Box 1. Who is scientifically literate? (UNESCO, 1993)

A scientifically literate person:

1. Knows something of the role of science in society and appreciates the cultural conditions; knows the conceptual inventions and investigative procedures.
2. Understands the inter-relationships of science and society, ethics, the nature of science, including basic concepts and relationships of science and humanities.
3. Appreciates the role of science in a humanistic way, and feels comfortable when reading or talking with others about science at a non-technical level.
4. Is curious about the how's and why's of materials and events – and genuinely interested in hearing and reading about things that claim the time and attention of scientists.
5. May never create any ideas pertaining to science, but will be conversant with the ideas that are being considered.

public, magazines, books, textbooks for school children and adolescents, exhibits for museums and galleries, informative websites, videos, theatre plays, and other means to disseminate information associated with invention and discovery, the essence of science.

In an effort to boost the interest of students in basic sciences, the Department of Science and Technology (DST), Government of India has announced 2004 as the 'Year of Scientific Awareness' (YSA 2004)[1]. DST is functioning as the nodal department to coordinate and monitor activities during the year through the National Council for Science and Technology Communication (NCSTC) and Vigyan Prasar (VP).

The main objectives of YSA 2004 are: (i) to enhance public awareness on the importance of science and technology; (ii) to convey the excitement of advances in science and technology to the young; (iii) to stimulate scientific temper in the common man, and (iv) to increase the capacity of the community for informed decision-making.

As a part of the YSA 2004 programme, the unique 'Vigyan Rail: Science Exhibition on Wheels' has been designed and implemented by VP and DST in coordination with the Ministry of Railways[2]. The Hon'ble Prime Minister of India flagged-off the Vigyan Rail on 15 December 2003 from New Delhi. The Vigyan Rail is a unique initiative in science popularization, to take science and technology to the people utilizing the extensive railway network in the country. A specially designed train with twelve compartments for exhibits depicting India's achievements in various fields of science and technology would move throughout the length and breadth of the country for about eight months. The Vigyan Rail will stop at 56 stations in different States/Union Territories, with each stop lasting for 2–7 days depending upon the geographical location and population.

The YSA 2004 programme covers themes like: (i) water and sanitation; (ii) health and nutrition; (iii) conservation of bio-diversity; (iv) preparing the community for managing natural disasters, and (v) empowering people through information technology.

Academic institutions, science-based organizations, research laboratories, science clubs, labour unions, employees' associations, youth and women groups, gram panchayats, etc. should conduct and coordinate several awareness and popular science activities in their respective areas for the benefit of common people.

The Gujarat Council of Science City (GCSC), working under the aegis of DST, Government of Gujarat has initiated a programme to inform the public about the exciting world of science and technology at the Gujarat Science City. GCSC has released an event calendar that depicts various scientific themes linked with important dates in the year that would be celebrated to inculcate scientific temper, attitude and deploying science for awareness and empowerment of the community.

1. Year of Scientific Awareness: Special Feature, *Frontline*, 13 February 2004.
2. Vigyan Rail: Science Exhibition on Wheels, Vigyan Prasar, www.vigyanprasar.com

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MEETING REPORT

Focus on earth science*

A two-day presentation of the project progress reports as a part of the 15th Group Monitoring Meet and the 10th Project Advisory Committee Meet of Earth System Science Division of the DST was organized by the Department of Geology, Banaras Hindu University. Besides presentations on new project proposals and progress reports by faculty members from different institutes, the 'Young Scientist Presentation' was an important highlight of this meet. It has been DST's initiative to encourage, give exposure and provide expert comments to motivated young earth science researchers through such presentations. Accordingly, eleven candidates carrying out research in earth sciences under different fellowship schemes were invited to present their work in this meet.

Solving Navier–Stokes equation at geologically realistic boundary conditions, S. Mukherjee (IIT Roorkee) provided a two-stage numerical exhumation model in terms of combined ductile shear and channel flow of the Higher Himalayan

*Based on a presentation of progress reports organized at Banaras Hindu University from 4–6 December 2003.

Shear Zone, Zanskar Himalaya and validated it from micro-textural data. Based on ^{207}Pb–^{206}Pb ages of detrital zircons from meta-sedimentary rocks from the eastern and western Dharwar blocks, M. Bidyananda (PRL) reported those zircons to be older than the Early Proterozoic, and that the crust-forming cycle took place in both the blocks during the Archaean Period. S. B. H. Kumar (Bangalore University) proposed a two-stage evolutionary model of the Eastern Dharwar craton as follows: (1) 2700 Ma back plume induced volcanism forming oceanic plateaus eventually accreted to protocontinent; (2) 2600–2550 Ma back subduction-induced partial melting of oceanic slab, giving rise to calc alkaline rocks over early formed protocontinent. S. Gupta (NGRI) reported 42–51 km anomalously thick crust below the mid-Archaean segment of the western Dharwar craton indicative of Archaean crustal shortening. Secondly, prominent low S-wave velocity zone in the mid-crust in the south Indian granulite terrain was interpreted as due to the possible entrapment of fluids during metamorphism, 2.6 Ga back. From his study on foreland basin development in compressional tectonic domain, G. K. Agarwal (University of Lucknow) narrated the relationship between basal friction coefficient and thrust and wedge geometry, and also simulated intermontane basins from a combination of basal detachment sheets. On the basis of samples collected during summer and winter seasons from northwestern India, S. Yadav (JNU) pointed out that the sources of aerosols in that region are the Thar desert and the certain litho-units of the Himalaya. He also suggested the ongoing desertification of Thar area due to natural removal of its dust particles. S. Gupta (University of Calcutta) presented palynostratigraphic studies from Sarda and Gandak wells, classified Tertiary succession of the Ganga Basin into 10 palynostratigraphic zones and specified age of litho-units using respective index taxa. J. Sanwal (Kumaon University) presented multi-proxy studies from Dulam area of Kumaun Himalaya, and based on the discovery of vertebrate fossils Mus and Golunda amongst other microfossils, four palaeocommunities were proposed; stable carbon isotope analysis of organic matter led to climatic zonation *vis-à-vis* ascertaining climatic changes through time (31 to 22 ka BP). P. K. Singh (BHU) discussed ultra-high temperature metamorphism from sapphirine–spinel–quartz bearing granulites from G. Madugula area of Eastern Ghats and reported isobaric cooling and isothermal decompression subsequent to peak metamorphism, and based on the P–T path. He correlated M_1 metamorphism of the study area with the Granvillan event. On the basis of structural analysis from Dudatoli–Almora Crystalline of the Kumaun Himalaya, N. R. Tripathy (BHU) concluded that the Rf/φ method was the best strain analysis technique, and that the study area had undergone three generations of deformation and folding events. From the studies on the tectonic evolution of the Chiplakot Crystalline Belt (CCB) of the Kumaun Himalaya, Y. Kumar (Kurukshetra University) presented his microtextural and fission track data and concluded that the middle of the CCB had undergone maximum shear strain, and that the hanging wall side of the CCB had undergone faster exhumation than its footwall. Award for best presentation was given to G. K. Agarwal and the second best award went to S. Yadav. The Young Scientist Presentation was encapsulated in an abstract volume containing all the eleven abstracts.

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RESEARCH NEWS

Condensation of bound pairs of fermionic atoms

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The probability of occupancy of single-particle quantum states in a collection of indistinguishable non-interacting particles is dependent on the total spin quantum number of the individual particles.

A dilute collection of atoms called fermions obey Fermi–Dirac statistics, if the total spin quantum number of electrons, protons and neutrons of the individual atoms is a half-integer (measured in units of Planck constant). In this statistics, all energy levels up to a maximum energy $E_F = k_B T_F$ are filled with one atom in each level and all the energy levels above E_F are empty at zero kelvin temperature. E_F is called the Fermi energy and T_F the Fermi temperature. At zero Kelvin, the fermionic atoms are said to be in a fully degenerate state. At finite temperatures for which $K_B T \ll E_F$, a narrow range of energy levels above E_F get occupied. If we can cool a cloud of fermionic atoms close to T_F, we can study the behaviour of a weakly interacting cloud of nearly degenerate fermionic atoms.

Alternatively, a dilute collection of atoms called bosons obey Bose–Einstein statistics, if the spin quantum number is an integer. They will exhibit the phenomenon of Bose–Einstein condensation (BEC) when cooled below a transition temperature T_c which is proportional to $n^{2/3}$, n being the number density of atoms, In BEC, a finite fraction of all the atoms occupies the lowest available energy state of the system. This fraction becomes nearly equal to one at zero kelvin.

For a dilute collection of alkali atoms which have a single electron in their outermost shell, the angular momentum quantum number $J = 1/2$. The nucleus has an angular momentum quantum number I which depends on the isotopic composition of the nucleus. For example, for ^{85}Rb, $I = 5/2$, while for ^{87}Rb, $I = 3/2$. Similarly, for ^{6}Li, $I = 1$ and for ^{40}K, $I = 4$.