

Scientists find nine million year old ape fossils in Himachal

SCIENTISTS have found that a very primitive ape-like ancestor which was hitherto considered a native of only Eurasia had existed in India too.

Scientists discovered the surprise fossil during an excavation in Haritalyangar in Shiwalik hills region in Himachal Pradesh, about 120 km from Shimla on the road to Kangra.

The fossils are nine million year old and are in the form of lower molar germs or permanent teeth that are un-erupted and still forming in the lower jaw. The crowns of both the molars are fully formed, but there is no root formation. This indicates that they belonged to infants of slight different ages at the time of their deaths.

One specimen is a partial right first molar and other a complete left second molar. The apes seemed to be slightly larger (about 15 kg heavier) than the modern-day Siamang Gibbons found in the Himalaya and South-East Asia.

Detailed studies showed that the

specimens were similar to those of a genus of primitive ape-like ancestors called pliopithecoid, which were widespread in Eurasia during the Miocene period (18 million to seven million years ago).

Interestingly, the specimens were also consistent in size and morphology to an upper third molar that was found in the same region in the 1970s. At that time it was suspected that the specimen was perhaps related to pliopithecoid genus but it was highly worn out and could not be studied properly. The specimen was initially identified as *Pliopithecus krishnaini* but was later transferred to a new genus *Krishnapithecus*.

The research team consisted of Dr. Anekh R. Sankhyan, a retired anthropologist from the Anthropological Survey of India, Dr. Jay Kelley of the Institute of Human Origins and School of Human Evolution and Social Change, Arizona State University and Terry Harrison of the Centre for the Study of Human Origin in the Department of



Dr. Anekh R. Sankhyan

Anthropology at New York University. The research findings have appeared in the journal *Current Science*. Dr. Sankhyan had discovered a late survivor of a hominid called *Sivapithecus* in the same area in 1985.

Speaking to *India Science Wire*, Dr. Sankhyan said the present discovery and that of *Sivapithecus* in the 1980s indicated that Haritalyangar perhaps served as an asylum for hominids during the very late Miocene period.

Contributed by Sunderarajan Padmanabhan (Courtesy: India Science Wire, Vigyan Prasar)

Cleaning Barapullah drain biotechnologically

A programme, “Local Treatment of Urban Sewage Streams for Healthy Reuse (LOTUS)”, between Department of Biotechnology (DBT), Govt. of India and Netherlands Organization for Scientific Research (NWO) was launched at the Barapullah drain site on 8 September 2016 to clean up the drain.

The project aims to demonstrate a novel holistic (waste) water management approach, that will produce clean water that can be reused for various purposes (e.g. industry, agriculture, construction etc.), while simultaneously recovering

nutrients and energy from the urban waste water. Special attention will be paid to pathogen removal and removing conventional and emerging pollutants (which are only partly retained in the existing WWTPs).

Barapullah is a 12.5 km long drain responsible for about 30% of pollution in the Yamuna River, collecting mainly domestic sewage and waste from small industry. This joint initiative and testing site will result in the designing and operation of a display plant along the Barapullah drain.



The Netherlands side has dedicated €1,470,000 towards the project. India will also be contributing a matching amount for the project.

Contributed by Alpana Saha, Sub-Editor (DBT CC Project), Vigyan Prasar, C-24, Outub Institutional Area, N.D-110016; Email: alpanarim@gmail.com



The researchers (from left): Ms Aditi Jain, Prof. Kaushik Chatterjee, Dr. Ravi Sundaresan and Dr. Lopamudra Das Ghosh (Photo: Prof. Kaushik Chatterjee, Materials Engineering, IISc)

Can your hair save lives? Yes, says new research by scientists at IISc

KERATIN, the protein derived from hair, is now being extensively used in many bioengineering products like protein-based thin films used in tissue engineering. A recent innovative application of hair has been in the field of medical science.

In 2002, scientists developed methods to easily extract keratin from hair, thus opening up possibilities for using this protein in new materials including protein scaffolds and hydrogels used in tissue regeneration.

“A cell needs something to attach to, on which it can grow. Apart from a few cells in the blood, most cells are stationary and attached to some type of a scaffold which helps the cells grow. As material engineers, we look for materials which can be used as scaffolds, where the cell can attach itself and grow,” explains Prof. Kaushik Chatterjee, Associate Professor at the Department of Materials Engineering at IISc. His group has explored the idea of using keratin as the basis of regenerative medicine or tissue repair, and also as a substrate for stem cell research.

What makes hair suitable for this? “Ideally, a substrate needs to enable

cell growth or tissue regeneration, and should not be toxic to the body. And, once the tissue regeneration is complete, the scaffold has to decompose and be metabolized by the body. Keratin satisfies all these conditions,” says Prof. Chatterjee.

“The best thing about using proteins derived from the human body – be it collagen from the skin or keratin from the hair, is that cells seem to grow better on these surfaces,” Dr. Lopamudra Ghosh, a research scientist working with Prof. Chatterjee, says.

Besides, human hair is easily available and inexpensive. “What’s exciting about keratin is that it is human derived and it is extracted from hair – a discarded and non controversial material. This not only reduces the difficulty of acquiring the substance, but also makes medical research using keratin much cheaper,” says Ms. Aditi Jain, a Ph.D. student from the Centre for Biosystems Science and Engineering in IISc, who is involved in this work.

Researchers from IISc have also demonstrated the use of keratin-coated surfaces to grow cardiomyocytes – the cells that make up the muscles in the

heart. “Heart diseases are one of the leading causes of death in the world. It is primarily due to the inability of the heart to repair itself upon damage. This compromises the function of the heart, making it increasingly susceptible to failure. We were therefore interested in developing engineered biomaterials that can support the growth of heart cells outside the milieu of the body,” explains Prof. Ravi Sundaresan from the Department of Microbiology and Cell Biology, IISc.

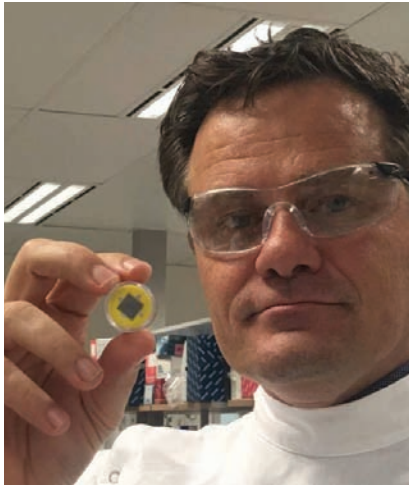
Prof. Ravi’s group has been successful in growing live heart cells in a lab dish using nanoscale keratin extracted from human hair. “We have also shown it to be a cost effective and an efficient model to study and understand the mechanisms underlying heart failure,” says Prof. Sundaresan.

Researchers from the above two labs collaborated to use keratin-coated surfaces to grow stem cells derived from adult bone marrow. The stem cells were efficiently converted to heart-like cells that could one day find use in regenerating damaged tissue in the heart, giving us a glimpse of what the treatment of damaged cardiac tissue would look like in the future.

With such novel uses of our hair, perhaps the glitz and glamour in the advertisements of shampoos and hair care products may be justified after all!

Courtesy: Research Matters/Gubbi Labs

Vaccines in tattoo form!



WHEN Edward Jenner pioneered the concept of vaccination, it was heralded as a major milestone in the medical field. Ever since, we have been able to battle countless number of diseases and keep them at bay.

But, how many of us are happy about the actual process of vaccination? The very sight of a smiling nurse or doctor approaching with the glinting needle of a syringe while extruding the

first drop from the nozzle can terrify any mortal being. This holds true even for grown-ups, let alone the case of children. Parents have the additional burden of comforting their wailing children during and after the time of vaccination. Only if science could put an end to this ordeal!

The relentless prayer of countless people who dread needles has prompted technology to come up with an alternative. Nanotechnology has now been employed to engineer patches that can effectively deliver vaccines without needles.

Called “nanopatches”, these are small square frames containing thousands of nano-scale projections coated with miniscule amounts of the vaccines. On application to the skin surface, the nanoneedles pierce through the outer skin layers and deliver the bio-agent right into the immune cells found abundantly in the epidermis.

Smaller than the size of postal stamps (app. 5mm X 5mm), nanopatches can be designed in two forms – those that can dissolve into the skin and those that need to be removed after application.

Apart from being pain-free, are there any other advantages over their needle counterparts? Certainly! Nanopatches can elicit a greater immune response because the conventional needles target the vaccine into muscle tissues that contain less number of immune cells. Intradermal and Intra-Muscular (IM) routes of delivery require up to 1 ml of vaccine, whereas

delivery via nanopatches is a matter of just a few microliters! This allows the immunization of a larger population with smaller amounts.

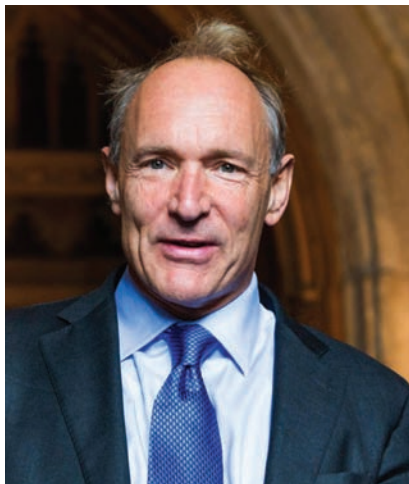
Moreover, vaccines are deposited on the nanoprojections by a process called dry coating, thereby bypassing the requirement for cold chain. Being a high cost and energy-intensive process, it is considered to be one of the major limitations in the logistics of conventional vaccines. It also restricts the availability of vaccines in rural areas.

The technology, masterminded by Professor Mark Kendall from the University of Queensland, Australia, was conceived with the goal of improving the cost and efficiency of vaccination. Pre-clinical trials conducted by Professor Kendall in mice using flu vaccine established the dose-sparing benefits and higher biological response compared to IM injection.

If these studies can be successfully translated into humans, nanopatches will be the next major breakthrough as the Grand Challenges in the global health has identified the development of a needle-free vaccination system as a major challenge in the global healthcare sector.

It might not be too long when everyone could self-vaccinate painlessly with the ease of using a sticker tattoo!

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Turing Award for Tim Berners-Lee

SIR Tim Berners-Lee, Professor at Massachusetts Institute of Technology and the University of Oxford, known for inventing the World Wide Web (the first web browser) and the fundamental protocols and algorithms allowing the Web to scale, has been named as the recipient of the 2016 ACM A.M Turing Award.

The award, named after Alan

Turing, the British mathematician, is recognized as the highest distinction in computer science and is considered as the Nobel Prize of computing.

Sir Tim invented the Web when he was at CERN, the European Particle Physics Laboratory, in 1989. He wrote the first web client and server in October 1990. As the Web technology spread, his initial specifications like the idea of

Indian geeks develop algorithm to grade fruits

INDIAN computer scientists have used latest techniques in image processing to detect the quality of fruits.

Shape, size, colour and texture are important grading parameters to find the quality of a fruit. One of the major tasks in post-harvest processing of oranges is classification of fruits based on their external appearance and determination of skin defects. Manual quality check for grading of fruits is subjective, time-consuming and inefficient, particularly when dealing with large quantities of fruits.

Researchers at the Department of Computer Science and Engineering of Annamalai University in Chidambaram have developed a new technique based on image processing for automated quality check of fruits based on colour and texture features of fruits. They took



a set of healthy oranges and another of oranges with skin defects and developed a database of images, with a series of attributes. They deployed an image processing tool known as ‘grey level co-occurrence matrix’ to develop the new algorithm for fruit checking.

“We used image analysis techniques to classify orange fruits into two commercially grading stages, which successfully extract useful and meaningful

features to uniquely represent external surface for classification purposes,” the researchers observed in their study, which appeared in *Current Science*. They suggest that the technique could be useful for detection of skin damages on other fruits as well in future. R. Thendran and A. Suhasini are co-authors of the study.

Contributed by Dinesh Sharma (Courtesy: India Science Wire, Vignay Prasar)

a boundless information world, URL’s, HTTP and HTML were polished and considered widely.

He launched the world’s first website, <http://info.cern.ch>, on 6 August 1991. In 1994, Sir Tim founded the World Wide Web Consortium (W3C), a Web standards organization which develops interoperable technologies (specifications, guidelines, software, and tools). He is also the Director of the World Wide Web Foundation which works to advance the Open Web as a public good and a basic human right.

The mission of the World Wide Web

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Consortium (W3C) is to lead the Web to its full potential by creating technical standards and guidelines to ensure that the Web remains open, accessible, and interoperable for everyone around the globe.

Sir Tim has received many awards and honours, including the ACM Software System Award in 1995. In 2001, Sir Tim became a Fellow of the Royal Society, and has received

honorary degrees from a number of universities around the world, including Manchester, Harvard, and Yale. TIME magazine included him as one of the 100 Most Important People of the 20th Century. In 2004, he was knighted by Queen Elizabeth, and in 2007 he was awarded the Order of Merit.

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