



The BLUE JAY SCIENCE MAGAZINE

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EDITORIAL

Dear readers,

India has no dearth of scientific talents. And many of them are really close to us. Close enough that we can learn from each moment of their life. We are starting from this issue a new series of articles introducing such great scientists to the world. Another article in this issue explains the buzzword – nano, which now means 'a car' to many. With all the featured and regular articles, I hope you will have a happy reading.

Bikash Ranjan Mohanty, Ph.D
Vijayawada, India

NEWS BYTES

A new flu strain

A new strain of swine influenza is suspected of infecting over 4,396 people globally, causing deaths in Mexico and the United States. The disease, which is believed to have originated in Mexico, has now spread across the globe, with confirmed cases having been reported in Canada, the United Kingdom, Spain, New Zealand, Costa Rica and Israel. As a result, the World Health Organization (WHO) raised the pandemic alert level to 5.

Accurate blood test for ovarian cancer

Researchers at Yale School of Medicine develop a blood test which detects early stage ovarian cancer with 99 percent accuracy. They hope this test will become the standard of care for women having routine examinations."

India buys 250,000 laptops for school children

Two Indian government organizations have placed orders for 250,000 XO-1 laptop computers. The laptops, designed by the One Laptop Per Child Association, will be distributed to students in nearly 1,500 schools.

Biofuels may not be beneficial

New studies in the journal Science conclude biofuels are not beneficial to climate change, as they require increased land use to grow crops and unintentionally increases the cost of food.

Discovery of smallest exoplanet yields 'extraordinary' find

British astronomers have discovered the smallest known Earth-like exoplanet orbiting a living star called Gliese 581 e and also discovered that a nearby planet called Gliese 581 d, discovered in 2007, in the much sought after 'habitable zone'. Astronomers also believe there is a possibility that 581 d could have liquid oceans on its surface, calling the find "extraordinary."

Courtesy – WikiNews & ScienceDaily

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PROF. TEJ NARAYAN TIWARI:

AN EMINENT PERSONALITY IN ENVIRONMENTAL PHYSICS

Subhanshu Sekhar Samal

Professor Tej Narayan Tiwari is an Ex-Professor and the Head of Physics Department, NIT Rourkela (Orissa). He had his education at Gujarat, Calcutta and Sambalpur Universities in India, and at University of California and International University in the USA. Prof. Tiwari holds a master Degree in Nuclear Physics, a Ph.D in Theoretical Physics and D.Sc in Environmental Science. He has received advanced training in Nuclear Physics at Saha Institute of Nuclear Physics, Kolkata and conducted research under the guidance of Noble Laureate Prof. (Mrs) M. G Mayer at University of California, San Diego (USA)

Dr. Tiwari taught physics and mathematics courses to undergraduate and post graduate students at NIT Rourkela. In addition, he has taught a course in nuclear power engineering to Electrical Engineering students and a course in environmental chemistry to post-graduate chemistry students at the same institute. Dr. Tiwari has conducted and guided research in many different areas such as Theoretical Physics, Applied Mathematics, Mathematical Biology, Physical Oceanography, Environmental engineering, education and management. He has published more than 350 research papers and review articles in these areas in various national and international journals. In addition he has published six books in English and Hindi including a book on noise pollution, a book on society and environment, and a book on Environmental Engineering.

He has done pioneering research in the areas of water quality index, correlation among water quality parameters, noise pollution, food pollution and biomedical waste.

Twenty two students have already completed their PhD under his supervision and 10 more students are presently doing research.

Dr. Tiwari holds three all India records, which have been listed in the 1993, 1996 and 1997 editions of the prestigious Limca Book of Records. These include a record of publishing highest number of research paper in one year and another for publishing highest number of research paper in India on environment. For his teaching and research activities, he has received more than two dozens of awards and gold medals from various learned societies and organization in India and abroad. His bio-data has been included in many directories published in India, Malaysia, Australia, UK, and USA such as distinguished personalities of India, International Directories of Distinguished Leadership, Eminent men and women of Asia, Ind-American Who's Who, Indo-Asian Who's Who, etc. He is fellow of various societies such as Indian Association of environmental Management (IAEM), Indian Academy of Environmental Science (IAES), Indian Water Works Association (IWWA), Management studies Promotion Institute (MSPI), Society for Allied Health Science (SAHS) etc. In addition, he is a life member of many more learned societies such as National Academy of Science (NAS) and Indian Institute of Chemical Engineers (IICChE). Prof. Tiwari is in the editorial board of several research journals such as Journal of current sciences, Bulletin of Pure and Applied Sciences and Applied science periodicals.

He remains as a constant source of inspiration for many Indians who wish to make a career in science. The Blue Jay Science Club wishes him very best for his successful life.

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SCIENCE CAPSULE

How pearls are made?

Abhilipsa Das

From very ancient time the stunning beauty of pearl has attracted many people but the birth of pearl was a mystery till Kokichi Mikimoto first cultured the pearl artificially in 1893. Pearls are made by molluscan bivalves or clams such as marine pearl-oysters and freshwater pearl-mussels. The miraculous event of natural pearl formation takes place when any foreign particle (organic matters, adult parasites or larvae,



molluscan eggs, decaying parts of plants or sand grains) enter into the molluscan shell and become embedded between the shell and mantle. To protect the body from the foreign intruder, the internal and external layer of epithelium form a sac-like structure around it called as "pearl-sac" or "mother of pearl". These pearl-sacs secrete a layer of a substance called nacre, which becomes deposited over the foreign body and form countless layers around the particle, forming a pearl in due course of time. The nacreous matter consists of thin alternate layers of aragonite and conchiolin. The conchiolin is organic in nature and consists of muco-polysaccharides. But such pearl production is accidental and occurs very rarely. An ideal environment is needed to create this beautiful gem. Thanks to human intervention. Careful monitoring and culture practice made us possible to get this lustrous gem in our hand.

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HEALTH IS WEALTH

Typhoid

Pradipta Ranjan Rauta

Typhoid fever, also known as enteric fever, or commonly just typhoid, is an illness caused by the bacterium *Salmonella enterica* serovar Typhi. The name of the illness is derived from the Greek word 'typhos', meaning stupor. Although typhoid fever is now rare in most industrialized countries, it remains a serious health problem in much of the developing world. The World Health Organization estimates that about 16 million cases of typhoid fever occur annually in the world causing more than 600,000 deaths. Common worldwide, it is transmitted by the ingestion of food or water contaminated with feces from an infected person. The bacteria then perforate through the intestinal wall and are phagocytosed by macrophages. *Salmonella typhi* then alters its structure to resist destruction and allow them to exist within the macrophage. This renders them resistant to damage by the immune response. The organism is then spread via the lymphatics while inside the macrophages. This gives them access to the reticuloendothelial system and then to the different organs throughout the body. This bacterium is a Gram-negative short bacillus that is motile due to its peritrichous flagella. The bacteria grow best at 37 °C/99 °F – human body temperature.

Symptoms of the disease vary from case to case but often include intermittent fever, headache, tiredness and weakness, changes in behavior, rose-colored spots on the chest area,



enlarged spleen and liver and abdominal discomfort with constipation in the early stages of the disease followed by the diarrhea later. The most severe complications of typhoid are intestinal bleeding and perforation. Intestinal bleeding occurs in about 5% of typhoid cases. It occurs during 2-3 weeks after infection with sudden deterioration developing malaise, fall in blood pressure, fall in temperature and increased pulse rate. Perforation occurs in about 4-5% of typhoid cases wherein ulcerated intestine perforates and the gut content leaks into the abdominal cavity causing infection.

Diagnosis is made by any blood, bone marrow or stool cultures and with the Widal test (demonstration of *Salmonella* antibodies against antigens O-somatic and H-flagellar). In epidemics and less wealthy countries, after excluding malaria, dysentery or pneumonia, a therapeutic trial with chloramphenicol is generally undertaken while awaiting the results of Widal test and blood cultures.

Typhoid fever in most cases is not fatal. Antibiotics, such as ampicillin, chloramphenicol, trimethoprim-sulfamethoxazole, amoxicillin and ciprofloxacin, have been commonly used to treat typhoid fever in developed countries. Prompt treatment of the disease with antibiotics reduces the case-fatality rate to approximately 1%.

As prevention is better than cure, sanitation and hygiene are the critical measures that can be taken to prevent typhoid. There are two vaccines currently recommended by the World Health Organization for the prevention of typhoid: these are the live, oral Ty21a vaccine (sold as *Vivotif Berna*) and the injectable Typhoid polysaccharide vaccine (sold as *Typhim Vi* by Sanofi Pasteur and *Typherix* by GlaxoSmithKline).

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NANOTECHNOLOGY:

SMALL THING, BIG FUTURE!!!

Ananya Nayak

Nanotechnology is not really anything new. It deals with entities and processes on the scale of 10^{-9} m (1 nanometre), which is the dimension of molecules and atoms.

What does 'nano' mean?

The prefix 'nano' is derived from the Greek word '*nanos*' meaning dwarf or extremely small.

How big is 'Nano'?

Nanometre is 10^{-9} m, which is one billionth of a metre.

What is Nanoscience/Nanotechnology?

Nanoscience is defined as the study of phenomena and manipulation of materials at the nanoscale.

QUIZ CORNER

Who was the first Indian scientist to get a Noble Prize?

Answer to April 2009 Puzzle Corner: 5th June

How do you 'see' nano size particles?

You cannot use conventional optical microscopes, as the particles are smaller than the wavelength of light. The most common types of microscope used for 'looking' at nanoparticles are the AFM: Atomic Force Microscope, the SEM: Scanning Electron Microscope and the TEM: Transmission Electron Microscope. Each one uses different techniques to 'see' the samples.

What areas of science are used to study Nanoscience & Nanotechnology?

Nanoscience and Nanotechnology are being investigated in many areas of science so the researchers who work in this field may have studied Physics, Chemistry, Biology, Materials Science and Engineering.

Which products use nanotechnology now?

There are many products available today that utilize nanotechnology and its benefits. For example; computer hard disk drives, synthetic bone, stain-repellent clothing, longer life tennis balls, glass that cleans itself, fuel additives that improve fuel consumption and lead to reduced emissions of pollutants, sun screens which scatter harmful UV light but not visible light and plasters that contain antimicrobial nanoparticles to name but a few.

Introduction to Nanotechnology

The basic (bulk) properties of materials often change dramatically when it is in nano scale. As you make things smaller and smaller, you eventually reach a point where the averaging no longer works.

The properties of materials can be different at the nanoscale for two main reasons:

- Nanomaterials have a relatively larger surface area when compared to the same mass of material produced in a larger form. This can make materials more chemically reactive
- Nanotechnology is the understanding and control of matter at dimensions of roughly 1 to 100 nanometers, where unique phenomena enable novel applications

At the nanoscale, the physical, chemical, and biological properties of material differ in fundamental and valuable ways from the properties of individual atoms and molecules or bulk matter. Often such change in properties causes health hazards.

WEB FOCUS

World Wide Fund for Nature (WWF) is creating solutions to solve our planet's big environmental challenges, so helping people and nature to thrive.

Visit: <http://www.wwf.org/>

Exposure Routes:

Inhalation

- Deposition increases with breathing rate and mouth breathing
- Deposited in lung to greater extent than larger respirable particles
- Animal studies indicate nanoparticles may enter blood stream from the lungs and translocate to other organs

Skin Absorption

- Some studies suggest nanoparticulates could enter body through the skin.
- Not known if skin penetration would result in adverse effects.

Experimental studies show:

- Toxicity of ultrafine or nanoparticles greater than same mass of larger particles
- Toxicity increases with decreasing particle size due to increasing surface area

Work practices at a nanoscience lab:

- Cleaning work area at end of each shift.
- Prohibiting food or beverages in work area.
- Providing hand-washing facilities
- Providing shower/change facilities to prevent contamination of other areas.

To prevent dermal penetration:

- Closed-toed shoes
- Disposable booties
- Long pants
- Long sleeved shirt
- Gauntlet gloves
- Laboratory coats
- Eye protection based on level of hazard

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All the science lovers are requested to submit their original articles pertaining to science to bluejayscienceclub@gmail.com

Olive Ridley

Scientific classification

Kingdom: Animalia
Phylum: Chordata
Class: Reptilia
Order: Testudines
Family: Cheloniidae
Genus: *Lepidochelys*
Species: *olivacea*



The Olive Ridley (*Lepidochelys olivacea*), also known as the Pacific Ridley, is one of the smallest species of sea turtle. It is listed as Vulnerable on the IUCN Red List and Endangered under both Australia's Environment Protection and Biodiversity Conservation Act 1999 and Queensland's Nature Conservation Act 1992. It is usually found in the Indo-Pacific and Atlantic oceans. It is named for the olive-green color of its heart-shaped shell and after H.N. Ridley FRS who first reported the sighting of these turtles in Brazil in 1887. They have an average weight just over 100 lb (up to 50 kg.). They have a high-domed shell, with a carapace length of only 30 inches (70 cm). The carapace is made up of five pairs of coastal scutes, with occurrences of up to 6 to 9 divisions per side. The margins are smooth. The carapace is dark olive green in color with a yellowish underside. The head is large.

Olive Ridelies are omnivorous, feeding on crabs, shrimp, rock lobsters, sea grasses, algae, snails, fish, sessile, pelagic tunocates and small invertebrates. They are sometimes seen feeding on jellyfish in shallow waters. These turtles forage offshore in surface waters and can dive to depths of at least 150 meters (500 feet).

The most fascinating feature of Olive Ridley is their mass nesting called 'arribada' meaning mass arrival in Spanish. They choose narrow beaches near estuaries and bays to lay eggs. Each adult female lays approximately 100-140 eggs at a time. It is believed that they nest in an interval of one-four years. The nesting season is between November to March. Olive Ridley turtles rely on an inexplicable, in-built navigation system that guides them; when it's time for them to reproduce, back to the precise coast on which they were born. In India, arribada takes place in the east coast state of Orissa at three nesting grounds Gahirimatha, Devi river mouth and Rushikulya river mouth.

Human activities like trawling and offshore drilling for oil and gas has threatened their survival and nesting in recent time. The nests and hatchlings of these beautiful creatures should be protected to increase their number.

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