Bridging cultural diversity

S ANANTHANARAYAN REPORTS ON A MEGA BIENNIAL WEEK-LONG FORUM FOR SCIENCE COMMUNICATION THAT IS UNDERWAY IN COPENHAGEN

The week-long Euroscience Open Forum 2014 kicked off in Copenhagen last Saturday, bringing together scientists, educators, science administrators, journalists and communicators. The event takes place every two years under the aegis of the European Union, with the previous two having been held in Turin (2010) and Dublin (2012). The theme for this year's event is "building bridges".

The forum is a place for the science community in Europe to express and address concerns in key areas as also those of policy and funding. Over 1,000 people have congregated in Copenhagen and over the week will be taking part in varied events, talks, seminars and presentations by those working in different fields. In keeping with the theme, the emphasis is on communication and the need for different players and stakeholders to connect.

After the formal opening, which was by Queen Margrethe II on Sunday afternoon, there were addresses by Jose Manuel Barroso, president of the European Commission, Sophie Carsten Nielsen, minister for higher education and science, Denmark, the host country, and Professor Lauritz Holm-Nielsen, president of Euroscience. All three emphasised the pivotal role of science and the need for communication of science and scientific developments with the general public and the importance of public support for the measures that states take for the promotion of scientific research. Barroso said that the EU provision for science and technology had been increased by 30 per cent despite a reduction of the overall budget. As for *building bridges*, he said there was need for five of these, between different areas of science; researchers and the public; laboratories and the market place; for member-states of the European Union to share infrastructure; and for cooperation worldwide.

The highlight of the opening ceremony was an interview of Rolf Dieter Heuer, director general of Cern, Geneva, and Fabiola Gianotti, particle physicist associated with the discovery of the Higg's particle in 2012 at the Large Hadron Collider at Cern. The interview, which was about the value of the Higg's particle discovery, was conducted by Dominique Leglu, editor-in-chief of the magazine *Science et Envenir* and brought out dramatically the importance of communication of and within science and that science must needs be an international effort. Excerpts:

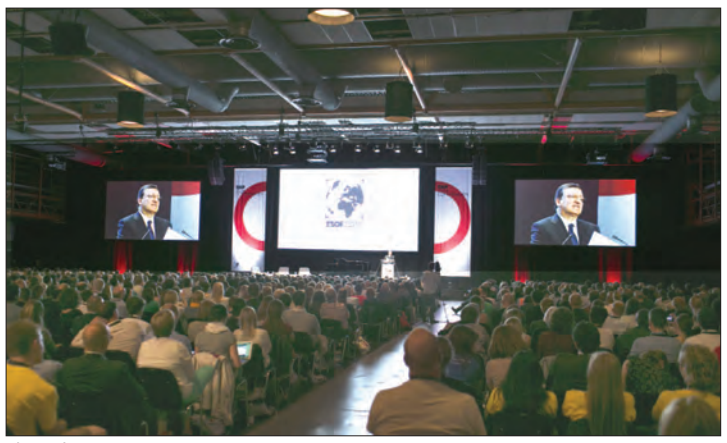
Dominique: Fabiola, the Large Hadron Collider has now created the Higg's particle, which was there before that only in the early universe. Can we say that the LHC has brought about a kind of time travel?

Fabiola: The Higg's is a very special particle which explains how other particles that make up the world have mass. All material things, including each one of us, are finally made up of the electron and the quark, which are the fundamental particles. But if these particles did not have mass, like the photon does not have mass, then they could not stick together and no matter would have been possible. The discovery of the Higg's is thus of fundamental importance. The high energies created in the LHC correspond to conditions of just a hundred billionth of a second after the Big Bang, and a temperature of 10 million billion degrees.

Dominique: Rolf, the discovery of the Higgs has cost some nine to 10 billion Euros. How could you explain to a common person how all this expense was justified?

Rolf: It is not correct to say the money was spent only to discover the Higg's. Yes, the Higg's particle was the star that got all the attention, but there have been many more valuable results of the research. And then, Fabiola just told us that the discovery of the Higg's was no ordinary thing either. But what is important is to communicate with the public what science research is about, and bridge the gap that divides science from society. At Cern, there is every effort to integrate our work with society and we associate people from different streams, even artists.

Dominique Leglu, editor-in-chief of the magazine *Science et Envenir* (left) interviewing Rolf Dieter Heuer, director general of Cern, Geneva (right) and Fabiola Gianotti, particle physicist associated with the discovery of the Higg's particle in 2012.


The opening ceremony.

Fabiola: The work at Cern is an object lesson in *group research*. Over 3,000 scientists from all over the world carried out the work that led to the Higg's particle. The scientists were from all countries, even some not well aligned, politically. The work exemplified the great unifying force of science. Over 30 per cent of the scientists were PhD students and half of them were less than 35 years old. The Higg's was not just a technological endeavour, it was also a human adventure.

Rolf: Yes, the diversity in the teams that worked to find the Higg's was an opportunity, with minds from different cultures working together. Along with the five bridges that were mentioned earlier, I would add a sixth — to bridge the cultural diversity of scientists from different countries. And coming back to the benefits that have come from basic research, let me say that the apart from the LHC, there are over 30,000 particle accelerators in the world — 15,000 are in industry and 15,000 are in hospitals — only a few left over are in physics labs. And then the instrumentation that gets developed in the course of research finds ready application in different fields — like treating cancer or detecting tumours. Let me also mention that the first webserver of all was also in Cern (what we have as the Internet today is also an offshoot of basic research).

Fabiola: Freedom and creativity are the watchwords in Cern. We have 3,000 scientists, but there is no hierarchy. We are open, no bureaucracy, people are free and creative. Yes, about 20 per cent are women and even more than 25 per cent among the younger ones. But the diversity extends beyond gender to culture and nationality. In the Cern canteen, we often find Nobel laureates and young initiates sharing a table.

Dominique: Rolf, which of the many questions that are there to answer would you like to see as the next big discovery in science?

Rolf: The discovery of the Higg's was the easy part. The real work starts now. What we have found is a particle that has mass in the range to be the Higg's particle. Is this the same particle that is predicted by theory? It may take a long time to know more! We have planned to work the LHC till 2035.

The future lies in ensuring public support for our work, involving young scientists and international collaborations. The "E" in Cern stands for *European*, but we now read it as *everywhere* and are admitting other countries into the collaboration. Israel is already a member and Pakistan may be another. We need to integrate the work in Asia, Europe and the Americas — a global vision.

Fabiola: All that physics has worked on so far is only five per cent of the universe, which we can see. The rest, the 95 per cent, is dark matter. We say "dark" both because we are ignorant of what it is like and also that this matter does not interact with ordinary matter, we have only deduced that it is there.

THE WRITER CAN BE CONTACTED AT
simplescience@gmail.com

How does Higgs do it?

Imagine a room completely full of delegates, with a door at either end. When Albert Einstein enters the room, the delegates cluster around him, feverishly trying to get near enough to speak with him. The crush of people gives inertia (mass) to the motion of Einstein across the room, making it very difficult for him to start moving and also very difficult for him to stop, once going! In contrast, less famous scientists can move across the room without such a large crowd forming around them. These less famous scientists have much less inertia (mass) than Einstein.

In this analogy, the delegates are the Higgs field. The other fundamental particles are the various scientists entering the room. The analogy describes how the Higgs field gives things their mass.

(From handout created by the Institute of Physics.)

What the Higgs?

In a more technical event last Sunday, Professor Jonathan Bagger of John Hopkins University explained that the discovery of a particle that had a mass nearly that of the particle predicted by theory rounded off the success of the so-called Standard Model of elementary particles. But for all its success, which was incredible accurate in explaining the dynamics of small particles, the Standard Model does not deal with some other disturbing phenomena. These include the nature of neutrinos, which theory says should be massless but actually have mass, which property also permits them to *morph* into alternate forms, which explains the discrepancies in the arithmetic of numbers of neutrinos produced and detected. Another phenomenon is *Dark Matter*, which we need to consider as existing, to explain the extent of gravitation effects in the universe, which visible objects could not have generated. And then there is the acceleration of the expansion of the universe!

Professor Bagger said there was, hence, a huge lot of work that scientists had still to do, and there was no way to go about it than with formal global cooperation.

Timothy Meyer, the new chief operating officer of Fermilab then spelt out the new particle physics research policy of the US government, which not only emphasised working with global partners but had international experts, including Fabiola Gianotti, on its guiding panel. Professor N Nahade of the European Union explained the priorities and the European strategy, which recognised that elementary particle research called for largescale facilities and long-term support, for which it was imperative that all groups in the world worked in concert.

PLUS POINTS

'Magic island'

A "magic island" has mysteriously appeared out of nowhere in one of the hydrocarbon seas on Saturn's giant planet-like moon Titan, only to later disappear. Described as a bright "transient feature" by scientists, it is not clear what the object is, or how it appeared there. Theories include that it could be the result of waves or bubbles, or even buoyant solid matter.

The sea had appeared flat and completely devoid of features, including waves prior to 2013. But then the object, dubbed "magic island" by scientists, suddenly materialised before vanishing in later images. The object was spotted in Ligeia Mare, Titan's second-largest sea, by radar images. The Cassini space probe that captured it has been exploring the Saturnian system since 2004. Planetary scientist Jason Hofgartner, from Cornell University in New York City, said, "This discovery tells us that the liquids in Titan's northern hemisphere are not simply stagnant and unchanging, but rather that changes do occur. We don't know precisely what caused this 'magic island' to appear, but we'd like to study it further."

The main theories argue that the island-like object is the result of waves formed by heavy winds, bubbles formed by gases pushing out from the sea floor or floating solids. "Likely, several different processes — such as wind, rain and tides — might affect the methane and ethane lakes on Titan," said Hofgartner. "We want to see the similarities and differences from geological processes that occur here on earth. Ultimately, it will help us to understand better our own liquid environments."


Before and after images show where the "magic island" appeared.

Details of the "magic island" discovery have been published in the journal *Nature Geoscience*.

TOMAS JIVANDA/THE INDEPENDENT

'Stand up, live longer'

Dr Mike Loosemore, head of the Institute of Sport Exercise and Health at University College London, has said that people should be encouraged to do more "low-level" exercise and that standing up for three hours a day can extend life span by two years. "There is now enormous evidence that simply standing makes huge differences to your health. Low-level activity, even regularly getting off your seat, can change your life forever," he said, writing for the BBC. "Active individuals reduce their risk of heart disease by 40 per cent against their inactive counterparts."

He warned that the government's guidelines advising adults in the UK to do 30 minutes of "moderate" exercise five days a week were "impractical or unobtainable" and that "barely seven per cent of men and four per cent of women were carrying out enough activity to fulfill them. But there is some good news. Even a small amount of activity can make major health gains, and this is what the population really needs to be taught".

The advice echoes a recent report that found a high association between hours spent sitting down and the risk of developing various cancers. The meta-analysis looked at data from 43 separate studies covering four million participants and found that just two extra hours of sitting down each day was associated with a 10 per cent increased chance of women developing cancer of the womb lining, and an eight and six per cent increase in the chance of developing bowel and lung cancer respectively.

Dr Loosemore also noted that activity had "great mental benefits, too, with the risk of developing of Alzheimer's disease decreased by a third and depression eased as effectively as Prozac or behavioural therapy. Activity is not only more powerful than drugs for most conditions, but can act as a cure-all".

JAMES VINCENT/THE INDEPENDENT

A USEFUL STRATEGY

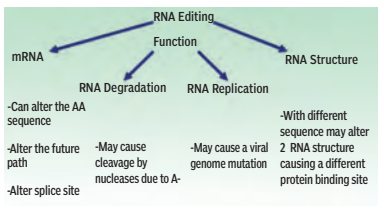
RNA EDITING ALLOWS THE CODING SEQUENCE OF MRNA TO BE ALTERED, WRITES **TAPAN KUMAR MAITRA**

About a decade after introns and RNA splicing were first discovered, molecular biologists were surprised by the discovery of yet another type of mRNA processing called RNA editing. During RNA editing, anywhere from a single nucleotide to hundreds of nucleotides may be inserted, removed or chemically altered within the coding sequence of an mRNA. Such changes often create new initiation and/or stop codons, and can alter the reading frame of the message.

The best-studied examples of RNA editing occur in the mitochondrial mRNAs of trypanosomes, which are parasitic protozoa. In these mRNAs, editing involves the insertion and deletion of multiple uracil nucleotides at various points in the mRNA. The information for this editing is located in small RNA molecules called *guide RNAs*, which are apparently encoded by mitochondrial genes separate from the mRNA genes. In one proposed editing mechanism, hydrogen bonding causes short complementary regions of the guide RNA and mRNA to come together, and nearby sequences of Us in the guide RNA are then spliced into the mRNA.

A different type of editing occurs in the mitochondrial and chloroplast mRNAs of flowering plants. In these cases, nucleotides are neither inserted nor deleted, but Cs are converted to Us (and vice-versa) by deamination (and amination) reactions. Similar base conversions have also been discovered in a few mRNAs transcribed from nuclear genes in animal cells. For example, a single codon in the mRNA transcribed from the mammalian apolipoprotein-B gene undergoes a C-to-U conversion during RNA editing. Another type of RNA editing detected in animal cell nuclei converts adenosine (A) to inosine (I), which resembles guanosine (G) in its base-pairing properties. The net result is, therefore, equivalent to an A-to-G conversion.

In all its manifestations, RNA editing seems relatively rare. However, its existence provides a reason to be cautious in inferring either polypeptide or RNA sequences from genomic DNA sequences. For example, many discrepancies were observed when the amino acid sequences of proteins produced by plant mitochondrial genes were first compared with the amino acid sequences that would be predicted based on the base sequence of mitochondrial DNA. Although some of these discrepancies can be explained by non-standard codon usage in mitochondria, most of the unexpected amino acids arise because RNA editing alters the base sequence of various mRNA codons, leading to the incorporation of amino acids that would not have been expected based on a gene's DNA sequence.



Nucleic acid editing is not restricted to RNA. Eukary-otic cells also contain a DNA-editing enzyme, known as *APOBEC3G*, that can inactivate retroviruses by catalysing C-to-U conversions in the initial DNA strand that is produced when the viral RNA is copied by reverse transcriptase into DNA. The C-to-U conversions in the first strand lead to G-to-A conversions in the complementary DNA strand, thereby introducing mutations that debilitate the virus. To defend against this attack, HIV and other retroviruses produce a protein called Vif, which targets APOBEC3G for destruction. Because suppression of APOBEC3G is essential for successful retroviral infection, blocking the action of Vif might be a useful strategy for developing novel new treatments for HIV/Aids.

THE WRITER IS ASSOCIATE PROFESSOR, HEAD, DEPARTMENT OF BOTANY, ANANDA MOHAN COLLEGE, KOLKATA, AND ALSO FELLOW, BOTANICAL SOCIETY OF BENGAL, AND CAN BE CONTACTED AT tapan-maitra59@yahoo.co.in

Bonding with mum

IRON DEFICIENCY IN NEWBORNS CAN BE CHECKED IF DOCTORS WAIT FOR TWO MINUTES BEFORE CUTTING THE UMBILICAL CORD, SAYS **MANUPRIYA**

More than 75 per cent infants in India suffer from anaemia or iron deficiency, according to a National Family Health Survey conducted in 2006. The problem can be reduced substantially if doctors wait for two to three minutes before cutting the umbilical cord during childbirth. Unfortunately, most doctors prefer not to wait before they clamp the cord.

The umbilical cord provides nutrition and blood to the baby from the mother. For many years, researchers have pointed out that delaying the cutting of the cord is good for the health of the baby. If it is cut at least two minutes after birth, the baby can take in more blood from the placenta, which makes the infant stronger. This delay also helps the baby fight iron deficiency.

According to World Health Organisation guidelines, doctors should wait till the "cord is flat and pulseless". That happens two to three minutes after birth. Even the Union ministry of health and family welfare recommends Delayed Cord Clamping in the current national guidelines for the care of newborns and has incorporated the practice in all its training modules in the past two years. Despite clear guidelines, most doctors do not practice DCC.

One of the reasons behind the non-compliance has been the assumption that the baby has to be held in the *introitus* position (at the level of the vagina) for DCC because gravity affects the volume of placental transfusion through the umbilical cord. This is often cited by doctors as a difficult posture to strike, especially with a slippery baby in gloved hands. But a new study by Nestor E Vain and his colleagues from the School of Medicine, University of Buenos Aires, Argentina, provides a solution.


In delayed umbilical cord clamping, the infant gets more blood from the placenta, which increases iron levels.

The team found that the cumbersome introitus position may not be needed and the position of baby has no bearing on the process of placental diffusion. The study was conducted at three university-affiliated hospitals in Argentina. Vaginally-born babies were selected for the study and were randomly divided into two groups — one in which the babies were held in introitus position for two minutes before clamping the cord and the other in which babies were placed on their mothers' abdomens for two minutes before the cord was clamped. The newborn babies were weighed immediately after cord clamping to measure weight gain because of placental transfusion in the infants. No significant difference in weight between the two groups was observed. This suggested that equal amounts of blood reached the babies in both groups. "Mean weight change was 56 g for 197 babies in the introitus group compared with 53 g for 194 babies in the abdomen," the scientists wrote in their paper published in *The Lancet* on 17 April 2014.

Neelam Kler, chairperson, department of neonatology, Institute of Child Health, Sir Gangaram Hospital, says the study has addressed an important and less investigated aspect of cord clamping. "Keeping the baby on the mother's abdomen relieves the obstetrician from holding the baby and facilitates maternal bonding. While at the same time the baby may be assessed for the need for resuscitation," she adds. This should encourage obstetricians to delay cord clamping and keep the baby on the mother's abdomen.

But popularising the simple technique is not going to be easy. "Most of the earlier books recommended clamping of the cord immediately after the birth of the baby. Despite the new recommendations, most obstetricians are resisting the change," says Sanjay Wazir, chief of neonatal medicine at The Cradle, Apollo Hospitals, Gurgaon.

CSE-DOWN TO EARTH FEATURE SERVICE