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FOR SPECIAL ISSUE OF 'SCIENCE HORIZON'

A special issue of 'Science Horizon' (December 2019) on 'SPACE EXPLORATION' will be published. Writers are requested to contribute Articles/Essays/Fictions/Quiz/Science Cartoons on the above theme which may include topics on history, technology, space missions, space telescopes, space station, rockets, space tourism, biography of astronauts and India's space exploration including rockets, satellites, chandrayan, mangalyaan and gaganyaan.

The article should ordinarily be of maximum five pages printed on one side of A-4 size paper. Authors are further requested to send their articles by **30.11.2019** and give their E-mail, Contact details, Passport size photographs etc. The articles should be sent to the Secretary, Odisha Bigyan Academy by the following address by post/in person along with softcopy (MS Word) through E-mail (odishabigyanacademy1@gmail.com).

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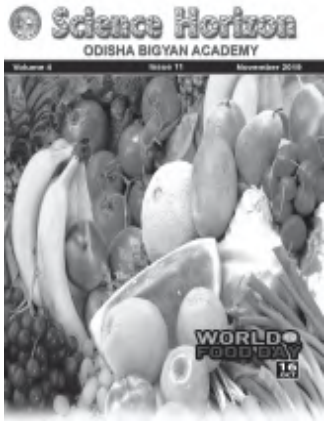

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The Cover Page depicts : **World Food Day** *Cover Design :* ***Kalakar Sahoo***

EDITORIAL

ELECTRICITY SCENARIO IN INDIA

Electricity is one of the important infrastructure for development of a country. As such many economists consider per capita consumption of electricity in the country to ascertain the economic development of that country. India, with a population of 124.72 crore (2011 census) has an average GDP growth of 7 percent per year. The growth of the electricity sector plays an important role to sustain the economic output of the country. In 2018, the per capita electric consumption in the country was 1181 units (kWh) whereas in the USA, it was 12271 units. From this, it is clear that we have to increase the use of electricity in our country for overall development.

At the time of independence in 1947, the total installed capacity of electricity in the country was 1362 MW and now it has increased to 362120 MW (as on 30.09.2019). Although there is a substantial increase in generation, still many villages in India are yet to see electric light and many electrified villages get it only about half the time of the day. In 2018-19, India generated 1274.595 billion units (BU) (it is 1547 BU if we add generation from non-utilities) against a demand of 1267.526 BU thereby there was a shortage of 0.6 percent. Similarly, against a peak demand of 177022 MW, availability was 175528 MW, with a shortfall of 0.8 percent.

India generates its electricity from different sources such as thermal (coal, petroleum oil and natural gas), hydel, nuclear and renewable sources (solar, wind, small hydel and bio-energy). The fact that about 65 percent of our total electricity comes from thermal sources is a point of environmental concern. Among the total installed capacity, capacity of thermal, hydel, nuclear and renewable energy are respectively 228601 MW, 45399 MW, 6280 MW and 81339 MW. The bulk of electricity production comes from coal power plants that produced 1021 BU in 2018-19, which is 66 percent of the total production followed by hydropower (135 BU), renewable energy (126.75 BU) and nuclear power (37.7 BU).

In India, coal satisfies a major portion of the total demand. India has large reserves of coal (it is the 5th largest in the world) and it has to be more economical to generate electricity from it. But its environmental impact has forced us against it. Apart from polluting air by releasing the poisonous gas like carbon monoxide, sulphur dioxide, nitrous oxide alongwith particulate matter and ash, it is considered one of the major sources of global warming and climate change. When fossil fuels are burnt in the boiler of the power plant, carbon dioxide is emitted to the atmosphere. Carbon dioxide is a greenhouse gas which causes global warming and climate change, effects of which are already felt. For its remedy, Paris Agreement has stipulated for reduction of thermal power generation. India has committed to reduce energy emissions intensity by 30% to 35% from 2005 levels by

2030 and to increase the share of non-fossil fuel energy to 40% of India's total energy mix by 2030.

India has decided not to add new thermal power plant after 2022 and to compensate it, renewable energy sources will be developed. The major renewable energy source in India are wind and solar. India is carrying out Jawaharlal Nehru National Solar Mission with the aim of achieving a target of 100000 MW by 2022. Till now it has achieved installation of 30709 MW and it seems that it may overreach the target. India has also the target of achieving 60000 MW of wind power, 10000 MW of bio-energy and 5000 MW of small hydel by 2022. India has estimated renewable energy potential of about 900000 MW and if developed properly, it would be sufficient to meet the demand of the entire country. But most of the renewable energy sources are seasonal in nature and hence we cannot leave thermal power altogether. After all thermal power is the base of our electricity generation system. But we can reduce its use by developing more of renewable energy for the benefit of human kind.

The expansion of nuclear energy is important in India as it is a clean source of power. But due to some past accidents in these plants (of course outside India), local people oppose its installation. But the technology is now well developed and there is no risk of accident. In India, the installed capacity of nuclear power is 6780 MW and capacity of 4800 MW is under construction. In 2018-19, 24026 MU of nuclear energy have been generated. Another problem for this power source is the inadequate availability of uranium fuel. Of course, India is trying to import it making various agreements with uranium-producing countries.

Hydel power is the cleanest source of electricity. Although India's hydro potential is 148700 MW at 60% load factor, we have utilised only 30.53 percent of it till now, reason being the accessible potential has been exploited and balance are in the Himalayan regions, which are difficult to access. Though India is acting on an attractive plan of adding 50000 MW hydro power, the progress is very slow due to various environmental and displacement and resettlement issues.

India has power transmission line linkage with the neighbouring countries of Nepal, Bhutan, Bangladesh and Myanmar. India is importing power from Bhutan and exporting power to Nepal and Bangladesh. At present Nepal is drawing about 570 MW of power from India and with the upgradation of transmission line it will further increase by around 250-300 MW. Presently, about 1500 MW power is being imported to India from Bhutan. India is providing 2-3 MW power to Myanmar through low tension line. Further, 1100 MW is exported to Bangladesh.

It is estimated that the total electricity consumption in the country is expected to increase to 3000 BU in 2030 and we have to rely more on renewable sources of electricity and also energy conservation must be carried out to save unnecessary use.

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Er. Mayadhar Swain
Editor

LAND USE, FOOD HABIT AND CLIMATE CHANGE

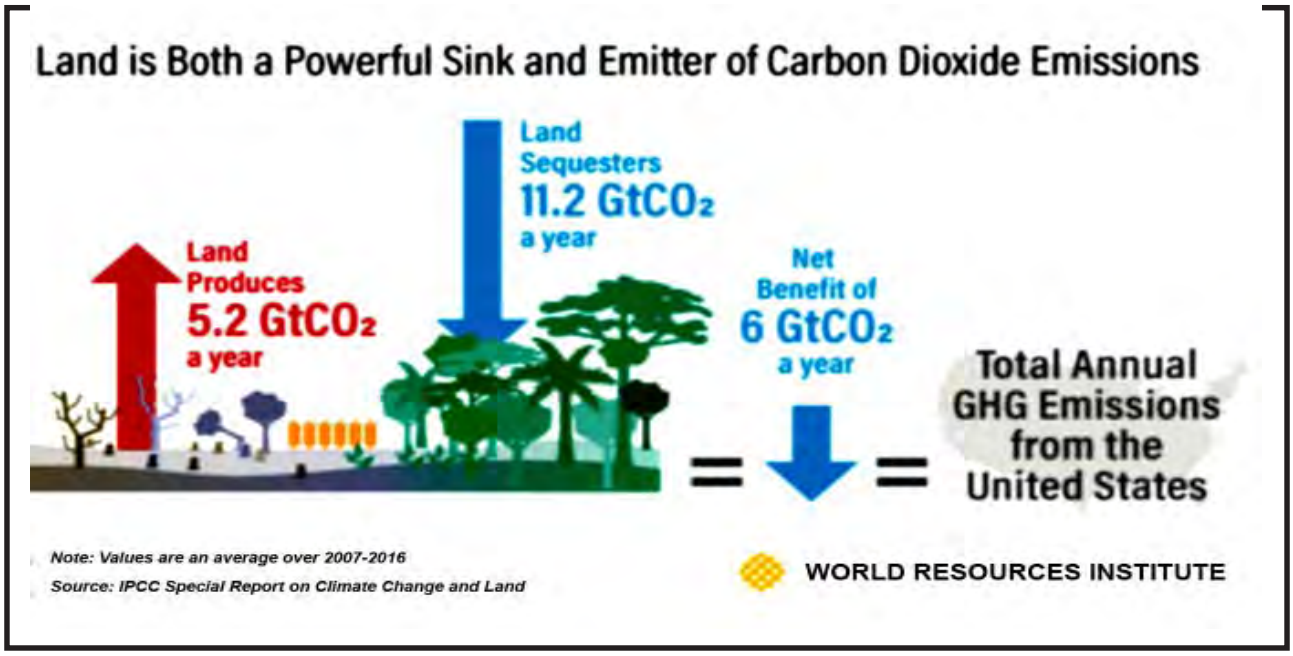
Dr. Bijay Ketan Patnaik

Existing land use and subsequent changes in land use have always been an integral part of conservation and discussion on climate change. That is because land acts as both the 'source' and as well as a 'sink' of carbon. In fact, the land sequesters almost a third of all human caused carbon dioxide emission. The Inter Governmental Panel on Climate Change (IPCC) 5th Assessment Report published in 2014 found that agriculture, forestry and other forms of land use was the source for nearly 24% of green house gas emission. But at the same time, it need not be forgotten that natural land processes absorb CO_2 equivalent to almost a third of carbon dioxide emissions from fossil fuels and industry. A new special report of IPCC, released on August 2019, present unequivocally, that land is also a critical resource and how different use of land-forestry, agriculture, urbanization are affecting and also getting itself affected by climate change. The report shows how managing land resources sustainably can address climate change.

So far, most discussions on climate change action plan focussed on energy, industry and transport, which are identified as major contributors to green house gas emission. But the IPCC special report, 2019 asserts that land is also critically important. Land use change, such as cleaning forest to make way for farm lands, urban settlements drive these emissions. But if we count on the entire food chain of agricultural products, including application of fertiliser, transport, processing and sale of foods to consumers, takes this contribution from 24% to 29%. Activities like agriculture and cattle rearing are also major sources of methane and nitrous oxide, both are hundred times more dangerous than CO_2- as a green house gas. Around 44% of recent human driven methane came from agriculture, peat land and other land based sources.

But despite, gradually increasing deforestation and other land use changes, the world's lands are removing more emissions than they emit. Land produces 5.2 gigatons (Gt) of CO_2 per year. (1 gigatonne is 10,000 lakh tonnes). Whereas land sequesters 11.2 Gt of CO_2 in a year and thus leaving a net benefit of 6 Gt of CO_2 per year, which is equal to total green house emission from the United States.

Basing on the IPCC special report on 'Climate Change and Land', which was presented to United Nations in August 2019, the UN body observed that threats of global warming cannot be tackled by cutting emissions from fossil fuels alone. The largest potential for reducing emissions from the land section is from curbing deforestation and forest degradation. It also needs changes in the pattern world produces and land consumes food, including farm practices, shifting towards plant-based diets, and reducing food and



agricultural product waste. Though other global bodies too made similar observations in the past, the IPCC's finding assume significance as its report is authored by 107 leading scientists from 52 countries. This report provides key scientific inputs to recently concluded COP 14 to combat desertification held in New Delhi during this month (September, 2019) and also to the UN Framework Convention on Climate Change Conference (COP 25) to be held in Santiago, Chile, in December, 2019.

According to the report, land is already under constantly growing human pressure and climate change is adding to their pressures. But at the same time land must remain productive to maintain food security as the population grow, and the negative impacts of climate change on vegetation increases with time. This implies that there are limits to the contribution of land to address climate change, for instance through afforestation. It also takes time for trees and soils to store carbon effectively. In fact by increasing soil's carbon storage capacity, it can not only sequester emissions, but also make crop more resilient to climate change, improve soil health and increase crop yields.

Land Use, Climate Change and Food Security

Keeping global warming to well below 2°C as per the Paris declaration, can only be achieved by reducing green house gas emission from all sectors including land and food. The IPCC special report of 2019 found that, if the world fails to reduce emissions in other sectors like industry, energy and transport, it may be required for us to rely even more heavily on land solutions, which may in turn affect the food security. The report also highlights that climate change occurring to greater green house emission is affecting the four pillars of food security; i.e. availability (yield and production), access (process to get and ability to obtain food), utilisation (nutrition and

cooking) and finally stability (disruption to availability). For example projected increase in temperature changes in precipitation patterns, changes in extreme weather events and reduction in water availability may result in reduced agricultural productivity.

The report puts it on record that about the third of food produced is lost or wasted. Causes of food loss and waste differ substantially between developed and developing countries. Similarly, the effects are also different for different countries, but the impacts are more drastic on low income countries in Africa, Asia, Latin America and Caribbean. Reducing this loss and food waste would reduce green house gas emissions and improve food security and will also help to end hunger. Besides suggesting to minimise wastage of food, the report also suggests that shifting of dietary preferences to include more plant based foods such as coarse grains, legumes, fruits and vegetables rather than animal based food could avoid a part of these green house gas emissions without jeopardising food security.

Four simple changes in our day to day diet can reduce the climate impact to a great extent. They are; (i) Eat meat-free meals, (ii) Buy organic and local products wherever possible, (iii) Don't waste food, and (iv) Grow your own food.

A question may arise, how change in dietary practices will have less impact on climate change. It is because of the fact that some dietary choices require more land and water, and cause more emissions of heat-trapping gases than others. Raising live stock for meat, egg and milk generates around 15% of global green house gas emission such as methane and nitrous oxide. This is the second highest source of emission and greater than emissions from all types of transportation sector combined. Besides, it takes 5 to 7 kilogram of grains to produce one kilogram of Beef meat.

Livestock productions account for 70% of all agricultural land use which occupies 30% of the planets land surface. Some of the environment effects that have been associated with meat production are pollution through fossil fuel usage, animal methane, effluent waste, water and land consumption. So, changing our food habits from non-vegetarian to vegetarian will help greatly in maintaining green house gas emission.

Land-based emissions reduction and carbon-removal efforts require large scale reforestation and prevent deforestation due to other land use like agriculture and farming. IPCC special report focuses on the fact that land use and climate stability are a delicate balancing act. Getting it right can reduce emissions while creating significant co-benefits; while getting it wrong can further add to climate change, worsening food insecurity and environmental problems.

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THE BOTANICAL DANCE OF DEATH: PROGRAMMED CELL DEATH IN PLANTS

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The cells of multicellular organisms are members of highly organized community. The rate of cell division and of cell death strictly regulates the number of cells in this community. If cells are no more needed, they die by activating intracellular death program by a process called as programmed cell death (PCD). PCD (the cell's active participation in its own demise) is an active, genetically controlled process in which cells are selectively eliminated in a highly coordinated, multi-step fashion through the involvement of specific proteases and nucleases. Cells that are damaged and unable to function correctly can also undergo PCD. This removes potentially harmful cells and prevents them from multiplying and spreading. Thus, only cells that are destined to die are destroyed and no damage to the neighboring cells is inflicted. In fact, 334 years ago the first cells ever observed microscopically were cork cells which had undergone PCD. All that remained of these differentiated plant cells was the surrounding cell wall. In plants, PCD is a facet of a wide range of developmental programmes which vary from the beginning of the plant's life cycle, through essential development (xylogenesis), right until the end of the plant life cycle (senescence) (Rogers, 2005). Cell death fulfills several essential functions in plant development:

(a) Senescence removes cells by recycling much of its carbon, nitrogen, and phosphorous.

(b) Cell death is important in sculpting tissues such as the formation of lysigenous aerenchyma, flower primordial during floral abortion, and aleurone layers during germination.

(c) Cells invaded by pathogens may be self eliminated as part of a hypersensitive response against the pathogen.

(d) Cell death also occurs during terminal differentiation and the classic example is the formation of vessel members and tracheids, collectively termed tracheary elements (TE).

(e) Cell death is programmed when the metabolism of cells is disconcerted either by coping with abiotic stresses imposed upon it or by bioengineering.

PCD in Vegetative Plant Tissues

Generally the structure of most of the leaves is determined by differential cell and tissue growth, but in some plants, for instance, in *Monstera deliciosa* (Swiss cheese plant) a group of cells die at early stages of leaf development, resulting in the formation of holes in the mature leaf (Greenberg, 1996). Dying cells of *Monstera* exhibit several characteristic features such as cytoplasm condensation, DNA degradation and disrupted vacuole. PCD occurs simultaneously

throughout the perforation sites and the boundary between dying and healthy cells is sharply delineated, suggesting that all target cells receive a death signal in unison. Similarly, sclerenchyma cells are dead because thick cell walls perform the mechanical function. Cork is constituted of characteristic cells with thick suberinised layer of the cell wall. Suberin combined with lack of intercellular spaces, protects internal tissues against desiccation. The protoplast is no longer needed, therefore it is eliminated.

PCD in Aleurone Cells

The cereal endosperm consists of two specialized tissues, the aleurone layer and the starchy endosperm. Programmed cell death is an integral part of the development of these tissues, although they die at different times. Starchy endosperm cells die after grain filling is complete. Unlike PCD of most other plant cells, including aleurone cells, the death of starchy endosperm cells is not followed by rapid destruction of the corpse. Dead starchy endosperm cells function to store reserves of carbon and nitrogen that will be used by the embryo upon germination. These reserves, which account for most of the mass of dead starchy endosperm cells, are not broken down until germination has been triggered. Enzymes to break down reserves are synthesized in aleurone. Aleurone cells form a secretory tissue that releases hydrolases to digest the endosperm and nourish the embryo. Aleurone cells die as soon as germination is complete as it is unnecessary for postembryonic development. In the aleurone, secretory processes and cell death are stimulated by gibberellin (GA), whereas abscisic acid (ABA) blocks the effects of GA and retards seed germination and cell death. Moreover, an elevation in cytosolic Ca^{2+} occurs in aleurone cells treated with GA (Gilroy and Jones, 1992), suggesting that a signal transduction pathway controls secretion and cell death. The apparent involvement of a specific signal pathway, the ensuing cell shrinkage, nucleus degeneration and DNA fragmentation show that PCD occurs in aleurone tissues that are no longer necessary for embryo nourishment (Wang et al. 1996).

PCD in Root Cap Cells

The root cap is situated at the tip of the growing root, guiding and protecting the delicate root tip as it pushes through the soil. Individual root cap cells are constantly being regenerated and have a short life span that ends in programmed cell death. The root cap consists of two parts, the central columella and the lateral root cap (LRC). The columella arises from the 'columella initials' located at the base of columella, whereas the LRC is derived from epidermal/LRC stem cells. Fendrych *et al.* (2014) reported a coordinated cell death program that removes the LRC cells before they enter the root elongation zone. They demonstrate that two highly co-regulated genes, the S1-P1 nuclease *BFN1* and the aspartate protease are expressed in a specific zone of the LRC where cells prepare themselves for subsequent PCD. They showed that PCD is established in the most distal LRC

cells, located at the transition zone of the root meristem (called PCD site I), and involves tonoplast rupture and abrupt vacuole collapse during LRC elimination. The authors also suggested that once the PCD is established, cell death progresses towards the root tip, forming PCD site II; finally, the cells lose their contact with the root at the proximal end of the columella. This entire process is re-capitulated in the next-younger LRC cell layer once it reaches the transition zone.

PCD in Senescence

Virtually all organisms, after they age, end their life with senescence followed by death. Senescence in plants is defined as the age-dependent programmed degradation and degeneration process of cells, organs or the entire organism, leading to death. Several genes termed senescence associated genes (SAG) induced early senescence (Lohman et al., 1994). The plant proteases are good candidates for cell death initiation genes. Blank & McKeon (1991) suggested that RNase and lipoxygenase might be involved in senescence control. A number of potential transcription factors are associated with senescence. Receptor like protein kinases has been concerned in senescence signaling and serves as receivers and transducers of external stimuli, acting through phosphorylation/ dephosphorylation cascades that lead to changes in gene expression (Robatzek and Somssich, 2002). The senescence associated kinase receptor gene (SARK) behaves as typical SAG that is induced by senescence inducing factors (ethylene, jasmonate) and repressed by senescence delaying factors (cytokinin, light).

PCD in Xylem Tracheary Element Cells

Vascular plants transport water in columns of specialized dead cells termed TEs (Tracheary Elements). Differentiation of TEs involves cell elongation, the deposition of cell wall components, including lignin, and autolysis. Autolysis begins as the cytoplasm and nuclei become lobed, condensed, and shrunken and end as the cytoplasm breaks into small packets. The studies of the PCD in tracheal element differentiation revealed rapid and progressive cell-autonomous degradation of organelles, including nuclei, plastids, mitochondria, endoplasmic reticulum and at maturity the loss of plasma membrane and some parts of the cell walls including vacuolar rupture (Obara and Fukuda, 2003). Nucleoids in chloroplasts are degraded and cytoplasmic streaming ceases immediately after the disruption of the vacuole. Yamamoto et al., (2001) stated that brassinosteroid biosynthetic pathway is activated before the tracheary element PCD, and the synthesized brassinosteroids induce PCD.

PCD during reproductive period

Un-pollinated flowers are fully thrown away. Ovaries with fertilized egg cells in ovules on the same plant are retained forming fruits while the other parts; petals, sepals or tepals fall off. Stigmas and pistils may also be eliminated. In apomictic species, the fruits develop without fertilization, which means that the ovaries with ovules are retained

forming fruit, but the other flower parts are eliminated. PCD is involved in the formation of female gametes in seed plants. Single meiotic division gives four haploid megaspore cells, three of them undergo PCD, remaining one have two additional mitotic division and bring to egg and associated cells of the embryo (Bell, 1996). PCD is also involved in the formation of male sexual organs. Tapetum layer is surrounding the pollen during maturation undergoes PCD (Greenberg, 1996).

Plants developed several mechanisms to avoid self-pollination. One of these involves inhibition of germinating pollen dependent on recognition by pistil tissue. This process is mediated by proteins showing RNase activity, which is crucial for their function. The growth of the pollen tube through the pistil is associated by selective cell death. Therefore pistil cells along the growth way of the pollen tube undergo PCD while the rest of the tissue stays intact (Wang et al., 1996). Two synergid cells are present at the entry to the egg sack, one of them undergoes PCD for arriving pollen tube to enter and release sperm cells.

PCD also occurs during the embryogenesis in plants. Cell death within the embryo does occur as part of its normal development and includes the death of scutellar cells surrounding the developing radicle, death of suspensor and death of nucellus from which the egg cell originates. These cell types that undergo cell death are highly specific and their death is essential for the final development of the embryo.

Programmed cell death in response to abiotic stress

Plant cells and tissues exposed to variety of abiotic stresses that ultimately may result in their death. Abiotic stresses include salinity, metals, herbicides and gaseous pollutants, including reactive oxygen species (ROS), as well as water deficit and water logging, high and low temperature and extreme illumination. Plants show adaptations to the stress including mechanisms to tolerate the adverse conditions, to exclude the toxins or to avoid conditions where the stress is extreme. PCD may be a part of an adaptive mechanism to survive the stress. Adaptation of plants to environmental conditions such as high light intensity or low humidity often involves covering their surfaces with layer of dead unicellular hairs. These cells are thought to go through PCD resulting in the formation of a protective layer that functions to block high irradiance and trap humidity (Greenberg, 1996).

Programmed cell death in response to biotic stress

Many studies have demonstrated the induction of PCD in plants in response to pathogen attack, indicating that PCD plays central role in pathogenesis (Goodman and Novacky, 1994). Studies showed that cells challenged by pathogens initiate an active PCD response, which is triggered by host-specific signals and requires synthesis of new proteins and/or activation of specific metabolic pathways (Greenberg, 1997).

Conclusion

PCD is a cell suicide process involving cell condensation and shrinkage and ordered cell disassembly. PCD deletes cells that serve a temporary function, are unnecessary or unwanted, or give rise to specialized tissues. These include aleurone cells, root cap cells, and TEs. During interactions with the environment, PCD deletes cells during hypoxia and after challenge with avirulent pathogens, both locally and systemically. ROS and phytohormones such as GA and ethylene can induce PCD in plants, whereas other phytohormones, including cytokinins and ABA, and signals from other cells can suppress it. The process of PCD is essential for the proper development of plants as well as ensuring a robust defense response against invading pathogens.

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WORLD DIABETES DAY

World Diabetes Day is observed on 14 November every year across the world to raise awareness of the impact diabetes has on the family and support network of those affected, as well as promoting the role of the family in the management, care, prevention and education of diabetes. World Diabetes Day is jointly introduced by the World Health Organisation (WHO) and the International Diabetes Federation (IDF). Amidst concern over an escalating diabetes epidemic, theme of this year's celebration is **"Family and Diabetes".**

WORM, DEWORM AND NO WORM

Prof. Prafulla Kumar Mohanty

What is a worm?

The English term "worm" is derived from Latin *vermis*, old English *wyrm*, old Nurse *ormr*, German *wurm*, the meaning of which is dragon, or snake or creeping animal. In common language, any creeping or crawling animal or loosely used for any elongated invertebrate lacking appendages as an earthworm or marine worm (chaetopoda), a flat worm (platyhelminthes), a round-worm (Nematoda) etc. But, in animal science (Zoology), it refers to helminth parasites. Although these organisms are not useful, decorative, ornamental, good looking, entertaining, vibrant, but they play a spectacular role in the economy of nature. Helminthes, a group of animal, in fact, constitute a large assemblage of worms. In life sciences, the term "worm" has been used loosely and lightly in some places like earthworm, silk worm, eanae etc. which is inappropriate and unscientific. The animals which are generally worm like are conventionally called worms because of either insect-like appearance or insect like movement (creeping movement). However, strictly speaking, worms come under Helminthes which is one of groups in animal kingdom. These are mostly parasites causing harm to our body.

Worms as parasites

Worms are usually parasites. Parasite is an organism which depends on the body of other organisms for its food or for both food and shelter. Parasites are chiefly of 2 categories namely (i) ecto-parasite and (ii) endoparasite. Ectoparasites are seen outside the body of other animals. The examples of ectoparasites are bedbug, louse, leech, ticks etc. and endoparasites are *Entamoeba*, malarial parasite (*Plasmodium*), *Trypanosoma* etc. The animal on which parasites live or take their food is known as "host". The intimate or close relationship between the parasite and host is "parasitism". In such relationship parasites never want the death of host. Because, once host dies means parasites die. The life cycle or the life as such depends on the host's body.

Since the inception or beginning of evolution of animals, parasites have been evolved. We can see the activities of parasites right from the first evolved group of organism protozoa. A successful and a good varieties of parasites are noticed in helminth group. In this group, the common human parasites are thread worms like roundworm, pinworm, whipworm, hookworm, eye worm (Table-1) etc. Gradually, parasites were seen in annelidan group (earthworm) which is beech and arthropodan group (mosquito, ticks, mites, bedbug, louse). Without contributing in any way, the parasites intelligently or accidentally or incidentally go inside or outside the body of host, take their food, live and multiply or reproduce as well as increase their number.

Table-1: Worms and their type of infection in human body

Sl. No.	Common Name	Scientific Name of the Worm	Nature of entry in human body
1.	Roundworm	Ascaris lumbricoides	Infected food and water
2.	Common hookworm	*Ancylostoma duodenale*	Bare feet, from the infected soil
3.	American hookworm	*Necator americanus*	Through bare feet from infected soil
4.	Filarial worm	*Wuchereria bancrofti*	Sucking of human blood by infected female culex mosquito
5.	Rhabditis	*Rhabditis hominis*	Infected soil
6.	Pinworm or Seatworm	*Enterobius vermicularis*	Dirty infected nails, food, water
7.	Guinea worm	*Dracunculus medinensis*	Infected drinking water
8.	Trichinia worm	*Trichinella spiralis*	Intake of infected pork
9.	Whipworm	*Trichuris trichura*	Infected food and water
10.	Eyeworm	*Loa loa*	General infection

Problems and Precautions

Once parasites enter into the body of hosts means problems are observed. Parasites which are found in intestines, they create intestinal disorders. Further, white patches are observed in different parts of the body alongwith anaemic look as well as abdominal pain. In chronic cases, the number of eosinophils gets increased and the infected persons suffer from eosinophilia throughout the year or life. In extreme situation, the affected individuals experience additional pain and suffering when the parasites migrate and reproduce in vital organs of the body like lungs, heart, kidney, spleen, brain etc. So, it is quite evident that these parasites, although are very tiny or small to look at, can generate and develop serious health disorder or ailment. Therefore, following precautionary measures are to be taken to keep one's body immune from the infection or attack or entry of these harmful parasites;

(1) We have to be very neat and clean.
(2) Cleaning and trimming of nails are highly essential.
(3) We should always take cold, filtered boiling water.
(4) Whenever we take food, it should be homemade and hot. We should not take food and water from outside.
(5) When food is left out in our containers, these should be appropriately covered.
(6) While taking raw fruits, vegetables, leaves, roots and stems, all these should be cleaned in water thoroughly.
(7) Before eating and after the use of toilet, hands are to be washed by soap properly.
(8) While going outside, shoes are to be used.
(9) We should avoid and discourage toileting outside our residence and using water of the river, pond or ditches.

Health is Wealth

It is believed that one of the best proverbs in the world is "health is wealth". But, now people are of the belief that wealth is health which is wrong. We have to remember a healthy person may be a wealthy person, but a wealthy person may not be a healthy person in the society. Unless we take sincere care of our health with respect to our food, water and hygiene, we will be diseased. To avoid infection and transmission of diseases, utmost care is to be taken. The old and gold saying is to be recalled which is "prevention is better than cure".

So, to keep ourselves healthy, fit and free from the infection of worms, the health department of Govt. of Odisha observes "National Worm Eradication Day" each year on 8th August. The objective of this programme is to create awareness about the infection of worms. Hope, we all should be careful, cautious and conscious about these dangerous organisms and make ourselves healthy individuals of the society. So we should recall and recapitulate –

"Control life or else life will control you"

and

"Save green and stay clean."

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COMBATING CLIMATE CHANGE- WAY TO ACHIEVE WORLD PEACE

Dr. Sundara Narayana Patro

Introduction

World's nations observed the 71st International Day of Peace on 21st September 2019. Celebration of the 'Day' followed a resolution adopted by the United Nations General Assembly in 1981 moved by United Kingdom and Costa Rica. It was first celebrated in 1982 at New Delhi, India. Initially the third Tuesday was declared to be celebrated as the International Day of Peace but later the date was fixed to be 21st September.

Every year UN decides a theme. The theme for 1982 was 'Right to Peace of People'. The theme for 2016 was 'The Sustainable Development Goals: Building Blocks for Peace'. In fact, it was in 2015, the UN Member States realized that for lasting peace in the world there was need for achieving economic and social development for all. For this, they adopted 17 Sustainable Development Goals (SDGs). The target period for its achievement was fixed to be from 2016 to 2030. These are: no poverty; zero hunger; good health and well-being; quality education; gender equality; clean water and sanitation; affordable and clean water; decent work and economic growth; industry, innovation and infrastructure; reducing inequality; sustainable cities and communities; responsible consumption and production; climate action; life below water; life on land; peace, justice and strong institutions; and partnership for the goals. These goals are broad based and cover a wide range of areas to ensure peaceful living with clean environment and social justice. The SDGs succeed the 8 'Millennium Development Goals' launched in 2000 that ended in 2015. The theme for 2017 was 'Sustainable Peace for a Sustainable Future', and the theme for 2018 was 'The Right to Peace-The Universal Declaration of Human Rights at 70'. 2018 happened to be the 70th year of launching of International Day for Peace. The theme for 2019 was 'Climate Action for Peace'. Out of 17 SDGs as mentioned above, the Goal 13 is 'Climate Action'. Of course all other goals are interrelated. The increasing pace of climate aberrations due to global warming needs urgent climate action to reduce loss of life and property and achieve peace.

Ferocity of Climate Extremes

All over the world, the number and severity of natural disasters, caused by climate related aberrations have been increasing menacingly. It amounts to massive loss of life and property impacting on the process of development and socio- economic status of the society. The poorest section of the society become more vulnerable, hit disproportionately and succumb to miserable loss of economy

and subsistence income. The Special Report of Inter-Governmental Panel on Climate Change (IPCC) released recently states that glaciers around the world, outside of Greenland and Antarctica but including Europe, are losing 220 billion metric tonnes of ice each year. The report observes that melting of glacier is happening faster than before and the pace is now accelerating. It is feared that these glaciers may shrink by 36 per cent by end of the century.

In recent decades the extreme weather and climate events like heat waves, droughts, heavy downpours and floods, hurricanes, cyclones, tsunamis etc. are on the rise leading to increasing number of billion-dollar disasters. Sea level rise increases the impacts of coastal storms. The floods in Thailand in 2001, Hurricane Sandy in United States in 2012, and Typhoon Haiyan in the Philippines in 2013 are some of the recent climate related disasters. The surge of intense floods, storms, droughts and heat waves has an ominous link to climate change. In 2014 about 17.5 million people were displaced by climate related disasters. Natural disasters in India, many of them related to climate, cause massive losses of life and property. Droughts, flash floods, cyclones, earth quakes, avalanches, landslides, dust storms and snowstorms pose the greatest threats. India is a highly disaster prone country. It is estimated that over 44 million people are affected by natural disasters every year in India. More than 70 per cent of the population occupy 80 per cent of its geographical area, mostly the coastal areas, that is vulnerable to cyclones, floods, landslides, drought, earthquakes as well as other local hazards. In 2018 in Kerala, in 2019 in Maharashtra and Bihar there were severe floods. Odisha is one of the disaster prone states in India that sustained super cyclone in 1999, Phailin in 2013, Hudhud in 2014, Titli in 2018, Fani in 2019, and frequent floods and droughts as an impact of climate change.

The Paris Agreement and After

Incidentally the UN Climate Action Summit was held on 23rd September 2019, two days after the International Day for Peace (21st September). It was hosted by UN Secretary General, Antonio Gutierrez with a view to accelerating actions to implement the Paris Agreement on Climate Change. The Paris Agreement is an agreement within the United Nations Framework Convention on Climate Change (UNCCC), dealing with green-house-gas emissions mitigation, adaptation and finance. It was adopted at the 21st Conference of Parties (CoP 21 or CMP 11) of the UNFCCC in Le Bourget, near Paris, France held from 30th November to 12th December 2015 participated by 196 countries. The Paris Agreement's long-term goal is to keep the increase in global average temperature to well below 2^0C above pre-industrial levels, and to limit the increase to 1.5^0C, since this would substantially reduce the risks and effects of climate change. Under the agreement each participating country is obliged to declare its Intended Nationally Determined Commitment (INDC). India has made three commitments- (1) India's Green-House-Gases (GHGs) emission intensity of its GDP will be reduced by 33-35 per cent below 2005 levels by 2030; (2) alongside, 40 per cent of India's power

capacity would be based on non-fossil fuel sources; and (3) at the same time, India will create an additional 'carbon sink' of 2.5 to 3.0 billion tonnes of CO_2 equivalent through additional forest and tree cover by 2030. India is the seventh largest country in the world with a total geographical area of 32,87,263 sq. km. Occupying just 2.4 per cent of world's land area it holds 17 per cent of the population of the world. India has the largest cultivated area equal to 18,92,761 sq. km which is roughly equal to 57 per cent of total area. Therefore, India has vast opportunity of increasing its forest and tree cover, enhancing climate resilient agricultural crops, setting up of solar panel and wind mills, exploring biomass energy and other measures towards sustainable climate action. India's strength lies in agriculture as 70 percent of rural households depend on it. It contributes 17 per cent to the total GDP and provides employment to over 60 per cent of the population.

Under the INDC India has focused on adaptation efforts, including: developing sustainable habitats; optimizing water use efficiency; creating ecologically sustainable climate resilient agricultural production systems; safeguarding the Himalayan glaciers and mountain ecosystem; and enhancing carbon sink in sustainably managed forests and implementing adaptation measures for vulnerable species, forest dependent communities and ecosystems. India initiated the International Solar Alliance (ISA) at the Paris Climate Conference in 2015. It is an alliance of more than 122 countries, most of them being sunshine countries, which lie either completely or partially between Tropic of Cancer and Tropic of Capricorn. India, again at the UN Climate Action Summit on 23rd September 2019 launched the Global Coalition for Disaster Resilient Infrastructure (GCDRI) with its office at New Delhi (after ISA also in New Delhi), will set targets for member countries to bring down the disaster deaths, economic losses and strive to achieve the SDGs. The GCDRI is targeted to help prevent and mitigate earth quake, tsunami, flood and storm impact by ensuring that affordable housing, schools, health facilities and public utilities are built in line with robust standards required to survive any natural or manmade hazard likely to occur in a particular location. India launched the Swachh Bharat Mission in 2014 for a targeted period of five years ending on 2nd October 2019, significantly paying homage to father of our nation Mahatma Gandhi on his 150th birth anniversary. By 2019 India hopes that the country is made open defecation-free. India also declared ban of single-use plastic from 2nd October 2019. The Jalsakti Abhiyan is another time-bound mission-mode campaign of India for community participation in conservation of water.

Impact on Health

The impact of climate change on human health, natural habitat and biodiversity is horrifying. The luxury-intensive modern lifestyle multiplies the problem manifold. With advancement of medical science, the communicable diseases like malaria, cholera, dysentery, influenza, hepatitis, tuberculosis, HIV and AIDS etc. are under control now. But the lifestyle diseases like atherosclerosis,

stroke, hypertension and other heart related diseases, obesity and type-2 diabetes, kidney disease, chronic obstructive pulmonary disease (COPD) etc. are on the rise. Sedentary habit, junk food, polluted air, polluted water, and unpredictable weather conditions are the contributing factors to enhance susceptibility of human health. Regular physical exercise, nutrient rich organic food, mediterranean diet and clean environment as well as stress-free life can only help reduce the burden of lifestyle diseases, the treatment of which is expensive and the diseases are incurable. The six essential nutrients in our body are carbohydrates, protein, fat, vitamins, minerals and water. The World Health Organization (WHO) is taking a proactive role in interventions for climate-resilient health systems and addresses the nutritional aspects as well as encouraging preventive and curative measures in respect of reducing lifestyle diseases burden. The Ayusman Bharat Programme launched in 2018 by India, was conceptualized as an insurance based health care delivery model that dovetails both preventive and curative health care under the coordination of the National Health Authority. As per the National Dialysis Programme Report 2016, an estimated 2.2 lakh new patients are added each year to access dialysis for renal replacement therapy resulting in demand of 3.4 crore dialysis every year. Cardiovascular disease (CVD), which includes heart attack and stroke, is the world's number one killer, causing 17.5 million deaths each year, with the figure expected to rise to 23 million deaths by 2030. The non-communicable diseases (NCD) kill around 40 million people each year. It contributes to 70 per cent of all diseases.Women's health is now a national priority. The breast and cervical cancer account for about 40 per cent of the cancer burden in India.

India's Response to International Initiatives

At international level the first initiative to address the global environmental issues was taken at the United Nations (UN) Conference on 'Human Health' held at Stockholm (Sweden) in 1972. The then prime minister of India Indira Gandhi as head of any state attended the conference. During the State of Emergency declared under her tenure in 1976 Article 48 A was added to the Constitution of India stating that "The State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country". The Government of India created the Department of Environment in 1980, which was upgraded as the Ministry of Environment and Forests in 1985. It is now renamed as the Ministry of Environment, Forests and Climate Change from May 2014. The Central Pollution Control Board (CPCB) was established on 22nd September 1974 as a statutory organization under the Water (Prevention and Control) Act, 1974. The CPCB also was entrusted with powers and functions under the Air (Prevention and Control) Act 1981. It serves as a field formation and also provides technical services to the MoEFCC under the provisions of the Environment (Protection) Act 1986.

In 1992 the UN Conference on 'Environment and Development' (UNCED) also called 'Earth Summit' was held in Rio de Janeiro (Brazil). This conference held after 20 years of Stockholm Conference was largely participated by different countries with seriousness. The conference laid a solid foundation to the international coordination and cooperation for addressing the issues of environmental concern. This impact making conference was mother to four major decisions. Those are Convention of Climate Change, Convention on Biodiversity, Forestry Principle and Agenda 21. In 2002 the follow-up conference was held at Johannesburg (South Africa), better known as Rio + 10 or Earth Summit-II. It was the world summit or UN Conference on 'Sustainable Development' (UNCSD). Again in 2012 the Rio + 20 or Earth Summit III took place in Rio de Janeiro with the same theme UNCSD.

Conclusion

China, India, United States, Indonesia, Brazil, Pakistan, Nigeria, Bangladesh, Russia and Mexico are the ten most populated countries in the world. The five most populous countries contributing to environmental pollution in the world are China (30 %), United States (15 %), India (6 %), Russia (5 %), and Japan (4 %). But if one looks at per capita emission of GHGs it is 6.4 Mt (Metric tonne) in China, 15 Mt in US, 1.6 Mt in India, 9.9 Mt in Russia and 9.0 Mt in Japan. Although the national level emission is less but the per capita emission of GHGs in some countries is far more than in India. In Germany it is 8.9 Mt, South Korea 11.6 Mt, Iran 7.1 Mt, Canada 14.9 Mt, South Arabia 16.3 Mt, Australia 16.2 Mt, France 4.5 Mt, Italy 5.4 Mt and UK 5.6 Mt, according to an estimate in 2016. The Indian Prime Minister Mr.Narendra Modi while addressing the UN Climate Action Summit in New York on 23rd September 2019 said that India has been taking proactive action to combat climate change even though its per capita contribution to GHG emission is far less compare to other countries. "Time for talk over, now act", Modi tells the UN Climate Meet. Urging world leaders to act immediately in order to protect the environment, he gives a call for global behavioral change in this context. Greta Thunberg, a Swedish girl of 16 years old made a scathing frontal attack, while making remarks at the UN Climate Action Summit on 23.09.2019 in New York, saying that "the generations that have polluted the most have burdened her and her generation with extreme impacts of climate change". This was the tone of a teen-age girl in the context of inaction or poor action of world leaders on climate change.

The theme of International Day of Peace 'Climate Action for Peace' draws attention to the importance of combating climate change as a way to achieve world peace. Climate change causes clear threats to international peace and security. Natural disasters displace three times as many people as conflicts, forcing millions to leave their homes and seek safety elsewhere. The see level rise causes salinization of water and crops in endangering food security, and the impact on human health is escalating. Peace can only be achieved if

concrete action is taken to combat climate change. UN Secretary General Antonio Gutierrez said "nature does not negotiate" and emphasized four key measures that governments should prioritize in order to reach carbon neutrality by 2050: tax pollution, not people; stop subsidizing fossil fuels; stop building new coal plants by 2020; and focus on a green economy, not a grey economy. He believes that transformable policies and strong political will help to a great extent to achieve peaceful living in our own environment.

It is appropriate here to talk about relevance of Gandhian thoughts on nature and environment conservation. He disapproved reckless plundering of nature's resources. "There is enough in the world for every one's need but not for every man's greed", he said. He believed in need based economy and not greed based economy. His central focus was conservationism in preference over consumerism. He championed for production by masses and not mass production by machines. He would not approve industrial activities as long as it contributed to environmental pollution and exploitation of nature although he was not opposed to it. He favoured promotion of cottage industries that are non-polluting and based on local natural resources. Such activities guarantee self-employment to local communities and do not subscribe to environmental pollution. Plastic ban from 2nd October 2019 has boasted the Sal (*Shorearobusta*) and Siali (*Bauhinia vahlii*) leaf plate and leaf cup making activities in tribal Mayurbhanj and other district as well as paper bag making (from waste and used paper called *'thunga'* in local Odia language) home-made industries in different parts of Odisha. Ecosystems are now suffering from ecological grief under the impact of climate aberrations. Gandhiji believed in harmony and peaceful coexistence with Nature. To be compassionate does not mean empathy for fellow men but for all, both animate and inanimate, the rivers, ponds, oceans, lands, mountains, plants and animals.

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ARECA NUT (ARECA CATECHU L.): NATURE'S SMALL COCONUT

Biswajit Patra

Arecanut (*Areca catechu* L.) is a highly profitable commercial plantation crop in India. The crop is mainly grown in the states of Kerala, Karnataka, Tamil Nadu, West Bengal and Andhra Pradesh and the Union Territory of Andaman and Nicobar Islands. In Odisha, it is mostly found in coastal district of Balasore and revenue areas of Bhograi. The fruit is locally called "*Supari"* which is used for various purposes and it is an important ingredient of "Gutkha" and "Paan Masala". It has the quality of supplying stimulation to nervous system & increasing secretion of saliva in the mouth. It aids digestive system & removes bad odour from the mouth. Ancient Ayurvedic literature cites arecanut for some of its medicinal qualities for manufacturing herbal medicines for skin diseases, diabetes, blood pressure, leprosy, fever, leucoria, urinary stones, rheumatism, intestinal worms, seminal weakness, jaundice, gastritis, hyperacidity etc by blending with other herbs [1]. Various parts of areca palm bark, roots, leaf sheath, juice of ripe arecanut, tender, raw & dried nuts flowers etc are used for various medicinal formualtions since ages world over. The local economy of Balasore district largely depends on the cultivation of paddy and betel vine. Prawn culture and salt manufacturing units are also developing in this area recently. The present report highlights the cultivation of arecanut among different categories of farmers in Bhograi area of Balasore district of Odisha.

Botanical Description

Arecanut is an erect, unbranched palm reaching heights of 12-30 m depending upon the environmental conditions. The stem marked with scars of fallen leaves in a regular annulated form becomes visible only when the palm is about 3 years old. Girth depends on genetic variation and soil conditions. Root system is adventitious. The adult palm has 7-12 open leaves, each with a sheath, a rachis and leaflets. The leaf stalk extends as the midrib until the end of the leaf and ends as leaflets. Male flowers are very numerous, sessile and without bracts. Calyx is l-leaved, small, 3-cornered, 3-parted. Petals are 3, oblong, rigid striated. Stamens are 6, anthers sagittate. Female flowers are solitary or 2-3 at or near the base of each ramification of the spadix, sessile, without bracts. Sepals are permanent. Staminodes are 6, connate. Stigmas are 3, short, triangular. Fruit is 3.8-5 cm long, smooth orange or scarlet when ripe, with a fibrous outer layer [3]. Arecanut palm is a monoecious plant with male and female flowers occurring on the same padix. Every year 3-4 inflorescences are produced. The first inflorescence on young palms may produce

Figure 1. L.S of Arecanut and tree showing unripe fruit.

only male flowers. The male flowers open for a few hours, shedding pollen most in the morning. The average male flowering period is 2-4 weeks. After this the stigmas in female flowers become receptive for 3-4 days. The sweet-scented male flowers are visited by bees and other insects for nectar but insects have not been observed visiting the female flowers. It is thought that most of the flowers are wind pollinated [5].

Tree Management

The spacing for arecanut varies from 1.25 x 1.25 m to 3.6 x 3.6 m. During the hot weather young seedlings should be protected from direct sunlight. Artificial shade of arecanut leaves or coconut leaves are often used. Arecanut is sensitive to drought. Therefore, irrigation is essential in areas with prolonged dry spells. Green manuring using leaves and cattle manure has been applied with success in areas with poor soils [6]. Despite reports of sensitivity to desiccation, predrying is widely practised in nursery cultivation to promote germination.

Pests and diseases

Pests causing major crop losses include leaf-feeding mites such as cholam mite (*Oligonynchus indicus*) and palm mite (*Raoiella indica*). Others are spindle bug (*Carvalhoia arecae*), inflorescence caterpillar (*Tirathaba mundella*) and root grub (*Leucophlis lepidophora*). Diseases resulting in heavy economic losses including foot rot, bacterial leaf stripe diseases, bud rot, inflorescence die-back, rotting disease, stem bleeding, sun scorch and yellow leaf disease [6, 7].

Problems of areca growers

Arecanut is a perennial crop. Once established, it can yield up to 25-30 years of age. The gestation period of arecanut is 7 years. Till then, heavy investment has to be made for establishment. The small growers cann't meet out these expenses from their own resources. Majority of the growers particularly small and medium farmers suffer from want of adequate finance for establishment arecanut gardens. The field study revealed that 90 percent of the respondents expressed, the problem of inadequacy of credit facilities. Added to that, there is water scarcity, problem of pests and diseases, labour, uncertainity of demand. Besides, there is price instability due to grading of nuts in the village market. Hence, the farmer is at a loss when there are few takers of his produce as the markets are volatile and returns are low.

Policy Implications

Support price needs to be revised to cover the cost of production, to protect the farmers from loss in the arecanut production. Arrangements should be made to provide new technologies to the farmers. Suitable steps should be initiated by the government to tackle the reasons for fall in prices of arecanut. Alternate use of arecanut should be looked for and promoted. The import duty on arecanut was increased from 35% to 100% to safeguard the interest of the farmers by the government of India. The arecanut is brought as a dry fruit. Arecanut should not be covered under dry fruit category. Appropriate action may be instituted so that the unscrupulous import should not take place.

Conclusion

Agriculture is the main economic activity of the people of Bhogarai area of Balasore district. One of the important features of the agriculture sector is change in cropping pattern and it helps the cultivators high yielding commercial crops. During last few years, arecanut has indicateded compound growth rate. This cultivation is one of the main economic activities of the study area and is an imporatnt source of income and employment to the people. Therefore, analysis of the cost of production of this crop is really necessary.

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IMPROVEMENT OF HUMAN INCOME AND HEALTH THROUGH CULTIVATION OF EDIBLE MUSHROOM

Dr. Sudhansu Sekhar Rath

Introduction

Mushroom was first cultivated in India in 1940, however its systematic cultivation was first attempted in 1943. Annual mushroom production has increased to 8000 in 2006 to one million tons in 2010. Mushroom cultivation in Jajpur district is negligible during last few years. Mushroom cultivation is considered to be an alternative source of Income and it decreases the malnutrition in the children of Jajpur. The district was prominently in national news for malnutrition deaths of children in a non-descript village named Nagada. Mushroom is a good nutritional & medicated food which meets the nutritional requirement by its cultivation. A number of mushroom species have medicinal & therapeutic value in the prevention/ treatment of cancer, viral disease, hyper cholesterolemia, blood platelet, anti diabetics, anti bacteria, anti fungal, anti viral, imunomodulating, kidney tonic, nerve tonic, chronic bronchitis. Agriculture sector is the main key position in Indian economy. Around one quarter in Indian national income originates from agricultural sector. Current project emphasizes the increase in the income

and health condition of the farmer through mushroom cultivation.

Jajpur district is located 20^0, 30^0 to 21^0 10^0 north latitude and 85^0 to 86^0, 44^0 longitude of the globe spreading over 2899 sq.km and 1.86% of the total land mass of the state. The total population is 1900054 resulting high density of 630 per sq.km in comparison with Odisha's 270 per sq.km (2011 census). It is the 7th populous district and 24th rank in area. Most of the people in Jajpur district are farmers & landless laborers. The district is surrounded by Keonjhar in north, Cuttack in south, Kendrapara in south east, Dhenkanal in west and Bhadrak in north east. The main production of Jajpur is rice. Mushroom cultivation is to be considered to be an alternative, additional source of income and improvement of health condition in poor family of Jajpur. Mushroom cultivation in Jajpur district in Odisha is negligible during last few years.

Mushroom was first cultivated in India in 1940. However, its systematic cultivation was first attempted in 1943 with the commercial cultivation by the joint effort of the scientists and farmers (Chang and Miles 2004). Annual mushroom production has increased from 800 ton in 2006 to one million ton in 2010. Known fungal species constitute only about 5% of their species in the world. Out of about 70,000 described species of fungi, it has been suggested that around 14,000 to 15,000 species produce frouting bodies of sufficient size and suitable structure to be considered as machrofungi (about 5000 of the species are considered to possess varying degree of edibility and more than 200 species from 31 genera are regarded as prime edible mushrooms. But only 100 of them are experimentally grown, 50 are economically cultivated, around 30 are commercially cultivated and only about 6 have reached an industrial scale of production in many countries. The number of poisonous mushrooms are relatively small (10%) and of these, 30 species are considered to be lethal (Chang and Buswell 2008).

Pleurotus ostreatus is the 2nd most cultivated edible mushroom after agaricus bisporus in the world. P ostreatus requires a shorter growth time in comparison to other edible mushrooms. Paddy straw mushroom is a popular veriety among people because of its suitable flavor, taste with high vitamin content compared to other cultivated mushroom (Mary & Sahana 2014). Mushroom is a highly proteinous food with medicinal values. Mushrooms are recognized world wide as medicinal foods rich in nutrition by doctors. The Food and Drug Agency (FDA) has officially designated mushroom as healthy foods (Babu & Rao 2013).

Out of the total mushrooms produced in India white button mushrooms share is 73% followed by oyster mushroom (16%) paddy straw mushroom (7%) and milky mushroom (3%). The per capita consumption of

Table-1: Proximal composition of some edible mushroom (dry basis)

Species	Protein	Fat	Ash	Carbohydrate%	Energy kcal/ kg
Agaricus bisporus	14.1	2.2	9.7	74.0	325
Lentinus edudes	4.5	1.73	6.7	87.1	772
Plurotus ostreatus	7.0	1.4	5.7	85.9	416
P. eryngii	11.0	1.5	6.2	81.4	421
P. sajor-caju	37.4	1.0	6.3	55.3	-
P. giganteus	17.7	4.3	-	78.0	364
Agricus blazei	31.3	1.8	7.5	59.4	379
Lentinus edodes	12.8	1.0	4.3	81.9	385

Adapted from carneiro et.al 2013(22), Kalac 2013 (29) phan et.al 2012 (101) Reis et.al 2013 (30)

mushrooms in India is very meagre and is even less than 100 gm per year (S.Gupta et.al 2018)

Material Method

Agriculture sector is the main key position in Indian economy. Around one quarter of India's national income originates from agriculture sector. 65% of employment is generated in agriculture sector. In future, to meet the challenges like increasing population, degradation of environment, climate change, reduction of agriculture land, water shortage is a great task to provide food security in India. Mushroom cultivation offers to provide good quality of protein, vitamin and minerals to vegetarian poor people. China is the biggest mushroom producer in the world and it produces 70% of the world's production. At present, the total mushroom production in India is approximately 0.13 million tons (2016). Punjab, Haryana, Himachal Pradesh, Uttar Pradesh, Rajastan and Jammu & Kashmir produce more mushroom in India, out of which Punjab's share is 50%.

Current Project was conducted in village Bichitrapur of Jajpur District with a farmer named Bhagirathi Rana.

Figure- 1

Figure- 2

Figure- 3

Preparation of Bed

Before cultivation of mushroom first mushroom bed is prepared in local bamboo as in Fig.-1 & Fig.-2.

The project was covered by net to avoid excess light and water. Bed is prepared having 2 feet wide and 5 feet in length in bamboo with 2 feet gap. Rice straw is used for preparation of bed. Rice straw is cut having 1 foot each and kept it in water tank for one night (near about 12 hours) as in Fig-3 & Fig-4.

The rice straw is kept in horizontal manner to avoid excess water and water is released from tank. Rice straw is sterilized by calcium bicarbonate water to avoid bacteria. Each bed is prepared by 8 bundles of rice straw in four steps. Then the bed is covered by polythin. Each bed uses 1 bottle of spawn weighing 200gm (Rate- 13.00 rupees). The average temperature is about 28 to 38 degree

Figure- 4

C. Mushroom is collected after 15 days. Average collection is about 1.5 kg per bed. Ten beds can be prepared every day with the help of one labourer.

Preparation cost: Cost of one bed = Rs. 30/-

Cost of the preparation of 10 beds =

30 x 10 = Rs. 300/-

Cost of spawn = 13 x 10 = Rs. 130/-

Cost of one labourer = Rs. 300/-

Other expenditure = Rs. 100/-

Total Cost- Rs. 830/-

Average cost of mushroom-

15 kg x 150 = Rs. 2250/-

Expenditure- Rs. 830/-

Net profit- Rs. 1420/-

Result & Discussion

Regional Plant Resource centre (RPRC) reported that out of a collection of 300 mushrooms in the state, they have identified 12 varieties as seasonal. Odisha produces 8129 tonnes of straw mushroom per annum. Current mushroom project was held in Jajpur district. The population density of the district is 630 per sq.km (Odisha- 270 per sq.km). Jajpur district has agricultural labourers 33.69% & main production is rice. Only 0.03% of field crop residues are used for mushroom production in our country (M. Singh). Mushroom is a good nutritional & medicated food which meets the nutritional requirement of the people of the district by mushroom cultivation. Extensive clinical studies, conducted primarily in China and Japan have

Table-2: World production of mushroom (Metric Tons)

Sl. No.	Country	1997	2007
1	China	562194	1568523
2	USA	366810	359630
3	Netherland	240000	240000
4	Poland	100000	160000
5	France	81304	140000
6	Haly	73000	125000
7	Ireland	57646	75000
8	Canada	57800	73257
9	U.K	107359	72000
10	Japan	74782	67000
11	Germany	60000	55000
12	Indonesia	19000	48247
13	India	9000	48000

Source:World mushroom and truffles: Production 1961- 2007, United Nations FAO, FAO (8/28/2009)

explicitly illustrated that a number of mushroom species have medicinal and therapeutic value in the prevention/ treatment of cancer viral disease, hyper cholesterolemia, blood platelet, anti diabetics, anti bacteria, anti fungal, anti viral, imunomodulating, kidney tonic, nerve tonic, chronic bronchitis. The production of mushroom of India is very negligible in comparison with other countries.

Mushrooms are prized for their exclusive flavor and deliciousness. They are rich in protein and contain less fat, less carbohydrate and salt and rich in fibers and have high vitamin (B1, B2, B12, C, D & E) and folic acid which are uncommon in vegetables. The absence of lysine and tryptophan make them ideal food for patients.

Table- 3: State wise mushroom production in India (2010) - in tons

State	Buttom Mushroom	Oyster Mushroom	Milk Mushroom	Other Mushroom	Total
Punjab	58,000	2,000	500	0	60,900
Uttarkhand	8,000	0	0	0	8,000
Haryana	7,175	0	3	0	7,178
U. Pradesh	7,000	0	0	0	7,000
Tamil Nadu	4,000	2,000	500	6	6,506
Himachal Pradesh	5,864	110	17	2	5,993
Odisha	36	810	0	5,000	5,846

Source: RMCU, DMR, Solan 2010

Conclusion:

Now a days, global warming, population explosion, climate change threats to food security in India due to natural calamity like Mahabatya, Hudhud, Fani have destroyed the eco system. Keeping this in view, new cultivation device for mushroom culture may be introduced to meet the necessity of poor and landless farmer not only district of Jajpur but also in India. The sensitization, awareness and use of new technology shall go a-long way in promoting and securing the economic and health of the people of the district in future.

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WORLD FOOD DAY

World Food Day is celebrated every year across the world on 16th October in honour of the Food and Agriculture Organsiation launched by the United Nations in the year 1945. The event promotes worldwide awareness and action for those who suffer from hunger and for the need to ensure food security and nutritious diets for all. The focus of the day is that, food is a basic and fundamental human right.

THE METRO MAN

Mr. Kanchi Narayan Mohanty

Look at the sky. We are not alone. The whole universe is friendly to us and conspires only to give the best to those who dream and work. This was not only the saying but also the golden principle of revered former President of India, Dr. A.P.J. Abdul Kalam. He was an aerospace scientist who served as 11th President of India. His dedications towards the development of ballistic missile and launch the 'Agni' and 'Prithvi' and many other achievements on nuclear tests, for which he is known as the "Missile Man" of India.

Great dreams of great dreamers are always transcended. In a like manner a towering personality and unparalleled technocrat is Elattuvapil Sreedharan, a genius born at Karukaputhur, Kerala on 12th June, 1932. He completed his education with Civil Engineering degree from Government Engineering College, Kakinada and joined as a lecturer at the Government Polytechnic, Kozhikode after working at Bombay Port Trust as an apprentice for a short period. After qualifying Indian Engineering Service Examination in the year 1953 he joined as Asst. Engineer in Southern Railways.

He has been awarded because of his utmost sincerity and intelligence. He adopted the innovative engineering method to finish the restoration of Pamban Bridge in 46 days

as against the six months deadline. Only because of his intense skill by adoption of superior technology and financial engineering the 760 km Konkan Railway was constructed within seven years. Delhi-Metro with rapid transit system having 250 stations and total length of 373 km and with daily ridership approximately 5.5 million was astounding success of Dr. Sreedharan. He proved his workmanship as the best technocrat and architect on infrastructure projects across the country for more than five decades. Even at the age of 88 when most people live with despair he lives engaging himself with policy making, urban planning, civil administration and sharing the experiences gathered over 56 years of his professional life with the engineering students.

Now he is associated with the 24 km Kochi Metro. He is also a consultant to the Uttar Pradesh Government for the Lucknow, Kanpur and Meerut Metros. He is also a consultant to the Jammu & Kashmir Government for the light metros in Jammu and Srinagar. In addition to the above responsibilities he monitors and provides technical guidance for the progress of Mumbai Metro Line No.-3 and Dethi's Rapid Rail Transit with regular visits.

Elattuvapil Sreedharan

He has covered all the states of India and sometimes abroad to share the experiences gathered on railways, overbridges and other infrastructure projects.

Author of the book 'India's Railway Man', Rajendra B. Aklekar has written in Sreedharan's biography that many hidden aspects of his life were not included and it is based on the personal interactions with Dr. Sreedharan popularly known as Metro Man at his residence in Kerala.

In the year 2003, The Time Magazine conferred him as one of the Heroes of Asia. He does not agree with the implementation of bullet trains in India for certain conditions. Dr. Sreedharan explained in an interview that high speed trains are necessary in a vast country like ours. But they are expensive. The country committed a mistake by going in for dedicated railway freight corridors at huge expense instead of going for dedicated high speed passenger corridors, which would have released sufficient capacity in the existing rail system for freight traffic. It is still not too late to convert freight corridors to passenger corridors. The cost difference between bullet train corridors and semi-high speed corridors

is not much. Adopting semi-high speed corridors will again be a mistake, which cannot be corrected later.

Metro Rail is no doubt very expensive; it costs Rs.250 crores per km for elevated corridor and Rs.450 Crore for underground rail. But its capacity is estimated from 45,000 to 90,000 persons per direction per hour. An alternative to such a high capacity transport is the suburban railway system, but it cannot substitute for an urban mass rapid transport system. Cheaper options like Bus Rapid Transit, Light Rapid Transit and tramways have lower passenger capacities. Roads are not yet maintained to adopt such transport. Roads would have to be widened for them and this is equally expensive. Dr. Sreedharan also has given his suggestion that people should switch from private transport to public transport for safe, reliable, affordable and convenient system.

The government must introduce disincentives like increase in road tax, surcharge in fuel, high parking fees and likewise to encourage people to use public transport. He also added that Metro is a social service and should not be guided by business considerations alone. Its fares must be affordable to attract commuters who otherwise rely on the road.

Ridership will increase only if Metro stations are within half a kilometre of commuter destinations. Link bus services and a common ticketing system must be introduced to provide door to door connectivity.

Dr. Sreedharan has been honoured on numerous occasions by government, private and foreign organisations from time to time. He is the recipient of the Padma Sri and Padma Vibhusan award from the government of India and the Ceralier de la Legion d' honour (2005), awarded by the France Government for his dedication and illustrious career towards rapid development in the field of railways, metro lines, over bridges for transport.

He is also a proud Indian who was appointed by former UN Secretary General Ban-Ki-Moon to serve on the UN's High Level Advisory Group on sustainable Transport for three years in 2015. He is one among the Indian genius who is a bright example for his farsightedness and strong determination.

And lastly about his family, he is having three sons, Ramesh, Achyuta, M. Krishnadas and one daughter Shanti. All are well established in their chosen fields. His wife Radhika is a pillar of support. He regularly reads Bhagbat Gita and tries to imbibe its teaching in his professional and personal life. He is a man of spirituality and a disciple of Guru Puja Swami Bhoomanada Tirthaji. He says, "I should continue to serve society with the attitude that it is an offering to God".

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CROSS CONTAMINATION : HIDDEN DETERMINANT OF FOOD BORNE ILLNESS

[1]Dr. C. Devadarshini
[2]Ms. Soumya

The importance of food for human health has been widely recognized; "*Eating safe food having optimal quantities of nutrients is a basic human right."* Contamination of food in any level whether in production or in processing or in consumption hampers this right to safe food by causing different food borne diseases.Therefore, prevention of diseases as well as contamination is not only the permanent responsibility of Government, but also of the consumers themselves. In the direction of preparation of safe food, we have to first recognize the methods that are to be practised inside kitchen to prevent cross contamination.

Cross contamination effect

"Cross contamination" is the indirect spread of disease causing bacteria, virus, parasite and their toxins from raw food to Ready-To-Eat (RTE) food either by equipment, utensils, surfaces or by the handler himself. It is the unintentional transfer of microbes, chemical contaminants or any foreign material from food, person or object to another food product. It usually occurs from raw food to RTE food in any level or any step of food pathway.

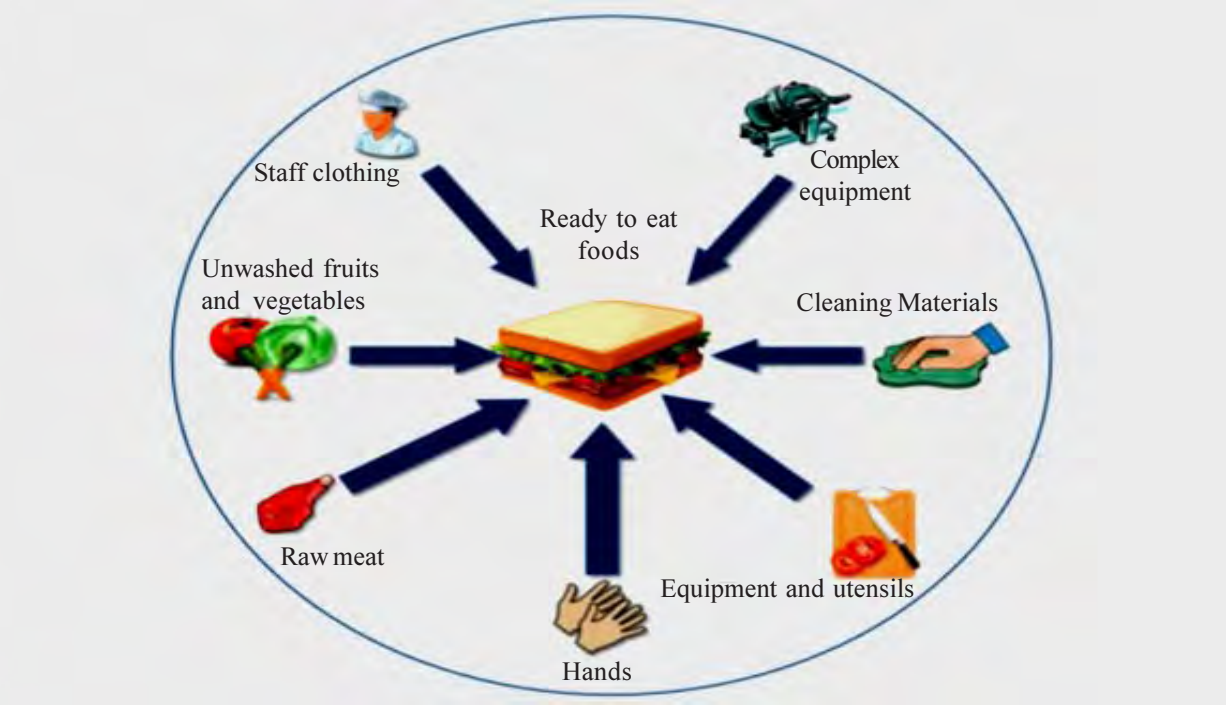
Cross contamination causes food poisoning when harmful bacteria e.g. *Salmonella, Yersinia, Campylobacter, E. coli, Clostridium etc.* are transferred to food products. Most common is the *Campylobacter.* Certain food borne diseases are diarrhoea, typhoid, enteritis including symptoms like nausea, vomiting, fatigue, fever, bloody stool etc.

Sources

Food handlers, equipment, food contact surfaces and food itself are the main common sources of cross contamination. Ignorance about food hygiene i.e. Good Hygiene Practices (GHP), insufficient work space, bad handling processes of the cook etc. leads to cross contamination in kitchen. Main sources are

1) **Storage of food:** Storing of RTE food above or next to the high risk food i.e. milk, meat, poultry, sea food etc. facilitates the transfer of micro-organisms from these to RTE food. For example, raw meat kept near cooked food cause cross contamination through blood drip and transfer of *Salmonella.*Unpasteurized milk facilitates transfer of bovine *E.coli* to other food.

2) **Contaminated equipment:**Dirty clothes, knives, chopping boards, unwashed utensils, fridge handle etc. act as the mode of transmission of microbes from contaminated food to fresh food causing food borne diseases.



3) **Food handlers:**Food handlers not allowing Good Manufacturing Practices (GMPs) are the chief mode of cross contamination. Handling raw food carrying microbes and then handling cooked food by not washing hands properly allows microbes to pass through hand and equipment.

4) **Others:**Improper cleaning of kitchen, poor drainage system helps in developing cross contamination by facilitating growth of flies, insects, rats, cockroaches, moles etc. Soiled uniforms and gloves as well as soiled fruits and vegetables facilitate microbial infestation in food.

Prevention

Cross contamination is manmade; hence, it can be prevented by following certain criteria carefully by the handlers in kitchen. These are as follows:

1) **GMP and GHP implementation:** Washing hands properly, keeping food covered, using separate equipments and surfaces for raw and cooked food, using mask and avoiding coughing, smoking, sneezing etc. during cooking, sanitizing utensils etc. are very helpful in preventing cross contamination.

2) **Safe and proper storage:** Storing RTE food and raw food separately, keeping raw food below the RTE food while kept in same refrigerator can be done to minimize contamination in food.

Proper training to employees and food handlers about GMP, GHP and nutrition education at household level to maintain proper sanitation during preparation, preservation and consumption of food is the best way of avoiding cross contamination as well as food borne illness.

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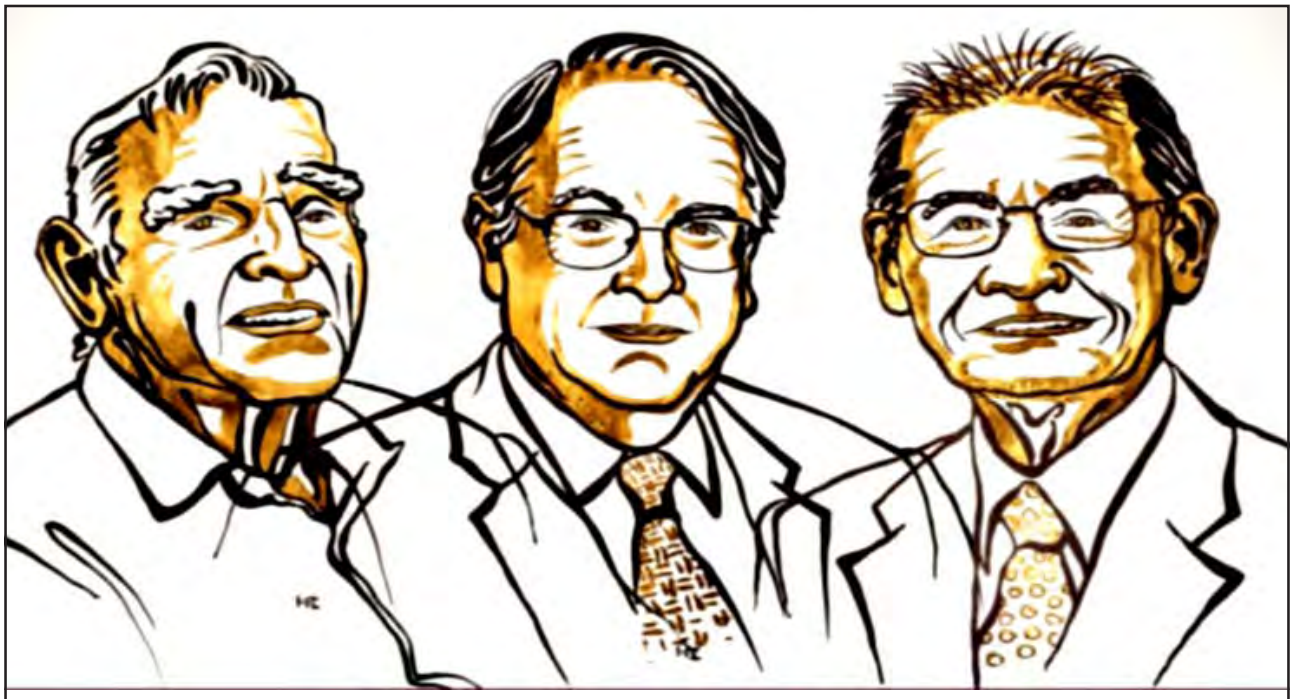
BATTERY SET FETCHES NOBEL PRIZE IN CHEMISTRY -2019

Prof. Ramesh Chandara Parida

The countless smart phones, laptops as well as other portable electronics that we use today and the new generation electric vehicles that have begun to ply on the roads have become possible because of the use of a type of rechargeable battery called lithium – ion battery, whose popularity for military and aerospace applications are also rapidly growing. It was developed by John B. Goodenough and M.Stanley Whittingham of the USA and Akira Yoshino of Japan. Taking into consideration the epoch-making inventions they have made such batteries that can serve mankind to overcome the fast depleting resources of fossil fuels as well as the problem of worsening air pollution. They have been rightly honoured with the coveted Noble Prize in Chemistry -2019.

Goodengough was born in 1922 in Jena of Germany and did his Ph. D from the University of Chicago in 1952. Now he occupies the Virginia H. Cockrell Chair in Engineering at the University of Texas. At the age of 97 he is the oldest ever person to have received the prize. Similarly, Whittingham who was born in U.K in 1941 , did his Ph. D. in 1968 from the Oxford University and is now the Distinguished Professor at the Binghamon University, the State University of New York. On the other hand Yoshino, born in 1948 in



John B Goodenough, M Stanley Whittingham and Akira Yoshino

Suita, Japan obtained his Ph.D. from the Osaka University in 2005 and is serving as an Honorary Fellow at the Ashai Kasei Corporation Tokyo and a Professor at the Meijo University, Nagoya, Japan.

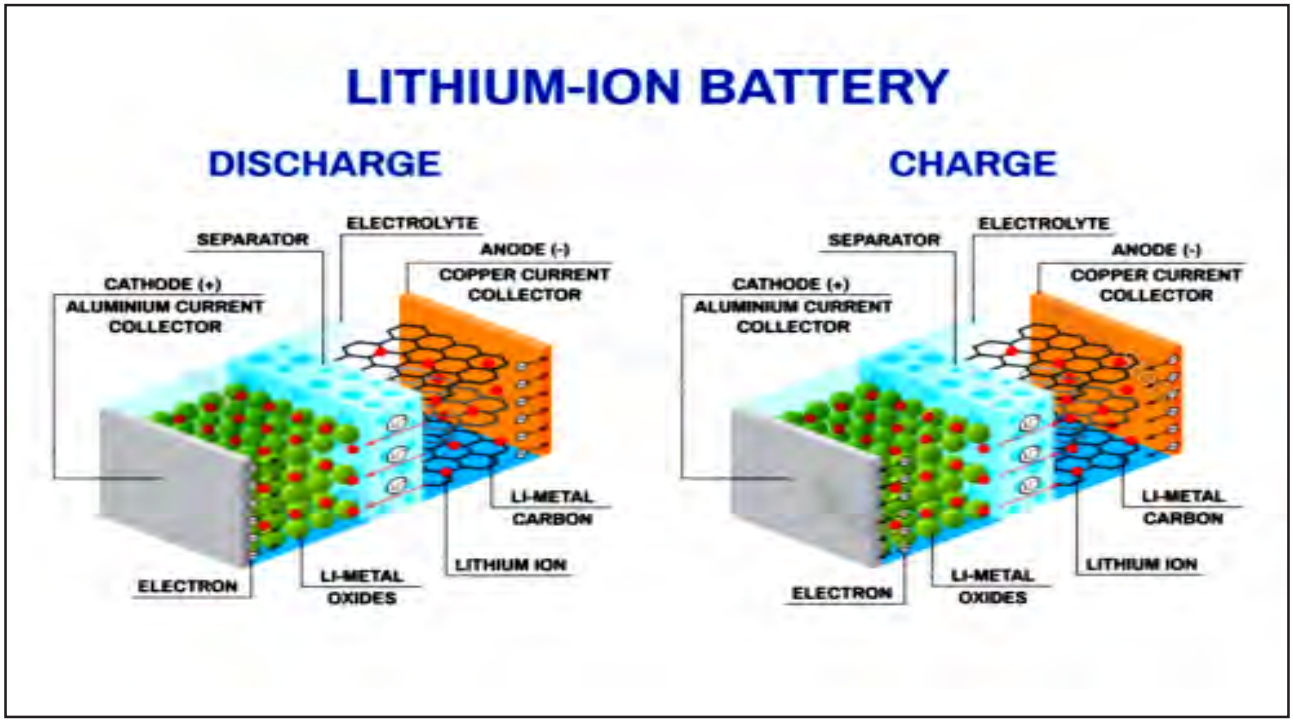
The history of the development of the lithium – ion battery goes back to 1970s, the years of oil crisis due to the Gulf War. Then Wittingham worked on developing methods that could lead to fossil fuel-free energy technologies. He could discover an energy-rich material to create an innovating cathode in a lithium battery . It was made from titanium disulphide as cathode, which at a molecular level has space to accommodate – intercalate – lithium ions. The anode was partially made from metallic lithium, having strong drive to release electrons. The battery has a potential, just over 2 volts, but it could not be quite viable as metallic lithium is very reactive.

Then Goodengough, in order to increase the potential of the battery, thought of using a metal oxide as the cathode instead of a metal sulphide, as used by Wittingham. So in 1980 he demonstrated that a cathode made up of cobalt oxide with intercalated lithium ions could produce as much as 4 volts. It led to production of more powerful batteries. Thereafter, Yoshino created the first commercially viable lithium ion battery in 1985 using this cathode. Then he replaced the reactive lithium in the anode by petroleum cake, a carbon material, that like the cathode's cobalt oxide could intercalate lithium ions. It led to the production of light – weight hard wearing batteries, which could be charged

hundreds of times before their performance deteriorated. Those entered the market in 1991. The advantage of such batteries is that these are not based upon chemical reactions that break down electrodes, but upon lithium ions flowing back and forth between the anode and the cathode.

At present, various variants of lithium - ion batteries are available. As for example, certain companies are mostly using lithium polymer batteries (with a polymer gel as the electrolyte instead of a relatively more inflammable organic matter like ether) with lithium cobalt oxide as the cathode material. It offers high energy density but presents safety risks, especially when damaged. Besides batteries with lithium iron phosphate, lithium manganese oxide and nickel manganese cobalt oxide cathodes are also now available. These offer low energy density but longer life and lesser risks. Such batteries are now widely used for electric tools, medical equipment and many other things. Of these the last one has acquired importance because of its applications in automobiles.

Again research is going on to improve the qualities of lithium –ion batteries including life extension, energy density, safety, cost reduction, charging speed etc. Attentions have also been focused on areas of developing non-flammable electrolytes, which can be safer and can be used to replace flammable and volatile organic solvents now in use in typical electrolytes. These efforts include the strategies like the development of aqueous lithium-ion batteries ceramic solid electrolytes, polymer electrolyte, ionic liquids and heavily fluorinated systems. All these developments lead to the optimism that one day, in near future, lithium- ion batteries can



Lithium Ion Battery

play a very effective role in making our society fossil fuel- free and in reducing air pollution. Therefore, Goodengough, Whittingham and Yoshino, the trio who have equally shared the 9 million Swedish krona Nobel Prize in Chemistry this year have done a great service to the mankind through their work, which according to Sara Snogerup Linse, a member of the Noble committee, gave us "access to a technical revolution", amply justifying it.

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GRETA THUNBERG-THE TEEN-AGER 'CLIMATE CHANGE' ACTIVIST

Prof. Gopendra Kishore Roy

"You have stolen my dreams and my childhood with your empty words. People are suffering. People are dying. Entire ecosystems are collapsing. We are in the beginning of a mass extinction. And all you can talk about is money and fairy tales of economic growth."- These were the excerpts from the speech of sixteen-year old Swedish climate activist Greta Thunberg in the 2019 United Nations Climate Action Committee meeting held on 23rd September last in the New York city. The assembled world leaders, many of whom were of her parents' age and a few of the age of her grand - parents were deeply moved by the teen-ager's words and there was wide media coverage of her speech.

The beginning

Greta Thunberg, the daughter of opera singer Malena Ernman and actor Svante Thunberg was born on 3rd January 2003 in Stockholm. She first heard about climate change when she was eight year old and could not understand why enough action is not being taken to counter it.

She wished to address the issue in her way and as a first step convinced her parents to adopt a few life style choices to reduce their own carbon foot print which include giving up

air travel (which indirectly affected her mother's professional career) and not taking meat. Her environmental concern focussed on the risk posed by 'global warming' and soon she started creating public awareness.

The 'Thought movement'

In August, 2018, when in ninth standard, Greta took time off school to demonstrate in front of the Swedish parliament holding a placard with a note "Skolstrejk for klimatet" (meaning 'school strike for the climate') signalling for stronger climate action. Soon her fellow students organized similar protests in their own communities. Thus under the banner 'Fridays for Future', started a 'school climate strike' movement. Students all over the globe were inspired and student strikes for climate action took place almost every week somewhere. By December, 2018, over 20000 students held such strikes in at least 270 cities.

Greta Thunberg with 'climate' placard

Greta Thunberg in different world forum

With endorsement of her parents , appreciation by the contemporary society and strong support by her peers, Greta Thunberg's activity drew wide public attention and she was invited to express her views on the issue in different world forums.

On 4th December, 2018, Greta addressed the COP-24 United Nations Climate Change Summit at Katowice, Poland and spoke before the Plenary assembly on 12th December highlighting the issue of global warming.

For her next address on 23rd January 2019 to a gathering of world leaders of World Economic Forum in Davos, Switzerland, Greta took a 32 hour long train journey (avoiding flight to reduce her carbon foot print) from her home town. By that time, she had galvanized 1000,000 fellow teens around the world to follow her example in striking for the climate.

In her address to a conference of the European Economic and Social Committee on 21st February,2019, she said that limiting 'global warming' to less than 2^0C goal established at the Paris agreement of 2015, the European Union must reduce the CO_2 emission by 80% by 2030 which is double the 40 % goal set in the above agreement.

On 29th March, 2019, Greta spoke to around 25000 people near the Brandenburg Gate (The gate on the Berlin wall separating the east and the west Germany, which was demolished after the merger of the two in 1990) in Berlin arguing that the world children must sacrifice their own education in order to protest against the destruction of their own future.

The greatest recognition to her movement came recently through her inspiring address on 23rd September, 2019 to the world

leaders at the United Nations Climate Action Committee held in New York city. To attend the meeting, her 14-day journey from the UK to the U.S. across the Atlantic in her zero emission yacht to minimize carbon foot print and reduce damage to the environment was a strong message.

Recognition and awards

Time magazine named Greta Thunberg one of the world's 25 most influential teenagers of 2018 and in April,2019, she was named as **one of the 100 most influential people of 2019** by the same magazine. She featured later on the cover of the May -2019 issue of the Time magazine described as a 'role model' and one of the 'next generation leaders'.

On the occasion of the International Women's Day 2019, Greta was proclaimed **the most important woman of the year in Sweden in 2019**.

In course of her visit to Germany for public address in the last week of March 2019, she received the **German Goldene Kamera Special Climate Protection Award** on 31st March, 2019.

On 12th April 2019, Thunberg shared the **Norwegian Fritt Ords Prize** celebrating freedom of speech with Nature and Youth organization.

Amnesty International announced on 7th June, 2019 to give Thunberg their prestigious **Ambassador of Conscience Award** for her leadership in the climate movement.

On 12th July, 2019 Royal Scottish Geographical Society awarded Thunberg the Geddes Environmental Medal along with its Honorary Fellowship to her.

Thunberg was named as one of the four winners of the **2019 Right Livelihood Award, known as Sweden's alternative Nobel Prize** on 25th September 2019.

Swedish and Norwegian parliaments have nominated Greta Thunberg as a candidate for **Nobel Peace Prize**.

The impact

Within a period of little over one year, there has been visible global impact of the movement initiated by the teen ager climate change activist- GretaThunberg. Her message has been accepted, acclaimed and propagated. In February 2019, 224 academics signed an open letter of support stating they were inspired by the actions of Thunberg and the striking school children in making their voices heard. The 'Friday School Climate Strike' initiated by Thunberg has been endorsed by United Nations Secretary General- Antonio Guterres.

On 20th September i.e. three days prior to her address in UN Climate Action Committee on 23rd September, 2019 (Friday) , under the banner of " Friday School Climate Strike", hundreds of thousands of young people around the world took part in the Global Climate Strike. More than 4500 strikes were planned world wide in over 120 countries and around 50 strikes were registered in the US

alone. About four million joined in the mammoth demonstration across the globe.

The voice of concern raised by the teen-agers is definitely a call not only to the global policy makers but to all of us-the elders of the human society to share our mutual responsibility to act as 'Trustees of the Earth' and hand over it as a safer and healthier habitat to our future progeny as we had inherited it from our ancestors.

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WORLD SCIENCE DAY FOR PEACE AND DEVELOPMENT

World Science Day for Peace and Development is celebrated every year on10 November to highlight the important role of science in society and the need to engage the wider public in debates on emerging scientific issues. It aims to raise the awareness on the importance of science in promoting a sustainable development and paving the way for peace. It also underlines the importance and relevance of science in our daily lives. By linking science more closely with society it aims to ensure that citizens are kept informed of developments in science.

Science led to the creation of penicillin and the atomic bomb, PV panels and GM-crops. Science is anything else than an instrument at the service of humanity aiming at technological and spiritual development. In order to promote a responsible use of science and underline its essential contribution to society, on 10 November the World Science Day for Peace and Development is celebrated, established by the UNESCO in 2001.

This year the theme is "Open science" which is a burning issue in the scientific community and is gaining increasing attention by the non scientific community as well.

QUIZ : ACID, BASE & SALT

Binod Chandra Jena

1. Which one is a Base ?
a) Hydrochloric Acid
b) Sulphuric Acid
c) Nitric Acid
d) Calcium Oxide

2. Which one is an Alkali ?
a) Sodium Chloride
b) Magnesium Oxide
c) Sodium Hydroxide
d) Hydrogen Sulphide

3. Which one is a Strong Acid?
a) Nitric Acid
b) Formic Acid
c) Acitic Acid
d) Phosphoric Acid

4. Which one is a strong Alkali ?
a) Ammonium Hydroxide
b) Magnesium Hydroxide
c) Calcium Hydroxide
d) Potassium Hydroxide

5. Which one is a weak Alkali?
a) Sodium Hydroxide
b) Ammonium Hydroxide
c) Zinc Hydroxide
d) Potassium Hydroxide

6. Which one is a Monobasic Acid?

a) H_2SO_4 b) H_3PO_4

c) HCL d) H_3NO_3

7. Which one is a Mono Acid base?

a) NaOH b) $Ca(OH)_2$

c) $Zn(OH)_2$ d) $Mg(OH)_2$

8. Which one is a dia Acidic base?

a) KOH b) Na OH

c) NH_4OH d) $Ca(OH)_2$

9. Which one is the Tribase Acid ?

a) HCL b) H_2SO_4

c) H_3PO_4 d) HNO_3

10. Which one is the Tri Acid base ?

a) $Al(OH)_3$ b) NH_4OH

c) $Mg(OH)_2$ d) NaOH

11. Which element reacts with a non-metal to form an acid ?

a) Oxygen b) Hydrogen

c) Sodium d) Potassium

12. Which gas reacts with a metal to form a base ?

a) Hydrogen b) Nitrogen

c) Oxygen d) Methane

13. Sodium Chloride when reacts with Sulphuric Acid, forms Sodium Sulphate. Name the other product in the reaction.

a) Sodium Sulphide

b) Sodium Hydride

c) Sodium Hydroxide

d) Hydrochloric Acid

14. Ferric Chloride when reacts with sodium Hydroxide produces sodium chloride. Name the other product.

a) $Fe(OH)_3$ b) $Fe(OH)_2$

c) FeO d) Fe_2O_3

15. When Lead Nitrate is heated it produces Lead Oxide and Nitrogen Dioxide. Name the other product.

a) Nitrogen

b) Oxygen

c) Hydrogen

d) lead

16. Which of the compound turns blue litmus to red litmus ?

a) NaOH b) KOH

c) HCL d) CuO

17. Which of the compound turns red litmus to blue litmus ?

a) H_2SO_4 b) NaCL

c) H_3PO_4 d) KOH

18. Sodium Chloride reacts with sulphuric Acid to produce Hydrochloric Acid. What is the other product ?

a) $NaHSO_4$ b) $NaHSO_3$

c) Na_2S d) Na(OH)

19. Sodium Carbonate reacts with Hydrochloric Acid to produce Sodium Choiride and water. What is the other product ?

a) Na_2O b) NaH

c) CO_2 d) $NaHCO_3$

20. Ferric Chloride when reacts with sodium Hydroxide produces sodium chloride. Name the other product.

a) $FeOH_2$ b) $Fe(OH)_3$

c) FeO d) Fe_2O_3

21. Ammonium chloride reacts with Sodium Hydroxide to produce Sodium chloride and water. What is the other product ?

a) NH_4OH b) NaOH

c) Na_2O d) NH_3

22. Which one is the Acid Salt ?

a) $NaHSO_3$ b) Na_2SO_3

c) Na_2CO_3 d) Na_3PO_4

23. Which one is the normal salt ?

a) $NaHCO_3$ b) NaH_2PO_4

c) $NaNO_3$ d) $NaHSO_4$

24. What is the pH value of Lactic Acid ?

a) 1.6 b) 4.6

c) 5.6 d) 6.6

25. What is the pH value of Albumin (egg) ?

a) 5.9 b) 7.9 c) 11.1 d) 8.5

ANSWER

01. (d)	02. (c)	03. (a)	04. (d)	05. (b)
06. (c)	07. (a)	08. (d)	09. (c)	10. (a)
11. (b)	12. (c)	13. (d)	14. (a)	15. (b)
16. (c)	17. (d)	18. (a)	19. (c)	20. (b)
21. (d)	22. (a)	23. (c)	24. (d)	25. (b)

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RECENT NEWS ON SCIENCE & TECHNOLOGY

Nobel Prize in Physics

The Royal Swedish Academy of Sciences announced on October 8 the names of three scientists to be awarded the 2019 Nobel Prize in physics for groundbreaking discoveries about the evolution of the Universe and the Earth's place within it.

The Canadian scientist James Peebles has been awarded half of the 9 million Swedish kronor (£740,000) prize for his theoretical discoveries about the evolution of the universe. A Swiss duo of astronomers, Michel Mayor and Didier Queloz, will share the other half of the prize for their discovery of the first planet beyond our solar system.

James Peebles was rewarded for laying a foundation for modern cosmology, including his realisation that the faint microwave radiation that filled the cosmos just 400,000 years after the Big Bang contains crucial clues to what the universe looked like at this primitive stage and how it has evolved over the subsequent 13 billion years. Results of his study show that ordinary matter makes up just 5% of universe's contents, with the rest being dark matter and dark energy.

Mayor and Queloz have been recognised for their joint discovery in 1995 of the first exoplanet 50 light years away in the constellation of Pegasus. The planet, 51 Pegasi b, is a gaseous ball about 150 times more massive than the Earth and with a scorching


James Peebles


Didier Queloz


Michel Mayor

surface temperature of 1000^0 C. The discovery heralded a new era of astronomy, with astronomers having since found more than 4,000 exoplanets, with an incredible range of sizes, forms and orbits. This has transformed our understanding of how planets formed and given new focus to the question of whether there could be alien life out there somewhere.

James Peebles, born in 1935 in Winnipeg, Canada, is now working as Albert Einstein Professor of Science at Princeton University, USA. Michel Mayor , born in 1942 in Lausanne, Switzerland, is now working as Professor at University of Geneva, Switzerland. Didier Queloz, born in 1966, is now working as Professor at University of Geneva, Switzerland and University of Cambridge, UK.

Nobel Prize in Chemistry

The Nobel Prize in Chemistry 2019 is awarded to John B. Goodenough, M. Stanley Whittingham and Akira Yoshino for their contributions to the development of the lithium-ion battery. This rechargeable battery laid the foundation of wireless electronics such as mobile phones and laptops. It also makes a fossil fuel-free world possible, as it is used for everything from powering electric cars to storing energy from renewable sources.

In the early 1970s, Stanley Whittingham developed the first functional lithium battery. He used titanium disulphide in the cathode and metallic lithium in the anode of the battery. He got 2 Volt at the terminal of the battery. In 1980, John Goodenough doubled the battery's potential by using lithium-cobalt oxide in the cathode and metallic lithium in the anode. In 1985, Akira Yoshino eliminated the use of pure lithium from the battery as it was explosive in nature. He used lithium-cobalt oxide in the cathode and petroleum coke in the anode. In modern battery, graphite is used in the anode.

Goodenough is born in 1922 in Jena, Germany and is now working in the University

John Goodenough **M. Stanley Whittingham** **Akira Yoshino**

of Texas at Austin, USA. Whittingham is born in 1941 in the UK and is now working as Distinghished Professor at Binghanton University, State University of New York, USA. Yoshino, born in 1948 in Japan is now working as Professor at Meijo University, Nagoya, Japan.

Nobel Prize in Physiology or Medicine

The Nobel Prize in Physiology or Medicine 2019 was awarded jointly to William G. Kaelin Jr, Sir Peter J. Ratcliffe and Gregg L. Semenza "for their discoveries of how cells sense and adapt to oxygen availability."

William G. Kaelin Jr **Sir Peter J. Ratcliffe** **Gregg L. Semenza**

Animals need oxygen for the conversion of food into useful energy. The fundamental importance of oxygen has been understood for centuries, but how cells adapt to changes in levels of oxygen has long been unknown.

The Nobel Laureates discovered how cells can sense and adapt to changing oxygen availability. They identified molecular machinery that regulates the activity of genes in response to varying levels of oxygen.

The seminal discoveries by this year's Nobel Laureates revealed the mechanism for one of life's most essential adaptive processes. They established the basis for our understanding of how oxygen levels affect cellular metabolism and physiological function. Their discoveries have also paved the way for promising new strategies to fight anaemia, cancer and many other diseases.

Born in 1957 in New York, William G. Kaelin Jr, is now working as Professor at Harvard Medical School.

Born in 1954 in Lancashire, UK, Sir Peter J. Ratcliffe is now the Director of Clinical Research at Francis Crick Institute, London.

Born in 1956 in New York, Gregg L. Semenza is now the Director of the Vascular Research Program at the Johns Hopkins Institute for Cell Engineering.

20 new moons of Saturn Discovered

20 new moons of Saturn have been discovered, that brings the ringed planet's total known satellites to 82, the International Astronomical Union's Minor Planet Center announced on October 7. Earlier Jupiter had the largest number with 79 moons. Three of the newfound moons are prograde, orbiting in the same direction that Saturn rotates, while 17 are retrograde, travelling in the opposite direction. Each is between 2 and 5 kilometers wide. Two of those prograde moons orbit fairly close to the planet while one is farther out where it circles Saturn in three years.

Further, it is expected Saturn to have some more moons. Scott Sheppard, an astronomer at the Carnegie Institution for Science in Washington, D.C. estimates that Saturn has about 100 moons - but the remaining ones are so small, under 1 kilometer across, that they're hard to identify.

A new technique to protect copper from corrosion

Researchers at Indian Institute of Technology (BHU), Varanasi, have developed a new method that promises to protect copper, which is one of the most popular commercial metals, from corrosion in a cost effective manner. Over the years, scientists have developed several techniques to combat the problem of corrosion of copper. However, they are very expensive or highly complex or provide incomplete protection in acidic media.

The new method promises to overcome these problems.

Researchers used technique called 'floating film transfer method' to obtain ultrathin films of an organic material, squaraine, and to transfer it over the copper articles as layers. The anti-corrosion activity was tested in the presence of hydrochloride using electrochemical techniques as well as surface characterization techniques. The tests showed that nearly 40% corrosion protection is reached with just one layer of squaraine and increased up to 98% with four layers.

There are several ways to protect copper from corrosion, but squaraine has an interesting chemical structure. It has a hydrophobic functional group at one end, a hydrophilic functional group at the other end and the two are connected to a square unit in the middle. This helps it dissolve in both hydrophobic and hydrophilic solvents and enables it to be drawn out in the form of thin films. Since metal surfaces are hydrophilic, if squaraine is coated on them, its hydrophilic end interacts with the metal surface and the hydrophobic end hangs out in air and thus repelling corrosive molecules.

For their experiment, the researchers filled a petridish with distilled water up to three-fourth of its height and the upper water surface was cleaned multiple times with small strips of lint free tissue to ensure that there was no contamination. One drop of squarine solution in chloroform was released over the water surface. A blue circular floating film was formed at the air-water interface within seconds. The film was then carefully lifted on to a copper strip and washed gently with a stream of distilled water followed by vacuum drying. The researchers kept depositing layer after layer and after adding every layer tested the anti-corrosion behavior of the layer.

The study results have been published in journal *Scientific Reports*.

Cosmonaut Alexei Leonov Died at 85

Soviet cosmonaut Alexei Leonov, who in 1965 became the first person to walk in space before co-leading the first joint mission between Russia and the United States, has died on 11 October 2019 at the age of 85.

Launched on Voskhod 2, the world's 17th human spaceflight, on March 18, 1965, Leonov made history as the first person to exit his spacecraft for an extravehicular activity (EVA). Ultimately, Leonov made it safely back inside after 12 minutes and 9 seconds floating outside his spacecraft.

Leonov's second spaceflight came a decade later with the lift off of the Apollo-Soyuz Test Project (ASTP), the first mission conducted jointly between the United States and Russia.

Launched on July 15, 1975, Leonov and his crewmate, Valery Kubasov, docked their Soyuz spacecraft two days later to an Apollo spacecraft carrying astronauts Thomas

Stafford, Deke Slayton and Vance Brand. The two crews spent almost two days together, conducting scientific experiments and taking part in cultural exchanges. The mission served a precursor to the later Shuttle-Mir flights and the establishment of the International Space Station. He had completed 113 orbits of Earth on his two missions.

Alexei Arkhipovich Leonov was born on May 30, 1934, in the town of Listvyanka, near Mariinsk in Siberia. He was serving as a Soviet Air Force parachute instructor when he was selected for the first cosmonaut class three years later.

For his service to his nation, Leonov was twice named a Hero of the Soviet Union and awarded the Order of Lenin, among many other honors. The Leonov crater, on the far side of the Moon, was named after Leonov in 1970. In 2004, Leonov co-authored the joint autobiography "Two Sides of the Moon: Our Story of the Cold War Space Race" with Apollo 15 moonwalker David Scott.

ICON Space Weather Satellite

On October 12, 2019 NASA (National Aeronautics and Space Administration) has launched a satellite called ICON or Ionospheric Connection Explorer to study Earth's Ionosphere. The ICON satellite rocketed into orbit following a two-year delay and was dropped from a plane flying over the Atlantic off the Florida coast. It will study the link between space weather and Earth weather. Five seconds after the satellite's release, the attached Pegasus rocket ignited and sent ICON on its way. It will study the airglow formed from gases in ionosphere and also measure the charged environment right around the 580-kilometer-high spacecraft. The ionosphere is the charged part of upper atmosphere extending several hundred kilometers up. It is in constant flux as space weather bombards it from above and Earth weather from below, sometimes disrupting radio communications. It is our frontier with space and thus acts as a protected layer present at the top of our atmosphere. Importance: Besides Sun, the hurricanes, tornadoes and other extreme weather conditions on Earth are also adding energy in this region. Therefore, the more scientists know, the better spacecraft and astronauts can be protected in orbit through improved forecasting.

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EDITOR

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1. "SCIENCE HORIZON" aims at developing the scientific outlook of students as well as the general people and seeks to give them information on scientific developments. It is published as a monthly magazine.
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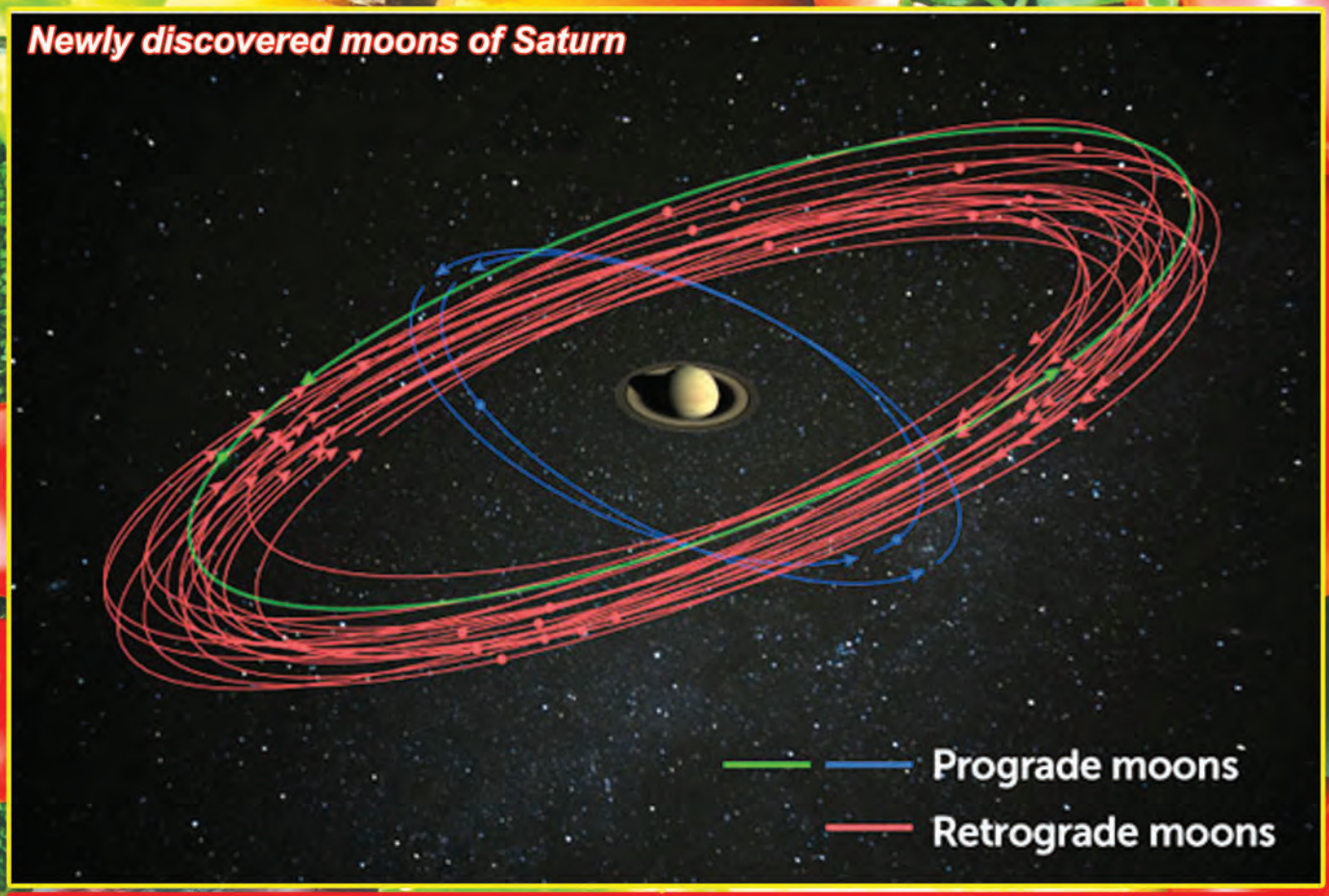
Newly discovered moons of Saturn



Lithium-Ion Batteries

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