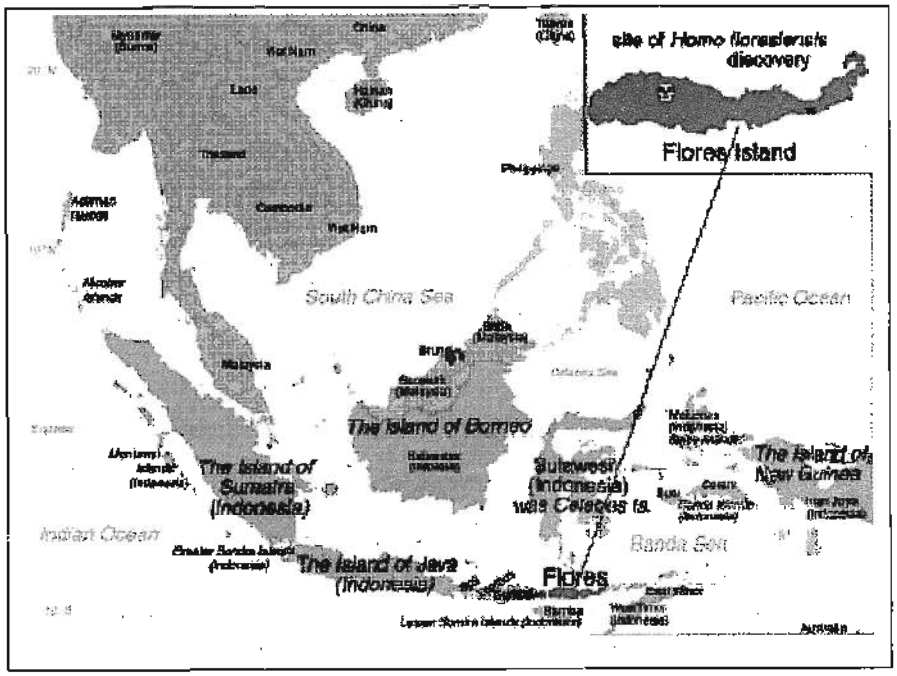
The same sediment where these fossils were found in Flores, contained a large number of stone tools and bones of dwarf elephants, giant rodents and Komodo dragons (lizards that can grow upto 10 feet and living even today). *Homo floresiensis* has been described as one of the most spectacular discoveries in paleoanthropology in half a century. It is, by far, the most extreme human ever been discovered!

"To find that as recently as, perhaps 13000 years ago, there was another upright bipedal, although a small brained creature, walking on the planet at the same time as modern humans is exiting and was unexpected" said Peter Brown, a paleoanthropologist at the University of New England, Australia. "It is totally unexpected" said Cris, the Director of the human origin programme at the Natural History Museum, London. To have tiny humans in the remote island of Flores is surprising enough.

Considering all the facts, the researches estimated that these tiny people may have lived in Flores from 95,000 years ago to at least 13,000 years ago. They base their theory on charred bones and stone tools found in the island. The blades, perforators, points and other cutting and chopping utensils were apparently used to hunt big animals.

Scientists believe that these tiny people had proportionately longer arms than us, sharply sloping forehead, hard and thicker eyebrow ridges but no chin. Though they did not look like modern humans, some of their behaviours may have been surprisingly close to humans.

The Flores people used fire in hearths for cooking and hunted *Stegodon,* a species of primitive dwarf elephant found on the island. Although small, the *Stegodon* still weighed around 1,000 Kg. They would have posed a significant challenge to a hunter of the size of a three-year-old human child. Hunting must have required joint communication and planning, the researchers say. Almost all the animal bones associated with the human artefacts are of smaller animals, suggesting that the tiny



humans selectively hunted the smaller *Stegodon*. The diet of the Flores people also included fish, frogs, snakes tortoise, birds and rodents.

This recent discovery shows that the Genus *Homo* varied and was more flexible in its ability to adapt than was previously thought. The genus Homo also includes modern humans, *Homo erectus, Homo habilis, Homo sapiens neandertalensis*. All of these are marked by relatively larger brain case, erect posture, opposable thumbs (thumb that can be placed opposite other fingers) and the ability to make tools. "*Homo floresiansis* is an addition to the short list of other human species that lived at the same time as modern humans. I think people will be surprised to learn that not so long ago, we were not alone" said Brown, co-author of the research programme.

Some researchers speculate (assume without hard evidence) that the hobbit and her peers evolved from a normal-size, island-hopping *Homo erectus* population that inhabited Flores around 849,000 years ago. Robert Foley of the Centre for Human Evolution, University of Cambridge says that the hobbit survived along side us for at least 30.000 years and we have not been very amiable eco-companions. The hobbits managed to do some extra ordinary things; manufacturing sophisticated stone tools, hunting pygmy elephants and crossing at least two water barriers to reach Flores from the main land, Asia. They did all these, equipped with a brain only 1/3 of the size of the modern human brain! Both these tiny humans and the pygmy elephants appear to have become extinct at the same time as a result of a major volcanic eruption.

Researchers are also anxious to investigate how and why the hobbits came to be so small. When scientists discovered the hobbit remains, they thought it was the skeleton of a child. There was no record of a human adult that small. The most likely explanation is, that over thousands of years, the species became smaller in body size. Dwarfing of mammals on islands is a well-known process and is seen worldwide.

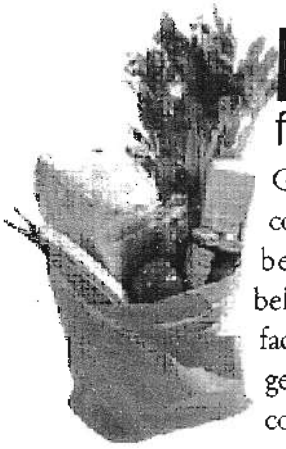
Islands often provides a limited food supply with few predators and few species competing for the same environmental niche. Survival would depend on minimizing daily requirements. However, there is no absolute proof that this is what happened with our tiny ancestor.

This discovery shows us how much we still have to learn about human evolution, particularly in Southeast Asia.

Jayantha Wattavidanage



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NUTRITION
food for thought

Good health does not always come easily. Health is an interaction between environmental, behavioural, social, and genetic factors. Some of these, for example genetic influences, are beyond our control. Yet, there are many ways, we can ensure good health through the choices we make in our daily living. One such thing is paying attention to what we eat. Food not only sustains us, but is a source of pleasure, a reflection of our rich social values and cultural heritage.

Sri Lanka is undergoing a period of changing pattern of nutrition. This burdens us with two problems. Malnutrion can either be under nutrition or over nutrition. Under nutrition remains a problem in several parts of the world, particularly in Africa, but in Sri Lanka as well. A recent problem we are facing is over eating, Too many calories are consumed over and above the required amount for our activity levels. Along with this, an imbalance in the consumption of nutrients occurs..

Under Nutrition



Under nutrition is known as Protein-energy malnutrition (PEM). Children are the usual victims. Physical and intellectual performances are impaired in under nourished children. Nutrition surveys in Sri Lanka in the past four decades indicate a considerable decline of under nutrition. The proportion of underweight children below five years of age reduced from 57.3% in 1975 to 29% in 2000 (Figure 1). Even moderate under nutrition can have lasting effects on children's brain development and school performance. Chronically undernourished (stunted) children are poor achievers, especially in language abilities.. Skipping breakfast is one of the common causes for the under nutrition among school children. This can impair child's performance in problem-solving tasks as well.

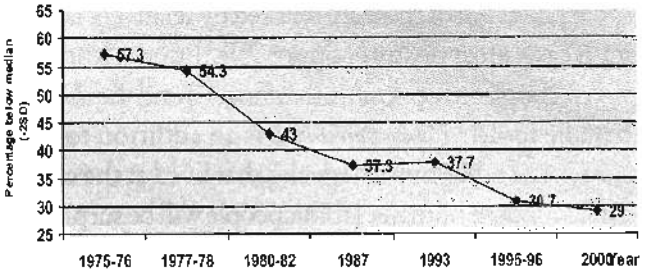
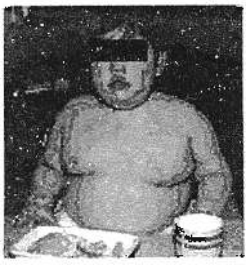


Figure - 1
Decline in prevalence of under nutrition among Sri Lankan children

Over weightness (obesity) a global problem



At the opposite end of the scale of nutritional problems is the over weightness. Obesity is increasing in epidemic proportions world wide, yet remains a neglected public health problem. Paradoxically, both under nutrition and over nutrition can exist at the same time. Sri Lanka is no exception to this situation. The proportion of overweight adolescence (10 – 19 years) and adult females over 18 years are shown in the Figure 2. In the

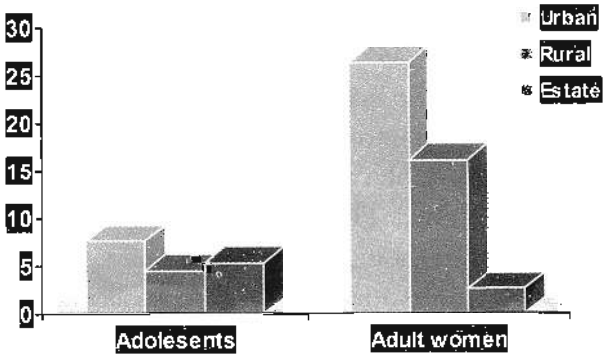


Figure - 2
Obesity among 10-18 year age group and among over 18 females in estate, rural and urban areas

urban areas about 8% of adolescents and 25% of adult females are obese. There are more obese chidren and women in urban areas when compared to estate and rural areas. The reason for obestity is too much of energy intake and too little burning of calories because of lack of exercise. If immediate action is not taken, millions will suffer from a variety of serious illnesses caused by obesity.

Health problems associated with over weightness

It is well known that diabetes, high blood pressure, high blood cholesterol levels, coronary heart diseases, certain type of cancers and strokes are linked to obesity. World wide increase in the numbers of diabetes, high blood pressure and coronary heart disease seen today has also been linked to increasing trends in obesity. In contrast, there is a reduction in numbers of vitamin deficiencies.

Micro nutrient deficiencies

Micronutrients are substances we need in very small or micro quantities. These substances are the 'magic wands' that are essential to produce enzymes, hormones, to drive body metabolism and to support growth and development. Even though the requirement is small, consequences of deficiency could be severe. Deficiency of micronutrients is a public health problem even in Sri Lanka, mostly affecting the children, pregnant mothers and those with low income levels. Iodine, vitamin A and iron are some of the most important micronutrients. The commonest micronutrient deficiency in Sri Lanka is iron deficiency. Iron deficiency hampers the body's ability to produce haemoglobin, which is needed to carry oxygen in the blood. Iron deficiency leads to anaemia. Anaemic people fatigue easilty, have a shorter attention span, reduced work capacity, lowered resistance to infection and even impaired intellectual performance. Deficiency of iodine, another micronutrient, causes goitre and deficiency in thyroxine hormone. Vitamin A deficiency is a leading cause of blindness in the world.

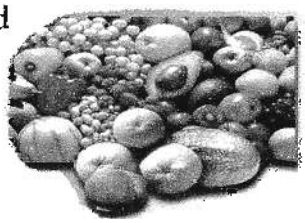
Good health does not always come easily. there are many ways. We can ensure good health through the choices we make in our daily living. One such thing is paying attention to what we eat.

Healthy eating guidelines

1. Eat a variety of foods everyday
2. Balance the food you eat with physical activity – maintain or improve your weight
3. Choose a diet with plenty of grain products, vegetables and fruits
4. Choose a diet low in fat
5. Choose a diet less in sugars
6. Choose a diet moderate in salt and sodium.

Antioxidants

Antioxidants are chemical compounds that protect the tissue from oxygen free radicals released in chemical reactions. Four nutrients are identified as antioxidants. These are beta carotene (a precursor Vitamin A), Vitamin C, Vitamin E and selenium. Antioxidants help to prevent cancer, thickening of blood vessels (arteriosclerosis), cataract and aging. Increasing your daily intake of fruits and vegetables to a minimum of 5 servings a day helps to keep up your antioxidants state (young for ever !!)



Unsafe weight-loss methods

With the increasing problem of obesity, it has now become a fashion among young people to practice unsafe weight-loss methods to lose weight fast. Deliberately restricting food intake drastically over a long period can lead to poor growth and delayed sexual development. One of the dangers of unsafe weight-loss methods is developing *eating disorders*. Children and adolescents (and their parents too) should pay attention to maintaining a healthy weight by practicing healthy eating ways.

Eating disorders

There are two main eating disorders, i.e. *anorexia nervosa* and *bulimia*. Anorexia nervosa is a psyhogological disorder, mainly in young women, who believe they are fat, have a fear of becoming obese and have severe weight loss because of refusal to eat. In bulimia, episodic binge eating is followed by feelings of guilt, depression, and self-condemnation. It is often associated with measures taken to prevent weight gain, such as self-induced vomiting, use of laxatives, dieting, or fasting. Adolescents who have eating disorders tend to have lower self-esteem, feelings of inadequacy, anxiety, depression and moodiness.



Distorted body image

In summary, it is important to launch an urgent effort to address the double burden of diseases (namely under nourishment and obesity) in Sri Lanka. A healthy diet should be recommended with defined limits of caloric and fat intakes. It is even more important for children to follow healthy eating guidelines to prevent obesity and related health risks in adult life. An effort should be diverted to increase physical activity from early childhood.

Renuka Jayatissa

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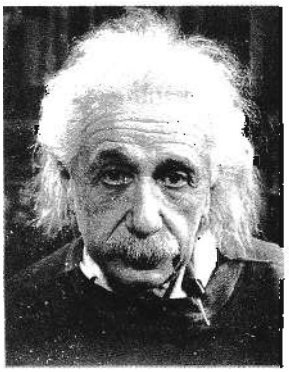
EINSTEIN & THE YEAR 2005

The year 2005 is a year of celebration for the scientists. In 1905, Albert Einstein, the great physicist, published a series of scientific papers that changed the history of mankind. To mark the 100th anniversary of this 'miraculous year', the United Nations designated 2005, The International Year of Physics.

Albert Einstein was born in 1879 in Wurttemberg, Germany. In 1905 he obtained his doctorate (PhD). During the same year, at the age of 26, he published his most famous work that laid the foundation for three areas of modern physics, the theory of relativity, quantum theory and the theory of Brownian motion. His theories helped to understand the heat source of sun and stars and led to the development of nuclear power and 'creation' of matter and anitmatter in the laboratory. Einstein work on the theory of relativity, the famous equation $E=mc^2$, and understanding light as both a particle and a wave are legendary.

He took up academic posts as Professor at Prague, Berlin and later retired as the Professor of Theoretical Physics at the Princeton University, USA. He was awarded the Nobel Prize in 1921 in Physics for his services to Theoretical Physics, especially for his discovery of the law of the photoelectric effect.

Einstein died on April 18, 1955 in New Jersey as a US citizen.



"Things should be made as simple as possible, but not any simpler"

Albert Einstein

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Cover story

Impact of Changing Weather Patterns

Climate of Sri Lanka is tropical with monsoonal rainfall patterns. Since it is located in Asian monsoon region, it has a tropical monsoonal climate. Sri Lanka is located just south of the southern tip of Indian sub continent between 6° and 10° north of equator surrounded by the Indian Ocean having an aerial extent of about 65,625 square kilometers.

There is marked variation in climate due to the central highland region being surrounded by an extensive lowland area. The regional difference in temperature is due to the altitude. There is no temperature variation due to latitude. The mean monthly temperature differs slightly, depending on the seasonal movement of sun, with some influence exerted by the rainfall.

Keeping track of global warming, rising sea-level, air and water pollution and extreme weather events is necessary to achieve sustainable development. While no one can control the weather, accurate observations and predictions with a high accuracy and lead time can radically improve our chance of living in relative safety.

The mean annual rainfall in Sri Lanka varies from 900 to 6000 mm. The higher values are experienced on the western slopes of the central hill country (see figure 1). In the southwest of the island, the annual rainfall varies from 2500 to over 5000 mm. In the northwest and the southeast, the annual means are less than 1250 mm.

The island is influenced by two wind regimes. The southwest monsoon (summer monsoon) is from mid May to September, and the northeast monsoon (winter monsoon) is from December to February. The seasons in between these two monsoons are called the inter-monsoon seasons where the winds are light and variable.

The rainfall during the two inter-monsoon periods, March-April and October-November is mainly convectional.

Southwest Monsoon (May to September)
The Southwest quarter of the island receive 500 - 4000 mm of rain during this season, higher falls over the western slopes of the central hills).

Northeast Monsoon (December to February)
The eastern half of the island including Rakwana hills receives 500 - 2000 mm of rain during this season. The higher rainfalls are experienced over Rangala range of hills.

First Inter Monsoon period (March to April)
The rainfall is mainly convective and ranges from 5-30% of the annual rainfall. The higher contributions to total annual rainfall are from inland areas.

Second Inter-Monsoon Period (October to November)
The rainfall is fairly widespread and is mainly due to disturbances (low-pressure systems, depressions and cyclones) in the southwest Bay of Bengal and in the southeast Arabian Sea. These disturbances generally form on the ITCZ, which lies across the latitude of Sri Lanka during October and November. The rainfall varies from 17% to 51% of the annual total.

Weather Related Natural Disasters

Majority of natural disasters experienced in Sri Lanka are weather related. Some of these are cyclones, heavy rainfalls leading to floods and landslides, lightening, tornadoes, coastal inundation due to high sea waves and tsunami. The frequency of occurrence of some disasters is extremely rare.

Frequent	heavy rain and floods, landslides, lightning, tornadoes, droughts
Intermediate	cyclones and storm surges, coastal inundation
Rare	earthquakes, tsunami

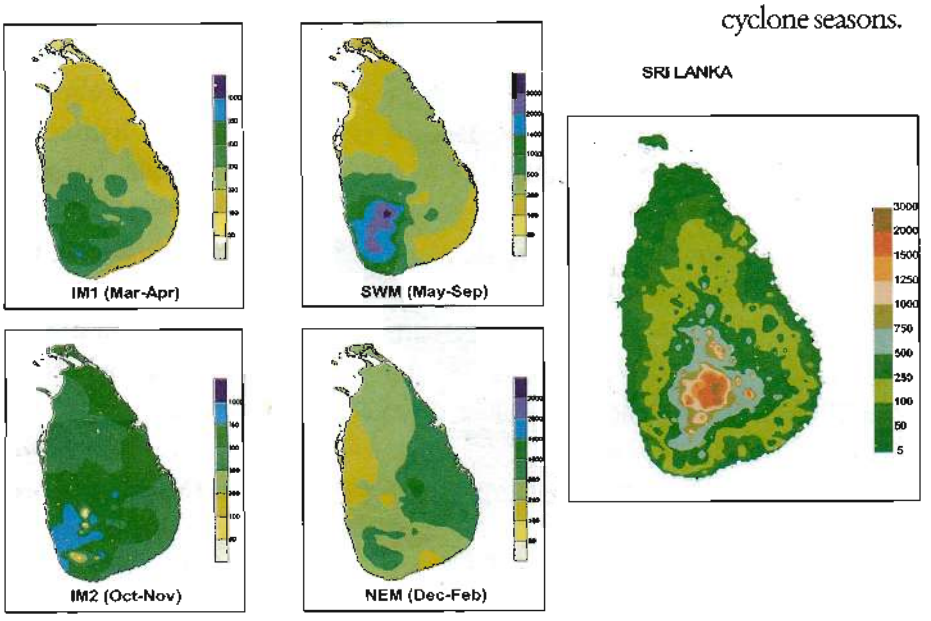


Figure 1 Seasonal rain fall patterns

Tropical Cyclones

Hurricanes, typhoons or intense vertical storms, no matter what you call them, tropical cyclones are the most devastating of all the natural hazards. Every year cyclones wreak havoc when they move inland from the sea, their fierce winds and heavy rainfall blazing a trail of destruction.

Tropical cyclones are areas of low atmospheric pressure that form over warm tropical or sub-tropical waters, eventually building up into huge, circulating mass of wind and thunderstorms up to hundreds of kilometers in diameter. Surface winds can reach speeds of 200 km an hour, although the 'eye' at the centre, usually just a few dozen kilometers in diameter, is relatively calm.

On average, about 80 storms or cyclones form over the globe annually. Of these, about 4 occur in the Bay of Bengal and one in the Arabian sea. Although a large number of cyclonic disturbances had either formed or passed close to Sri Lanka, only 15 cyclonic storms had crossed the coast during the period 1881 - 2001. Out of the 35 systems which crossed Sri Lanka during the above period, 26 systems had crossed the coast during November and December (see figure 2). Therefore in Sri Lanka, November - December is reckoned as the cyclone seasons.

The Department of Meteorology issues cyclone alert warning when a depression or a cyclonic storm is about 550 km off the coast. When the storm is 300 km off the coast a cyclone warning is issued every 6 hours. Point of probable landfall and likely areas to be affected are also given. When the tropical storm is 200 km off the coast and if the landfall is indicated, a bulletin is issued every 3 hours.

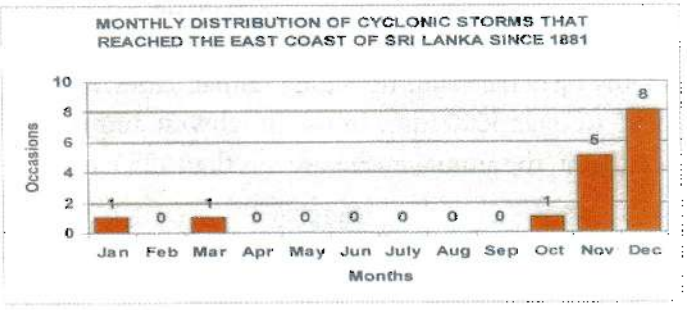
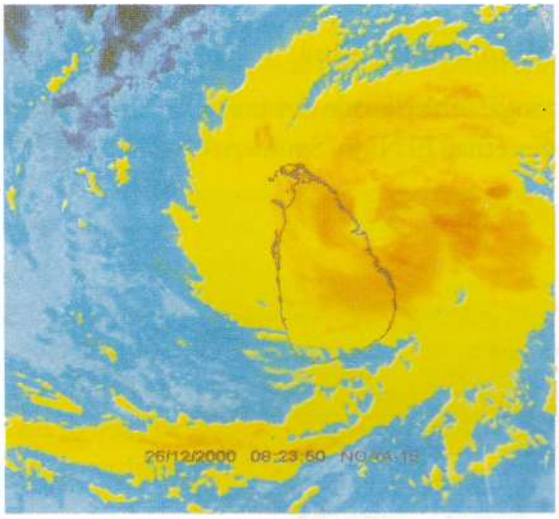


Figure 2 Cyclones that have hit Sri Lanka

Measures to limit the impact of tropical cyclones can range from community awareness campaigns on how to deal with disasters to building levees against flooding. All such measures are important, as they not only reduce the cost of disasters to the community, but also help save lives.



Trincomalee Cyclone 26.12.2000

Beyond a good early warning system, a preparedness plan should cover the protection of buildings, emergency shelter, secure and reliable communications, evacuation and transport arrangements. It should also include safety, security measures and coordination between various agencies. Getting the warnings out in time to a population aware of danger and poised to act makes a real contribution to a cyclone disaster mitigation system.

Storm Surges

Storm surges, a result of tropical cyclones, can be just as lethal as cyclones. If this 'wall of water' reaches land, sea water flows in with immense force washing away everything in their path. One of the most dramatic example on record was in 1970, when a massive storm surge left 300,000 people dead after it swept in over the coastal wetland of Bangladesh. A storm surge forms when tropical cyclones move over a continental shelf. A combination of strong onshore winds and low atmospheric pressure creates the surge-a giant dome of seawater some 60 to 80 kilometers across and 2 to 5 metres high. If the cyclone reaches the coast, the strong winds whip up the sea and push the dome of water inland, usually to extremely destrction. Providing timely early warning of storm surges and publicizing evacuation plans as widely as possible are both crucial to reducing risk. Early warning of surges will depend heavily on early warning of cyclones.

Thunderstorms and Tornadoes

Thunderstorms and tornadoes are considered most destructive weather systems during intermonsoon periods. These phenomena occur under specific conditions, where lower atmospheric wind changes the speed and direction vertically, with an optimal shear in a moist environment. All thunderstorms and tornadoes have the potential to produce lightning. The cloud to ground stroke is the most destructive and hazardous. General public should take precautionary measures during this period.

Floods

Flooding occurs when rainwater accumulates at a rate faster than soils can absorb it or rivers can carry it away. Floods come in all sorts of forms, from small flash floods to sheets of water covering huge areas of land, and can be triggered by severe thunderstorms, tornadoes, tropical cyclones and monsoons. In coastal areas, storm surges caused by tropical cyclones, tsunamis, or even rivers swollen by exceptionally high tides can cause flooding.

Forecasting floods can be tricky and depends on the type and nature of the phenomenon that triggers the flooding. For example, widespread flash floods are often started off by heavy rain falling in one area within a large area of lighter rain, to eveyone's confusion. Forecasting floods caused by the heavy rain or storm surges that can sweep inland as part of a tropical cyclone can also be a complex job.

To make predictions as accurate as possible, the National Hydrological Services and the National Meteorological Services should undertake flood forecasting based on quantitative precipitation forecasts.

Landslides and mudflows

Landslides happen when heavy rains send large amounts of earth, rock, sand and mud flowing swiftly down mountain slopes. This happens partcularly on slopes that are bare or burnt by forest or brush fires.

Mudflows and the coarser debri flows are wet, fast-moving landslides. They form when masses of loose, wet debris become unstable due to saturation from rainfall or an overflowing lake. Landslides and mudflows can bury, crush or carry away people, objects and even buildings. Landslide prone areas need highly effective disaster management strategies. Hazard maps are one of the first steps towards formulating such strategies. These are essential topographic maps showing potential level of danger from landslides.

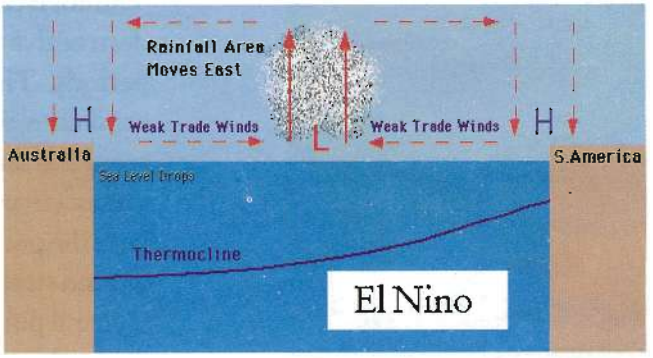
Drought

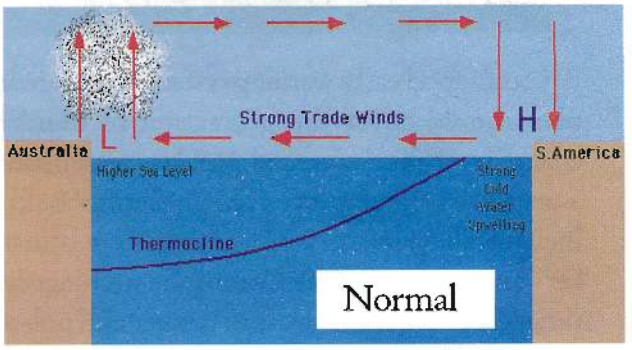
Drought, stands alone among other water related disasters. It is caused by too little water, not too much. Drought takes place over a relatively long time, not in few minutes or hours like other water related disasters. It can happen almost anywhere.

Drought is, in fact, a normal periodic feature of climate, the result of a natural reduction in precipitation over time. When rainfall becomes relatively scant or infrequent, the normal balance between precipitation and the evaporation process gets disrupted. Drought is the result. It can be highly destructive, particularly when accompanied by high temperature, strong winds and low relative humidity.

El Nino and La Nina

Among Earth's climatic variation, none is more dramatic in effect than El Nino/Southern Oscillation (ENSO). An El Nino strikes every three to seven years, when trade winds in the tropical parts of the Pacific Ocean weaken or reverse their usual route.





The winds then blow surface water warmed by the tropical Sun to the eastern Pacific Ocean and the equatorial west coast of South America. Rain follows the current, and eastern South America may then experience flooding,

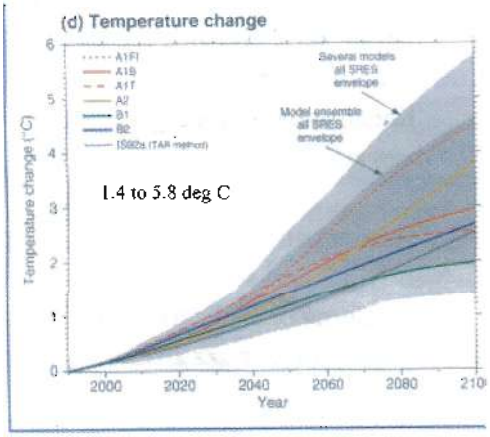


Drought in Hambanthota, 2001

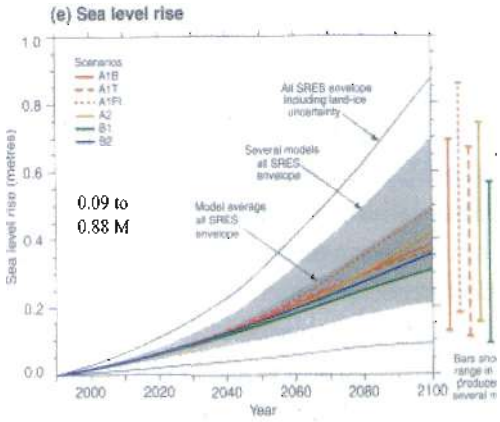
while Australia, southern Africa and Indonesia may have droughts. A La Nina events is the opposite, with warmer waters in the western Pacific and cooler waters off the west coast of South America. The weather brought by El Nino events is often so extreme that its prediction is now a top priority for National Meteorological and Hydrological Services around the world. Careful monitoring of the sea-surface temperatures of the Pacific Ocean enables prediction of El Nino and La Nina events and their impacts in all parts of the world up to several months ahead.

The Implication of Climate Change

Climate change is a huge challenge to the adapability of humans. Shifts in the global climate have triggered some of the extreme weather conditions we are now seeing. Even in a stable climate, the temperature, wind, cloudiness and precipitation are in a constantly changing state. Floods, droughts, storms, heat waves and cold snaps, as well as related events such as bush fires, avalanches and landslides, are all natural facets of climate variability. Impacts from above extreme events can be costly in both human and environmental terms. The IPCC's three-volume Third Assessment Report was finalized in early 2001. Its message is clear: intensive climate research and monitoring give scientists much greater confidence in their understanding of the causes and consequences of global warming. The Assessment Report presents a snapshot of what the earth will probably look like in the 21st century, when global warming of 1.4 - 5.8°C will influence weather patterns, water resources, the cycling of the seasons, ecosystems and extreme climate events. Even greater changes are expected in the more distant future.



The average sea level is predicted to rise by 9 to 88 cm by the year 2100. This could cause mainly by the thermal expansion of the upper layers of the ocean as they warm, with some contribution from melting glaciers. The uncertainty range is large, and changing ocean currents, local land movement and other factors will cause local and regional sea level rise much more or much less than the global average.



Effective Early Warning Systems

Keeping track of global warming, rising sea-level, air and water pollution, extreme weather events and other processes facing the world is necessary for achieving sustainable development. While no one can control the weather, accurate observations and predictions with a higher level of accuracy and lead time can radically improve people's chances of living in relative safety, and protecting precious natural resources. Millions of people worldwide owe their lives and livelihoods to effective early warning systems. People-centred early warning systems empower communities to prepare for and confront the power of natural hazards. They bring safety, security and peace of mind. Early warning systems provide resilience to natural hazards, and protect economic asserts and development gains. They help the society adapt to and defend against the uncertainties of climate change.

G.H.P. Dharmaratne

Mr. G.H.P. Dharmaratne (B.Sc, M.Sc, and Dip. Atmospheric Physics & Dynamics) is the Director General of the Department of Meteorology

Vidu 22-1-14

Little Known

Solitary Pollen Bees of Sri Lanka

Any one who has tasted bee honey, seen a beehive or experienced the painful sting of a bee will know about the honeybees. '*Meemessa*', '*Bambara*', '*Danduwel messa*' and '*Kanameemessa*' are the well-known honeybees of Sri Lanka. The term 'honeybee' is a general term that refers to those bees that collect nectar from flowers and store nectar as honey in the waxy hives they build. Honeybees live in large colonies and hence a hive would have several hundreds of worker bees and a single queen. The great majority of bees in the world are not honeybees but solitary-pollen bees. Unlike the honeybees the solitary-pollen bees do not store honey or build impressive hives nor do they live as a colony. They are termed solitary-pollen bees because they nest singly or in small groups. Individual bees are either male or female bees with no queen bees or workers. Female bees gather pollen to feed themselves and provision their nests to feed their young. Hence, they are simply known as solitary-pollen bees.

The great majority of bees in the world are not honeybees, but solitary-pollen bees. Unlike honeybees, these do not store honey or build impressive hives. Nor do they live in colonies. There are about 17,000 species of solitary pollen bees in the world, twice the number of species of birds and five times the number of mammals! Though they have no role in honey production, they are valued for their silent service as pollinators.



Blue-green metallic *Ceratina*, one of the most colourful solitary-pollen bee in Sri Lanka resting on a *Crotolaria* flower

Since prehistoric times, primitive man has obtained honey from feral honeybee colonies. With the dawn of agriculture, honeybees were domesticated and managed by man. Two different species of honeybees are domesticated in different parts of the world. In Asia and Southeast Asia, as in Sri Lanka and India, the domesticated honeybee is scientifically called *Apis cerana* (the Asian honeybee). The honey bee species in the Near East, Africa, Europe and America is called *Apis mellifera* (the European honeybee). In Sri Lanka, apart from the well-known domesticated 'Meemessa' (*Apis cerana*) there are three other honeybees that build hives and store honey. They are *Apis dorsata* ('Bambara'), *A. florea* ('Danduwelmessa') and *Trigona iridipennis* ('Kanameemessa'). All of them build hives and live as a colony. Their hives are seen on trees, buildings and on rocks. In the colony, is a single queen (the only reproductive female), a few males (drones) and a large number of workers. These worker bees are females that are sterile and their egg-laying structure (ovipositor) is transformed into a sting. T. *iridipennis* or 'Kanameemessa' is of special interest among our honey bees as they are stingless species.

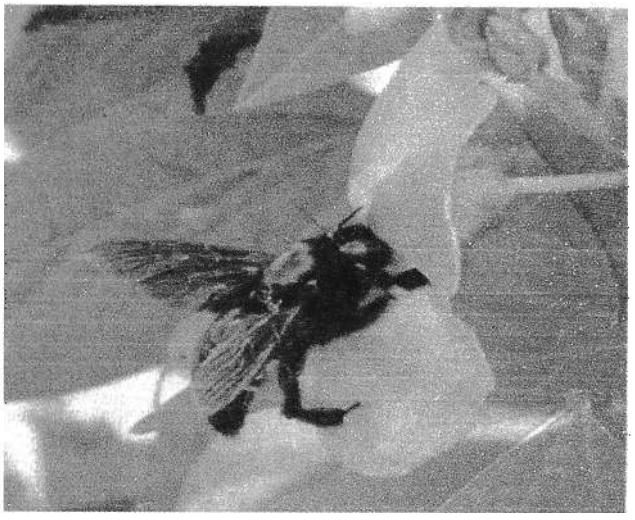
The role of honeybees as pollinators of flowers resulting in fruits and seeds has been valued ever since the beginning of civilization. But, honeybees are not the only bees that buzz around in your garden and bring

about pollination by delivering pollen from one flower to another. The solitary-pollen bees conduct themselves in the same manner but are silent and out numbered by the worker honeybees. Moreover, the solitary-pollen bees are valued only for their silent service as pollinators as they have no role in honey production. These less-known solitary-pollen bees are represented by about 17,000 species in the world. Thus, the solitary-pollen bees constitute about 80% of the bees known so far. This number corresponds to twice the number of birds (9,040 spp.) and five times the number of mammals (4,000 spp.) in the world.

According to scientific classification all the honeybees of the world belong to a single family, Apidae. All other bees, the solitary-pollen bees of the world are grouped into 7 families. Of these 7 families, only 4 families of solitary-pollen bees are represented in Sri Lanka. Anthophoridae, Colletidae, Halictidae and Megachilidae are the families of solitary-pollen bees present in Sri Lanka. Unlike the honeybees of Sri Lanka, the pollen bees have not been well studied. During a recent study conducted over a period of 3 years, 137 species of solitary-pollen bees belonging to 35 genera have been identified. They have been collected from several areas of the country and on a variety of wild and cultivated crops. Although the solitary-pollen bees are far more numerous in terms of number of species, the honeybees appear to be far more numerous in terms of number of individuals of the worker cast that live in large colonies. One has only to observe closely and quietly a patch of flowering plants on a sunny morning and these busy solitary-pollen bees are sure to be there along with the honeybees. The males of solitary-pollen bees rest on plants or scout around flowers and nest sites, to find a passing female to mate!

Bees, among insects are unique in that they bear specialized, branched hairs on their body and legs that enable them to carry pollen. In honeybees, these hairs are found on the last pair of legs and are formed into a pollen basket into which pollen is collected. In solitary-pollen bees, pollen carrying hairs are found either on the under side of the body, on legs and around the waist. Thus, different families of pollen bees carry pollen on different parts of their body. With each visit to a flower, their bodies get dusted with pollen.

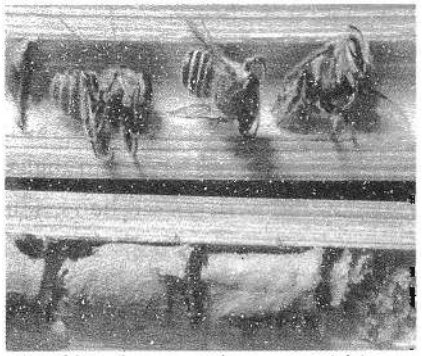
Solitary-pollen bees come in a variety of sizes and colours. Most of our solitary-pollen bees are small to medium sized and black in colour. However, the hairs, spots and stripes on their body may take all the colours of the rainbow. The blue-green metallic *Ceratina* is one of the most colourful of our solitary-pollen bees and so is the fast flying blue striped *Amegilla*. *Megachile* bees are black with orange/yellow/white/black hairs on different parts of the body. The largest of the solitary-pollen bees in Sri Lanka are the carpenter bees, locally known as 'Ambalanpaluwa' and scientifically as *Xylocopa*. Villagers consider them as beetles due to their hardened body, dark colour and large size. There are 13 different species of carpenter bees in Sri Lanka. They buzz while



The largest solitary pollen bee, the Carpenter bee, is often mistaken as a beetle.

flying and alight on specific flowers. They may look fearful while on flight but they are very attractive, as their wings appear iridescent when held at certain angles. Some have their body covered with golden hairs. The yellow, orange or white colours on their body may give the impression that they are carrying pollen but it is the hairs on them that gives this appearance. Carpenter bees carry large loads of pollen on their legs. They nest in old structural timber, and hence, the name.

Solitary-pollen bees construct their nests in the ground, in hollows of plant stems or in old wood. Each female constructs a nest by excavating a tunnel or gallery, which consists of a series of cells. In each cell, a ball of pollen is placed, and an egg is laid, after which, the cell is sealed. In a solitary-pollen bee nest only a few eggs are laid, unlike in honeybee hives where the queen lays hundreds of eggs. Ground nesting bees prefer to nest in bare sandy slopes where the morning sun falls. Only the opening to their nest, a very tiny hole in the soil with debris around it (similar to an ant hole), can be seen from outside. A closer look at these holes will take your eyes towards a small flying bee with a load of pollen on its legs and body. Wasps too nest in the ground but the female wasps do not carry pollen as their young are fed with spiders and caterpillars. The bee nest hole in the ground leads to a maze of branched galleries reaching deeper layers of soil. Finally, the galleries end in cells where eggs are laid and provisioned. In certain ground nesting solitary-pollen bees, large number of females make their nests close to each other forming 'bee villages'. Certain species of our ground nesting solitary-pollen bees are attracted to human sweat, hence they are commonly known as sweat bees. They are not known to sting under normal circumstances. The stem nesting solitary-pollen bees have specific preferences for the stem hole size (diameter) and they have been found to nest in cut stems of rose, *Gliricidia* and bamboo. A certain group of stem nesters, the *Megachile* bees (with 16 species in Sri Lanka) line the inside of the hollow stem with fresh leaves cut into circles from near by plants. Hence, they are commonly known as leaf cutter bees.



Leaf-lined *Megachile* bee nest within a bamboo-stem (spilt opened)

Other solitary-pollen bees such as *Braunsapis* and *Hylaeus* are very small bees that nest in tiny punctures found on wooden structures like window and door frames of buildings and fence-posts.

Certain species of solitary-pollen bees are of special significance as they are solely responsible for pollinating specific types of crops having a specialized flower structure. The flowers of the plant family Solanaceae that includes vegetables like brinjal, tomato, potato and chilly have their pollen tucked away in anthers. Their concealed pollen is released only when the pollen bearing anthers are vibrated. Bees adapted to obtain pollen from such flowers hang on to the anthers with their tiny legs and vibrate their body enabling pollen to be released from the anthers. Due to the buzzing noise produced during vibration of the body, these bees are referred to as buzz pollinators. Certain species of the genera *Xylocopa*, *Lasioglossum*, *Amegilla*, *Patellapis* and *Hoplonomia* have been observed to buzz pollinate. Vegetables like ladies fingers ('Bandakka') have flowers bearing unusually large pollen grains and only the solitary-pollen bees that have sparsely set hairs could carry such pollen. *Lithurgus* is one such bee. These are some of the pollen specialist bees but the great majority of solitary- pollen bees are generalists visiting a variety of flowering plants for pollen and nectar. Thus, solitary-pollen bees, although not conspicuous, are silent pollinators of many crops and plants. Not all solitary-pollen bees are interested in collecting pollen for feeding their young. Among them there are cuckoo bees that lay their eggs in provisioned nests of other bees. *Coelioxys*, *Euaspis*, *Thyreus*, *Sphecodes* and *Nomada* are such parasitic bees. They lack pollen-carrying hairs and hence resemble wasps.



Lasioglossum bee buzz at anthers of *Osbeckia* ('bowitia') flowers

Although solitary- pollen bees are little known, they constitute the great majority of bee species. Unfortunately the life of solitary-pollen bees and honeybees are at risk due to modern agricultural practices and urbanization that destroy their nesting sites and foraging plants. The agro-chemicals affect the foraging

bees and their young. Considering the economic and commercial values of solitary-pollen bees as pollinators, they are vital members in the natural and cultivated habitats and deserve protection and encouragement.

Inoka Karunaratne

The information given in this article relating to bees of Sri Lanka was collected during a recent study funded by a Research Grant from the National Science Foundation of Sri Lanka.



Dr Inoka Karunaratne (B.Sc, PhD) is a Senior Lecturer in the Department of Zoology, University of Peradeniya.

Pollen bees, pollen bees,
People will ask, "What are these?"
We can't take their honey,
We can't use their wax.
All they've got going are pollination attacks.

Roll in that pollen, bees.
Shake out that pollen, bees.
Stuff that pollen
Into neat hind leg packs!

In your fuzz, as you buzz.
Dust it all around the world from your knees.
Golden grains. . ..
They won't make us sneeze,
When they're on pollen bees!



Dr. Suzanne Batra
A bee specialist, USA

In a lighter vein . . . . .

Murphy's laws on scientific experiments

1) In any field of scientific endeavor, anything that can go wrong, will.
2) If the possibility exists of several things going wrong, the one that will go wrong is the one that will do the most damage.
3) Everything will go wrong at one time. That time is always when you least expect it.
4) If nothing can go wrong, something will.
5) Nothing is as easy as it looks.
6) Everything takes longer than you think.
7) Left to themselves, things always go from bad to worse.
8) Nature always sides with the hidden flaw.
9) If everything seems to be going well, you have obviously overlooked something.
10) If in any problem you find yourself doing an immense amount of work, the answer can be obtained by simple inspection!

Source: adapted from iNet
http://www.xs4all.nl/~jcdverha/scijokes/

Do you know?

Why do we age.....

The answer may lie in our cells. Actually cells senesce (the process of becoming old) at different rates among different organisms and among different people. Geneticists have recently been able to isolate genes that make certain cells to act differently, either age faster, or slowly. Scientists are looking for a senescent factor that may turn out to be the reason why cells stop dividing, and thus, age. Several theories have been proposed. The 'damage theory' assumes that ageing is the result of damage to tissues caused by free radicals. Free radicals are atoms, ions and molecules that contain an unpaired electron. They are generated during metabolic processes. Thsee are implicated in age-related diseases such as cancers as well. Longer-lived species seem to have lower rates of free radical generation than do species with shorter life spans. The 'programmed theory' suggests that the senescent factor is genetically regulated. Many scientists believe that we are programmed to have a fixed, maximum life span of between 120-130 yrs!

VIDU 22-1-18

Towards an IT Based Society

Computers have moved into every corner of our daily lives. They are all around us. You use computers in everyday life, at the supermarket, at the bank and even when you answer your mobile phone. You know more about computers than you think you do. The beginnings of computer literacy are already noticeable.

The remarkable thing about the computer industry is that, so much has happened in so short a time. We have got ahead of four generations of technology in about 56 years. The first three computer 'generations' are fixed to three technological developments: the vacuum tube, the transistors, and the integrated circuit. Each has drastically changed the nature of computers.

Through the 1970s computers gained dramatically in speed, reliability, and storage capacity. Entry into the fourth generation was evolutionary rather than revolutionary. The fourth generation was, in fact, an extension of third generation technology. Announcing first personal computer 1981, IBM PC became the industry standard machine. The IBM machine included innovations, such as an 80-character-screen line, a full uppercase and lowercase keyboard, and the possibility of adding external peripherals and internal components such as memory.

As we evolve from an industrial society to an information society, our jobs are changing from physical to mental labor. Just as people moveed physically from farms to factories in the industrial age, today, people are shifting from muscle power to brainpower in a new, computer-based Society.

Computers have moved into every corner of our daily lives. Whether or not you personally know anything about it, you use computers, when you make a bank withdrawal, when you buy groceries at the supermarket, and even when you answer your mobile phone. In the homes, people use computer technology for writing letters, keeping track of bank accounts, communicating with friends, accessing knowledge, purchasing goods and for entertainment. Without knowing about computers, it will not be easy to get through the rest of your life in the new millenium

Every computer has three fundamental characteristics that make it useful. The three fundamental characteristics are, speed, reliability and storage. Computers provided the processing **speed** essential to our society. The quick service that we have come to expect for bank withdrawals, hospital bills, telephone calls, and travel reservations, to name just a few, is made possible by computers. Business depends on the speedy processing that computers provide for everything from balancing ledgers to designing products. Computers are extremely **reliable**. Of course you might not think so from some of the stories you may have heard about computer errors. However, most errors supposedly made by computers are really human errors. Computer systems can **store** tremendous amount of data which can be located and retrieved efficiently. The capability to store volumes of data is especially important in an information society. These three characteristics, speed, reliability and storage capability, have the following by products.

When computers move into business offices, managers expect increased **productivity** as workers learn to use computers to do their jobs better and faster. Furthermore, jobs such as punching holes in metal or monitoring water levels can be more efficiently controlled by computers. To make decisions, managers need to take into account financial, geographical, and logistical factors. The computer helps decision makers

sort things out and make better choices. Because it improves productivity and aids decision-making, the computer helps us hold down the cost of labour, energy wastage, and paper work. As a result, computers help reduce the costs of goods and services in our economy.

Next, we look at some of the ways in which we use computers to make the workday more productive and our personal lives more rewarding. Most schools in the present society have computers available for use in the classroom, and some schools in developed countries require students to bring their own. Many educators prefer learning by 'doing'; rather than teaching in classroom, which is uniquely suited to the use of computers in education. Business people make bar graphs and pie charts to convey information in a graphical form, which has a deeper impact than using numbers alone. Architects use computer-generated graphics to experiment with possible exteriors and to give clients a visual walkthrough of proposed buildings. A new kind of artist has emerged, one who uses computers to express his or her own creativity.

Product from vegetables to magazines are packaged with barcodes that can be read by computer scanners at supermarket checkouts to determine the prices, while managing the inventory.

Computers operate behind the scenes too. Energy companies use computers to locate oil, coal, natural gas, and uranium. Electric companies use computers to monitors to record the amount of energy used each month in homes and businesses. Recent innovations in computerized law enforcement include national finger print files, a national file on the mode of operation of serial killers and the computer modeling of DNA. Which can be used to mach traces of hair, blood, or other evidence found at a crime scene to a suspect.

Computers speed up record keeping and allow banks to offer same-day services and even allow do-it-yourself banking over the phone and internet. Computers have helped to increase the cashless economy, enabling the widespread use of credit cards and instant credit checks by banks and retailers. Among other tasks, the government and other organizations use computers to forecast weather, manage vehicle parks, process immigrations, and collect taxes. People have computers in their homes, often justifying them as educational tools for their children. Personal computers are being used at home to keep records, write letters, through the internet.

Computers have paved the way for robots to take over many of the jobs that are too unpleasant or too dangerous for humans, such as opening packages that are believed to contain bombs. Robots are best known for their work in factories.

One of the most popular uses of computers today is communicating with other people who have computers. Computers give people the option of working at their homes without going to offices. An individual with a personal computer at home, can hook it up to a phone line or a cable and communicate with the computer at the office, to access data stored in another computer at a another location, or to send messages to colleagues. The most likely way for such a user to connect to another is via the Internet. A user needs software called a browser to access Web sites and other parts of the Internet. Many people, especially those associated with universities and government or organizations, have free access to the Internet.

Computers are all around us. You have interacted with computers in your everyday life, at the supermarket, your schools, in the library, and more. You know more about computers than you do. The beginnings of computer literacy are already noticeable.

S T Nandasara



Mr. S T Nandasara (B Dev, MCS, MACS, MBCS) is a Senior Lecturer at the Advanced Digital Media Centre, University of Colombo School of Computing

VIDU 22-1-20

PROTECTING THE OZONE LAYER

Where do we stand today?

WHAT IS OZONE (O_3)?

Ozone (O_3) is a naturally occurring gas made of a triple form of oxygen. Therefore, it can be considered as another form of oxygen. Relative proportion of ozone in the atmosphere is 0.000007% by volume as compared to 21% of oxygen. Ozone is not uniformly distributed in the atmosphere. More than 90% of it is found in the stratosphere 10 to 50 km above the earth's surface. The region in the stratosphere where ozone is concentrated is commonly known as the ozone layer. This ozone layer acts as a protective shield for the earth which filters harmful ultraviolet (UV) rays.

Formation of Ozone -

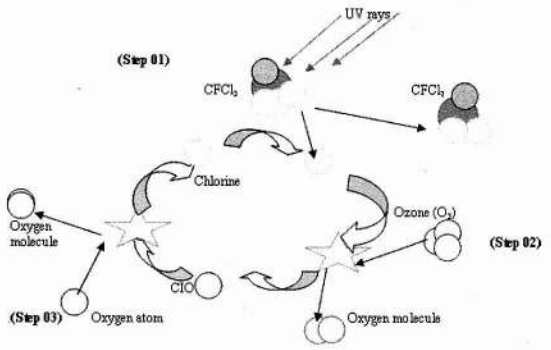
$O_2 + h\nu \quad O + O$ (1)

$O + O_2 \quad O_3$ (2)

UV radiation from the sun splits the oxygen molecule in to two oxygen atoms. A free oxygen atom then combines with an oxygen molecule and forms ozone (O_3) molecule. In the same way, with the help of UV radiation, O_3 molecule is broken down to form oxygen. In this natural process, two reactions take place and there is a dynamic equilibrium of ozone and oxygen in the atmosphere However, in mid 1970s it was discovered by the scientific community that man-made chemicals, which comprise of chlorine and bromine atoms in an organic form, are depleting the ozone layer.

Causes of ozone depletion

In late 1970s it was proved that the most commonly used Ozone Depleting Substances (ODS) are Chlorofluorocarbons (CFCs) and Halons, which are used in industries such as air conditioning, refrigeration and as a fire fighting agent. When these man made, non-reactive ODSs are released to the atmosphere, they slowly move up and reach the ozone layer in the stratosphere and are split by UV radiation from the sun. This process sets highly reactive chlorine and bromine atoms free. These chlorine and bromine atoms act as a destroying agent of ozone molecules i.e. ozone is broken in to oxygen and chlorine monoxide. This chlorine monoxide is very unstable and reacts with a free high-energy oxygen atom producing an oxygen molecule while releasing the chlorine atom again. The released chlorine atom goes after another ozone molecule and destroys it. By this way, a single chlorine atom can destroy up to 100,000 ozone molecules. The aforesaid chemical reaction is illustrated in Figure below.



Step 01- CFCs are broken down in to chlorine and dichlorofluoromethane by the UV rays.

Step 02 - Ozone molecules are broken down in to oxygen (O_2) and chlorine monoxide (ClO) by these chlorine atoms. This process reduces the ozone (O_3) in the stratosphere.

Step 03 - a free oxygen atom reacts with chlorine monoxide and a chlorine atom is set free. Repetition of this process gradually thins out the ozone layer.

Bromine radicals produced in the same way also act in a similar manner and destroy ozone, thining the ozone layer. Some chemical compounds like nitrous oxide (N_2O) and other nitrogen compounds also have a minute damaging affect on the ozone layer. The impact a chemical has on the ozone Layer is identified through the Ozone Depleting Potential (ODP). Trichlorofluoromethane (CFC11) and dichlorodifluoromethane (CFC12), which are widely used refrigerants, have an ODP of 1.0 and bromochlorodifluoromethane (halon 1211) has an ODP of 3.0. Therefore, it is evident that halon used as a fire fighting agent is more damaging to the ozone layer, when compared with CFCs. This weakening of the earth's protective shield, the ozone layer will cause health problems, environmental damages, and influence the global climate, and many other aspects directly threatening the life existence on planet Earth.

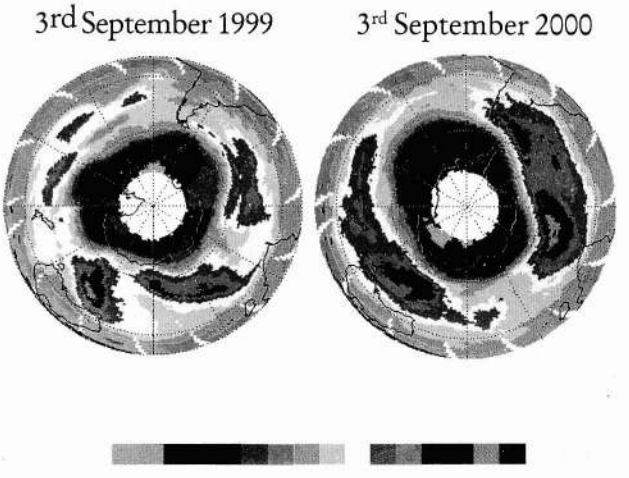
The ozone hole

What is referred to as the ozone hole is a thinning of the ozone layer, and not an actually visible hole. Due to the global circulation system, the ozone concentration in the equator is naturally low (around 150 Dobson Units) and the concentration in the polar regions are natural high (around 400 Dobson Units). The thinning of the ozone layer is prominent in the South Polar region. It has been observed that ozone concentration in the polar regions has dropped from around 400 Dobson units to 150 Dobson Units. This phenomenon is at its peak in the southern hemisphere spring and summer, September to December. Ozone hole mapping had revealed that the hole has even reached a maximum of 28.3 million square km in year 2001.

Health and environmental impact of ozone layer depletion

The direct result of the ozone layer depletion will be an increase of the amount of UV radiation that will reach the earth's surface. These UV rays have a damaging effect on humans, terrestrial ecosystems, marine life, crops and other living creatures. It can cause sun burns, skin aging and skin cancer, cataract leading to blindness and suppression of the immune system. Since UV rays are of energy, it can penetrate much deeper in oceans, seas and fresh water bodies. Therefore, UV destroys fish eggs and amphibian eggs and larvae.

UV destroys thePhytoplanktons, the primary producers (of food chain) of the oceans. Food chains of the oceans are affected and population of fish will be reduced. Genes (DNA) are sensitive to UV rays. Mutations can occur in genes causing cancer. UV destroys phytoplanktons which absorb CO_2 for photosynthesis. This indirectly increases global warming. CFCs are powerful greenhouse gases and, as such, directly influences global warming. Global warming leads to mean sea level rise, melting glaciers and polar ice caps and changes in global and local weather patterns. UV rays at the lower atmosphere produce ground level ozone. This highly reactive and toxic ozone causes respiratory diseases. This ground level ozone also reacts with unburned hydrocarbons which are emitted from vehicles and produces photo chemical smog. This smog also causes respiratory diseases.



Towards preserving the ozone layer

United Nations Environment Programme (UNEP) initiated the issue of protecting the ozone layer in 1976. As a result, the Vienna Convention for the protection

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of the ozone layer was adopted in 1985. However, commitments of member nations were not binding. The necessity was felt to have a binding policy to protect the ozone layer. To provide the necessary platform, from which, detailed international binding action could be taken and to implement the measures to protect the ozone layer the *Montreal Protocol on Substances That Deplete The Ozone Layer* was promulgated on 16th September 1987. It has a membership of 189 countries to date. Sri Lanka ratified the Vienna Convention and the Montreal Protocol on the 15th December 1989, and subsequently, ratified all the amendments to it. Under the protocol, all countries are required to gradually reduce the consumption and production of ODS. For this purpose, member countries are categorized in to Article 2 and Article 5 countries. Developed countries fall under Article 2. Developing countries (countries with annual ODS per capita consumption below 0.3 kg), are defined in Article 5. Article 2 countries were required to phase out CFC in 1996 and Article 5 countries were required to phase out CFC in 2010. Although Sri Lanka is categorized as an Article 5 country, considering the effects on the environment, Government of Sri Lanka has taken a policy decision to phase out CFC by 2008, two years ahead of the original protocol dead line.

To help the implementation process of the Montreal Protocol in Article 5 countries a Multilateral Fund was established in 1990. Contributions made by the Article 2 countries are allocated to fund phasing out and other related projects in Article 5 countries. To achieve Protocol targets and to fulfill the other obligations in Sri Lanka, the Montreal Protocol Unit was set up under the Ministry of Transport, Women's affairs and Environment in 1994. As of January 2003 the Montreal Protocol Unit changed its name to 'National Ozone Unit' for easy comprehension of the general public.

W.L. Sumathipala



Dr W.L Sumathipala (BSc PhD) is the Director, National Ozone Unit of the Ministry of Environment & Natural Resources

What have you learnt?

Try your hand at MCQs

1. True or false?

a) The fossil skeleton of the miniature human called hobbit is *Homo floresiensis*
b) It was discovered in Australia
c) Hobbit lived over a million years ago
d) They are believed to have used fire for cooking
e) The female fossil Lucy discovered in 1974 belong to the same genus as Hobbit

2. True or false?

a) Obesity is becoming an important health problem among urban children in Sri Lanka
b) Overweight children, when compared to others, are more likely to develop diabetes when they grow into adults
c) Vitamin C releases free oxygen, which damages tissues
d) A healthy diet should include plenty of sugar to provide enough energy
e) Antioxidants are believed to prevent cancer

3. True or false?

a) The rain fall during months of March-April is due to the southwest monsoon
b) Tropical cyclones are caused by high pressure systems in the atmosphere
c) Most of the cyclones in Sri Lanka occurs during November - December period
d) Thunderstorms are more frequent during inter monsoon period
e) *El-Nino* phenomenon is caused by changes in the wind direction over the Indian Ocean

4. True or false ?

a) In a bee hive, worker bees are females
b) The majority of bees in the world are honey bees, living in colonies
c) Solitary-pollen bees are an important source of bee honey
d) Over 100 species of solitary-pollen bees have been identified in Sri Lanka
e) Carpenter bee (*Xylocopa*) is the largest solitary pollen bee found in our country

VIDU22-1-22

of the ozone layer was adopted in 1985. However, commitments of member nations were not binding. The necessity was felt to have a binding policy to protect the ozone layer. To provide the necessary platform, from which, detailed international binding action could be taken and to implement the measures to protect the ozone layer the *Montreal Protocol on Substances That Deplete The Ozone Layer* was promulgated on 16th September 1987. It has a membership of 189 countries to date. Sri Lanka ratified the Vienna Convention and the Montreal Protocol on the 15th December 1989, and subsequently, ratified all the amendments to it. Under the protocol, all countries are required to gradually reduce the consumption and production of ODS. For this purpose, member countries are categorized in to Article 2 and Article 5 countries. Developed countries fall under Article 2. Developing countries (countries with annual ODS per capita consumption below 0.3 kg), are defined in Article 5. Article 2 countries were required to phase out CFC in 1996 and Article 5 countries were required to phase out CFC in 2010. Although Sri Lanka is categorized as an Article 5 country, considering the effects on the environment, Government of Sri Lanka has taken a policy decision to phase out CFC by 2008, two years ahead of the original protocol dead line.

To help the implementation process of the Montreal Protocol in Article 5 countries a Multilateral Fund was established in 1990. Contributions made by the Article 2 countries are allocated to fund phasing out and other related projects in Article 5 countries. To achieve Protocol targets and to fulfill the other obligations in Sri Lanka, the Montreal Protocol Unit was set up under the Ministry of Transport, Women's affairs and Environment in 1994. As of January 2003 the Montreal Protocol Unit changed its name to 'National Ozone Unit' for easy comprehension of the general public.

W.L. Sumathipala



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What have you learnt?

Try your hand at MCQs

1. True or false?

a) The fossil skeleton of the miniature human called hobbit is *Homo floresiensis*
b) It was discovered in Australia
c) Hobbit lived over a million years ago
d) They are believed to have used fire for cooking
e) The female fossil Lucy discovered in 1974 belong to the same genus as Hobbit

2. True or false?

a) Obesity is becoming an important health problem among urban children in Sri Lanka
b) Overweight children, when compared to others, are more likely to develop diabetes when they grow into adults
c) Vitamin C releases free oxygen, which damages tissues
d) A healthy diet should include plenty of sugar to provide enough energy
e) Antioxidants are believed to prevent cancer

3. True or false?

a) The rain fall during months of March-April is due to the southwest monsoon
b) Tropical cyclones are caused by high pressure systems in the atmosphere
c) Most of the cyclones in Sri Lanka occurs during November - December period
d) Thunderstorms are more frequent during inter monsoon period
e) *El-Nino* phenomenon is caused by changes in the wind direction over the Indian Ocean

4. True or false ?

a) In a bee hive, worker bees are females
b) The majority of bees in the world are honey bees, living in colonies
c) Solitary-pollen bees are an important source of bee honey
d) Over 100 species of solitary-pollen bees have been identified in Sri Lanka
e) Carpenter bee (*Xylocopa*) is the largest solitary pollen bee found in our country

5. True or false?

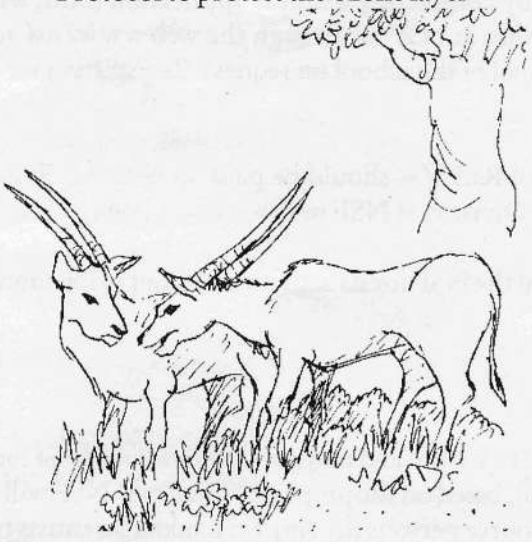
a) Most of ozone is found in the atmosphere, within 10 km of the earth's surface

b) Chlorofluorocarbons (CFCs) release chlorine that protects the ozone layer

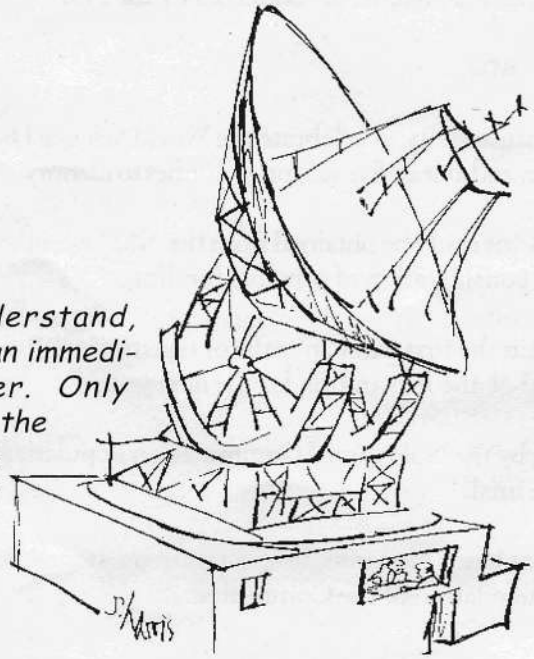
c) Depletion of the ozone layer is thought to increase the risk of getting cataract (opacity in the lens in the eye)

d) Ozone concentration in the equator is lower than that in the polar regions

e) Sri Lanka is a signatory to the Montreal Protocol to protect the ozone layer



We are a protected species and an endangered species, but when I see a person, I don't know if he is protecting us or endangering us!



"As I understand, they want an immediate answer. Only trouble is, the message was sent out three million years ago"

Answers to MCQs

1. a) T b) F c) F d) T e) F

The fossil skeleton of the miniature human *Homo floresiensis* was discovered in an island east of Bali, Indonesia. This 3 feet tall fossil, weighing 25 Kg is thought to be of a 30 year old female who lived 13,000 years ago. These people who lived in caves in Flores Island are supposed to have hunted and used fire for cooking. The female fossil Lucy, discovered in Ethiopia in 1974, belongs to Genus *Australopithecus* that was extinct 1.6 million years ago!

2. a) T b) T c) F d) F e) T

Both under nutrition (malnutrition) and obesity (being overweight) are problems in Sri Lanka. Obesity in children leads to diabetes, coronary heart disease and high blood pressure. Vitamin C (so are Vitamin E, beta carotene and selenium) is an antioxidant. It protects tissues from damage by free oxygen radicals released during chemical reactions in the body. Antioxidants are thought to prevent cancers and slow down ageing of the body.

3. a) F b) F c) T d) T e) F

March to April is the first inter monsoon period. Southwest monsoon is during May-September. Tropical cyclones are areas of low atmospheric pressure that form over warm tropical waters. November – December is the cyclone season for Sri Lanka. Thunderstorms and lightening are more frequent during inter monsoon period. El Nino occurs when reversing wind direction blows warm tropical water in West Pacific Ocean to the East Pacific Ocean.

4. a) T b) F c) F d) T e) T

Though not important as makers of honey, solitary-pollen bees play a significant role in pollination. There are about 17,000 species of solitary pollen bees, worldwide. Carpenter bees are often mistaken by farmers as beetles because of their hardened body. There are about 17 species of carpenter bees in Sri Lanka.

5. a) F b) F c) T d) T e) T

Most of the ozone is in the stratosphere, 10 to 50 km above the earth's surface. A single atom of chlorine can destroy up to 100,000 atoms of ozone. Depletion of ozone layer leads to sun burns, blindness, skin cancers and ageing of the skin. It affects the food chain in the oceans. Sri Lanka ratified the Vienna Convention and the Montreal Protocol in 1989.

Answers to MCQs

Vidu 22-1-24

School Science Society Programme at the NSF

1. Introduction

School Science Society Programme (SSSP) has been established to register School Science Societies (SSS) with the NSF with an objective of fostering students to acquire knowledge on latest developments in various fields of science and technology, to make them aware of scientific knowledge in day to day activities and to improve their standard of living.

2. Registration of School Science Societies

School Science Societies can be registered with the NSF by completing a simple application form, which could be obtained from the Science Popularization Division at NSF or through the web www/nsf.ac.lk. Application forms will be sent free of charge to the Principal of the school on request. Registration fee will be Rs.100/=.

The registration has to be renewed annually and a sum of Rs.50/= should be paid on renewal. Renewal forms could be obtained from the Science Popularization Division at NSF or through the web.

Registration would be cancelled if any SSS uses the name of the NSF for its activities without prior approval from the National Science Foundation.

3. Benefits to the School Science Society

1) NSF will assist to organize various activities related to science and may provide funds required for the activity (< Rs.10,000/- per programme per school), based on the proposal submitted. NSF will also assist the School Science Society by providing resource persons (leading Sri Lankan Scientists from Universities and Research Institutions).
2) A copy of Vidurava Science Magazine will be sent to all the registered School Science Societies.
3) Members of SSS can participate in periodic seminars, workshops, field trips and various activities including the World Science Day Programme organized/conducted by the NSF.

4. Activities of the School Science Societies

- Registered SSS should organize one main activity to celebrate the World Science Day Programme, which is held on 10 November each year, and at least five (05) programmes to identify and scientifically solve problems in their localities.
- A separate proposal for each activity (forms could be obtained from the NSF) including a breakdown of the budget should be submitted for consideration of possible funding.
- The first proposal should be sent within the first three months of registration. If not, it would be taken in to consideration at the renewal of the registration for the next year.
- Proposals would be selected for funding by the NSF Special Committee on Popularization of Science. The decision of the Committee will be final.
- Funds will be issued on reimbursement basis. However, in special circumstances 50% of the total budget may be released on the recommendation of the Committee.