Last total solar eclipse of the century

The last total solar eclipse of this century is going to be visible from North Atlantic Ocean to India via large parts of Europe and Middle East on 11 August 1999. In India the umbral shadow of the moon on the ground which causes temporary darkness will move from Northern Gujarat to the Bay of Bengal via parts of Maharashtra, Madhya Pradesh, Orissa and Andra Pradesh. It will occur in the evening. In Gujarat it will occur well before sunset but in Maharashtra at most of the places it will occur shortly before sunset. Although the eclipse occurs in the monsoon season, if it is not either cloudy or rainy, it may be visible in a belt comprising Bhuj, Vadodara, Khandwa, Akola, Bastar, Koraput, Vishakhapatnam and Vizianagram districts. In the Bay of Bengal the eclipse will end with the sunset. The best place to watch and conduct scientific experiments related to it in India will be in western parts of Gujarat state. The visibility of the corona of the sun there will be the best and longest. The shape of this shadow on the Earth will be nearly elliptical with the direction of major axis nearly east–west because the sun's position in the sky is angular with respect to the horizon and not right over the head. Its altitude at the time of its entry in India (in Kutch, Gujarat) will be at 13° and the same while leaving the Andhra Pradesh's coastline will be only 7°. Its duration in Kutch will be approximately 65 s but the same in the Bay of Bengal will be less than 25 s. The partial eclipse in India will start from 1600 h 53 m 03 s and the totality from 1700 h 59 m 21 s. From the start of the partial eclipse itself the intensity of the sunlight starts reducing slowly initially, the rate of which continuously changes becoming faster with time later and at the moment of start of the totality phase it drops abruptly to its lowest value. At the end of totality, the light intensity of the sun starts increasing abruptly to slowly later to the normal. After this eclipse the next total solar eclipse in India will be visible on 22 July 2009, the path of which will traverse from China to Bangladesh via Bhutan and Indian states Assam and Meghalaya. After that no total solar eclipse will be visible in India for about four decades.

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NEWS

DST sponsored SERC summer school NMCMP-V

The advent of computers has transformed all areas of research and development. Areas which were once considered to be remote from the field of computers are getting active help from this technology. This importance of computers has been enhanced many folds with the arrival of the Internet within the reach of an ordinary man. It is against this background that the Scientific and Engineering Research Council (SERC) of the Department of Science & Technology (DST), Government of India, devised a five-year cycle of summer/winter schools on 'Databases, Numerical methods and Computer Modelling in Modern Approach to Petrology (NMCMP)'. The aim was to train manpower for the utilization of computer technology to facilitate research work in Earth Sciences. To achieve this objective, research scholars, teachers and professional earth scientists from different organizations were invited to participate in these schools. The course content wad devised putting thrust on computer application supplemented with classroom lectures and demonstrations by eminent scholars in this field. The first school of this series was organized at the Delhi University under the directorship of P. K. Verma in 1993. It evoked a strong response. The successive schools of this cycle were later held at Jadavpur University, Calcutta under S. C. Sarkar in 1994, at Allahabad University, Allahabad under Alok K. Gupta in 1996 and at Wadia Institute of Himalayan Geology, Dehradun under K. K. Sharma in 1996. The fifth and last school of this cycle was held again at the Department of Geology, Delhi University under P. K. Verma from 23 March to 7 April 1999. A number of participants had attended more than one school of this series. The thrust of the last school of this series was on the use of internet and MS-Access for research purposes.

A large chunk of a research scholar's time is spent on literature survey. To search the voluminous literature available in the libraries of different universities and institutions is too tedious a job for the limited resources of a researcher. Furthermore, once searched this literature is not readily available for reference at a later time. To overcome this difficulty, MS-Access can be utilized effectively. Each and every reference can be assigned a unique ID number. Different tables can be correlated through these ID numbers. With the help of a scanner, important data tables and pictures too can be stored. The school served a great purpose by imparting the basic know-how of this database technique.

The course started with a very thought-provoking lecture by V. Rajamani, J.N.U. on the topic 'The making of Bharat'. MS-Access was taught by P. K. Verma with active support from his colleagues from the departments of

Geology and Computer Sciences. S. C. Sarkar (Jadavpur University) threw light on different aspects of metallogeny throughout the Indian subcontinent. A. K. Gupta (Allahabad University) delivered lectures on different processes of magma generation and the genesis of Komatiites. G. S. Nurulla (DDG, GSI, NW region) talked on seismic hazards and their evaluation. K. R. Gupta (DST) presented a talk on the funding of research projects and the role of DST in it. A. Dey (Calcutta University) delivered his talk on the different aspects of basalt petrogenesis with special reference to the Deccan basalts. K. K. Sharma (Wadia Institute of Himalayan Geology, Dehradun) discussed the nature of crustal growth throughout geological past and correlations of different Indian shields. R. S. Sharma (emeritus professor) taught various processes responsible for melt generation during the process of metamorphism. R. N. Singh (CMMACS, Bangalore) dwelt at length on the thermal modelling of the lower continental crust. S. K. Tandon (Delhi University) talked on how to understand the past climates with the help of different proxy indicators. J. P. Srivastava (Delhi University) presented a series of lectures on the geochemistry of the Deccan basalts. C. S. Dubey (Delhi University) demonstrated how to extract geological informations of our own interest from the Internet.

Each participant was given a task to prepare a representative database related to his own research work, which all the participants completed with support from faculty members and the Central Library staff.

As this was the last school of the series, there were discussions on future planning for running such schools. A suggestion made was to organize a workshop next winter for the participants to present their progress. Such schools have been very helpful for research workers. They are provided a platform to discuss their problems and to arrive at solutions with the help of fellow-workers and scientists from the different parts of the country.

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RESEARCH NEWS

Getting at the core of the colinearity of *Hox* genes

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Discovery of homeotic genes was a major step towards understanding the genetic control of development. Mutations in homeotic genes convert one body part into another; for example, *bithorax* mutation of *Drosophila* transforms part of the haltare towards wing. Pioneering work of Ed Lewis showed that bithorax locus is complex of several distinct genetic elements and, most importantly, that bithorax mutations map in an order that corresponds to the order of the body parts that are affected by these mutations[1]. This colinearity – correspondence of order of genes on the chromosome with the order of body parts that are under the control of these genes – is conserved up to vertebrates.

All homeotic genes were later found to have a 60 a.a DNA binding domain called the 'homeobox'. In fact, most of the homeotic genes outside *Drosophila* have been identified on the basis of this homology. Although the 'colinearity' of homeotic genes was first discovered in *Drosophila*, the fly seems to be an exception to the rule! Unlike other organisms, homeotic genes of *Drosophila* exist in two clusters (Figure 1 *a*): the Antennapedia complex (ANT-C) that controls development of the head and half of the thorax and the bithorax complex (BX-C) that controls development of the rest of the thorax and abdomen. In vertebrates, the corresponding homeotic genes exist in one cluster and there are four such clusters per haploid genome (Figure 1 *b*). Moreover, genetic experiments showed that colinear arrangement within the BX-C is not essential; for example, both *Ubx* and *Abd-B* can function even when displaced to different locations in the genome. Another difference between fly and vertebrate *Hox* complexes is that the complexes in vertebrates are compact, 80 to 120 kb, while in *Drosophila* the BX-C alone spans more than 300 kb, 95% of which constitutes *cis*-regulatory elements. The colinearity in the BX-C extends to this vast *cis*-regulatory region also. Such a striking colinearity in homeotic gene clusters observed in all animals with anterior–posterior axial polarity could not be an accident. Unlike in *Drosophila* where determination of entire anterior–posterior axis takes place simultaneously, in vertebrates there is a temporal order for this – anterior parts are determined earlier and posterior parts later. The *Hox* genes are, accordingly, activated in this temporal order – the spatial colinearity is accompanied by a 'temporal colinearity'[2,3]. Why does this organization of homeotic genes persist? In other words, what is the mechanism that utilizes this organization in the transcriptional regulation of homeotic genes?

Several observations suggest that the mechanisms involved in regulation of homeotic genes are conserved. Transgenic animals, both flies and mice, carrying a reporter gene driven by a *cis*-regulatory element from the *Hox* cluster often show an expression pattern which is consistent with the property of the regulatory element in question[4–8]. Also, when a reporter gene is inserted with the complex, its expression is driven by the *cis*-regulatory elements of complex in