MEETING REPORT

Revolutionizing personal computing*

At the media presentation involving Nehru Science Centre, Mumbai and Press Club, Mumbai, Shivaprasad Khened (Director), Shrikant Pathak (Curator) and Arnab Chatterjee (Curator) of National Council of Science Museums, Mumbai presented a breakthrough in computer sciences; a technological marvel called 'leap motion' technology. They gave a sneak preview of this technology and how it could be used in educational tools. The Nehru Science Centre launched this user-friendly interactive device on 23 July 2013.

*A report on the media presentation 'The "mouse" is relegated to history' held by Press Club, Mumbai and Nehru Science Centre, Mumbai on 24 August 2013 at the Press Club Conference Room, Mumbai.

The leap motion technology, a new way to interact with computers, was launched on 22 July in the US. It allows control of computer operations, to grasp and open objects with a wave of the hand. The knowhow is all set to make the rugged 'mouse' an object of history and revolutionize personal computing. It is more accurate than a mouse and as reliable as a keyboard. Instead of the conventional mouse, there is a leap motion controller of the size $3 \times 1 \times 0.5$ inches consisting of two LEDs, two detectors and a small processor core.

The technology involves 'gesture' or physical prompting to interact with the computer and uses a number of camera sensors to map out a workspace in a 3D operational area. It can track user's fingers individually, and knows the difference between the fingers and a pencil held by the user. In practice, the user literally interacts with the computer by waving his hands through the air. The device has several applications in various fields such as education, gaming, engineering, 3D modelling, art, archeology, architecture, sign languages, etc.

In less than one month since this technology has been launched globally, the scientists/curators working at the Nehru Science Centre, have acquired and begun using it for their educational programmes. This is a new beginning in the virtual world of computing.

Parul R. Sheth, E-705/706 Kalp Nagri, Vaishali Nagar, Mulund (West), Mumbai 400 080, India.
e-mail: parulrsheth@gmail.com

Threatened by fashion

Cashmere has always been a coveted item for clothing and accessories by people all over the world. *Cashmere* wool comes from goats that are specially reared for their long fibres from which *cashmere* or *pashmina* (as it is locally called) is woven. *Cashmere* fibre is six times thinner than human hair at 12–16 µm and is warmer than the wool of other animals. The ban on the sale of *shahtoosh* (wool of chiru or the Tibetian antelope) also has resulted in increasing demand for *cashmere*, which is considered a good replacement[1]. The rising global demand and market value for *cashmere* have resulted in an increase in the number of goats that the pastoralist community rears[1]. Mongolia and China supply 90% of the world's demand for *cashmere*[2]. A recent study by Berger *et al.*[2] shows that the high global demand for *cashmere* products and its ever-growing market have been responsible for the decline in the population of large mammals in the steppes of Central Asia.

Pashmina goats: source of the world famous cashmere fabric Photo copyrights: hyd-news.blogspot.in201305pashmina-goats-becoming-extinct-in.html

Scientists from Wildlife Conservation Society and the Snow Leopard Trust have used data collected over many years of work in Mongolia, China, Tibet and Ladakh in India, to examine the effects that the global demand for *cashmere* have on wildlife in the region. They have observed that the vast pastures of Central Asia that were once dominated by herds of wild ungulates have now been replaced by larger herds of goats reared for *cashmere* production. They have also found that goat herds in Mongolia alone had surged from 5 million in 1990 to 14 million in 2010 (ref. 3). The increasing presence of humans and their growing settlements with domesticated cattle and dogs and over-grazing of pastures by livestock have physically displaced the wildlife in the area[4]. Over-grazing by livestock not only affects the wild ungulates but their declining numbers and the easy availability of livestock accelerates conflict with carnivores[2]. Pashmina goats are of high economic value to the pastoralists and their increasing competition with wild ungulates and predation by carnivores may eventually result in low tolerance levels among the community towards wildlife in the region[5]. In addition to highlighting the need to reduce the number of livestock (especially the pashmina goats), which would help reduce the pressure and competition for resources between livestock and wild ungulates, scientists believe that developing a sustainable system is the key to reverse this trend. One of the novel ways they propose is green labelling of *cashmere* products, which would protect both wildlife and livelihood of the herders. Scientists mention that the future of the native species of Central Asia like the Kiang, Saiga, Blue sheep, Tibetan ante-

lope, etc. will remain unsure if consumers of *cashmere* continue to be ignorant regarding the source of the products purchased by them. Scientists hope that working in league with the local herders, representatives of the fabric industry and also the government officials will provide them with suitable solutions to implement a sustainable conservation plan that works for all.

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Ipsita Herlekar, S. Ramaseshan Fellow
e-mail: iherlekar@gmail.com

RESEARCH NEWS

Hydrogen bond seen, halogen bond defined and carbon bond proposed: intermolecular bonding, a field that is maturing!

E. Arunan

I wrote my first research news in *Current Science* in 1999, when some results questioning the conventional wisdom on hydrogen bonding were published[1]. The news item discussed three topics, namely blue shifting in X–H infrared stretching frequency in an X–H•••Y hydrogen bond, the experimental evidence for partial covalency in H•••Y bond and the studies on halogen bonds similar to hydrogen bonds. Experimental evidence for partial covalency (chemical bond) was making waves in the field as hydrogen 'bonding' was thought to be just an electrostatic 'physical' interaction between two dipoles. Despite the popular use of the terms 'hydrogen bond' in the literature for close to a century, there were continuous murmurs that 'hydrogen bond' was a misnomer. Eventually I proposed to IUPAC that the hydrogen bond should be redefined and following IUPAC's procedure formed a task group of experts from all over the world to actually do the same[2]. Fourteen years later, three more recent results have prompted me to write again. IUPAC has now defined 'halogen bonding' through another task group, with Gautam R. Desiraju and Anthony (Tony) C. Legon being members common to both task groups[3]. High-resolution atomic force microscope (AFM) has shown images of hydrogen bonds formed by OH and also CH groups as donors[4]. We have recently proposed a 'carbon bond' analogous to hydrogen and halogen bonds[5].

In 2009, stunning images of a pentacene molecule including the bonds (electrons in between the atoms) were revealed by AFM[6]. It was only a matter of time before someone visualized hydrogen bonds using AFM. Somewhat fittingly, a team led by a chemist (Xiaohui Qiu) and a physicist (Zhihai Cheng) has succeeded in recording the AFM images of 8-hydroxyquinoline assembled on Cu(111) surface (Figure 1)[4]. This image has been called a 'stunner' by Kemsley[7] in a research news published by *Chemical and Engineering News*, coinciding with the web release of the article by *Science*. What is stunning about this image is the fact that it not only shows the O–H•••O hydrogen bonds accepted by everyone, but also the C–H•••O and C–H•••N hydrogen bonds questioned and ridiculed by some in the not so distant past[8]. The opposition to call these 'hydrogen bonds' was so prevalent that Desiraju and Steiner had titled their book discussing C–H•••O hydrogen bonds as *The Weak Hydrogen Bond*[9]. A covalent bond could be a covalent bond, no matter how strong or weak it is. Of course, these arbitrary borders in hydrogen bonds vanished with the recent IUPAC definition which only insisted that some evidence be provided that there is bond formation between H already bonded to a more electronegative atom and any other atom or a group of atoms[2]. As the founder, chairman of the IUPAC task group, it is indeed personally pleasing to see the first image showing evidence for O–H•••O, C–H•••O and C–H•••N hydrogen bonds, all in the same molecular system.

With the hydrogen bond well established, chemists started wondering if other atoms could have such interactions. Alkali and halogen group atoms were of course the first targets as H used to top these two groups in older version of the periodic table. Many started working on lithium bonding and halogen bonding. For the first group elements all expected to have a valency of 1, it was simpler to see the presence or lack of lithium bonding. For the halogens it would be difficult as the halogen atoms, except F, were known to exhibit multiple valency with ClF_3 and IF_5 known as stable molecules. Hence, halogen atoms bonded to more than one atom could not constitute a halogen bond analogous to a hydrogen bond. Even with this complexity, halogen bonds similar to hydrogen bonds were seen both in the gas phase molecular complexes[10] and in condensed phase[11]. The definition of the halogen bond proposed by the IUPAC task group, chaired by P. Metrangolo and G. Resnati, reads as follows: 'A halogen bond occurs when there is evidence of a net attractive interaction between an electrophilic region associated with a halogen atom in a molecular entity and a nucleophilic region in another, or the same, molecular entity.' One can see the similarity with the hydrogen bond definition. The definition still avoids the use of the term 'electronegativity' commonly used by many chemists and biologists, but detested by purists.

The word 'occurs' right at the beginning of the definition makes one wonder 'what occurs?' Clearly the task group has stayed clear from getting into a debate about what is a 'bond'? Even to an emi-