from these spots by mass spectrometry is underway.

P. Venkatesan (Tuberculosis Research Centre, Chennai) briefed how computational tools could be used to classify biological sequences, detect weak similarities, separate protein-coding regions from non-coding regions in DNA sequence, predict molecular structure and function, and reconstruct the underlying evolution history as a means to our understanding of life and evolution as well as to the discovery of new drugs and therapies. His talk on 'computational molecular biology' majorly dwelt around machine learning approaches such as artificial neural networks, hidden Markov models, Markov chain Monte Carlo and belief networks that are ideally suited for analysing biological data.

Type 2 diabetes is associated with increased frequency of vascular restenosis due to accelerated vascular smooth muscle cell motility from the media to neointima. Nitric oxide (NO) is an established inhibitor of growth factor-induced vascular smooth muscle cell (VSMC) motility. Contrary to this, Madhulika Dixit (Germany) showed data that NO stimulates the motility of VSMCs cultured for several days in the presence of insulin. Additionally, chronic insulin exposure of these cells also abrogated the ability of NO to inhibit PDGF-induced motility. Showing a role for both tyrosine phosphatase and kinases in NO-mediated motility of VSMCs, Dixit related how these molecular mechanisms underlie the pathogenesis of vascular disease in hyperinsulinemic diabetes.

The symposium also included a presentation of research papers both oral and poster by Ph D students and junior faculty of several prestigious Indian university and research institutions and also from Sweden. Through this symposium it was made possible to bring together researchers working on different aspects of genomics and proteomics of diabetes and its complications on a single scientific platform to focus on current trends and needs and emphasize on what should be the future directions for translational research application in this field.

M. Balasubramanyam*, **M. Rema** and **V. Mohan,** Madras Diabetes Research Foundation, Gopalapuram, Chennai 600 086, India. *e-mail: drbalu@mvdsc.org

MEETING REPORT

Art of petrography: Eyes of a petrographer and mind of a petrologist*

The DST-sponsored contact programme on 'Art of Petrography' was held recently at the Banaras Hindu University (BHU), Varanasi. The course was aimed at reviving the mastery on careful petrographic studies to extract and interpret invaluable petrological information frozen in rock textures at meso-, micro- and even at nano domains of igneous, sedimentary and metamorphic rocks. There were 40 participants from all over India. Teachers (4) and research scholars (27) from different colleges/universities, junior-level scientists/researchers from GSI (3), NGRI (4), and State Directorate of Geology (2) constituted the list of participants. Twenty-two distinguished speakers were on the faculty. The lecture gallery with modern audio-visual system made the setting perfect for teaching and learning.

Anand Mohan (Department of Geology, BHU) while welcoming the participants, briefly highlighted the enormous potential and scope of petrographic studies of rocks. The inaugural lecture, 'A journey to the centre of the earth', was delivered by A. K. Gupta (Allahabad) on recent understanding of deeper parts of the earth through experimental, mineralogical and phase petrological studies. M. Joshi (BHU), reported on the methods of optical mineralogy and polarizing microscope, which are essential for petrographic studies. B. K. Chatterjee (BHU) discussed petrography of carbonate sediments and their diagenesis emphasizing that carbonate sediments are born, not made, unlike siliciclastics. I. B. Singh (Lucknow) discussed at length the petrographic aspects of sandstone including its changes with depth of burial. He also demonstrated the staining techniques used to differentiate primary and secondary matrix in clastic rocks. The nature of metamorphic reactions and technique of graphical representations in triangular diagrams of mineral assemblages related to different metamorphic reactions was taken up by Anand Mohan. S. Dasgupta (Jadavpur) concentrated on how to recognize key mineral assemblages in 'appropriate rocks' to unravel ultrahigh temperature metamorphic imprint, drawing examples from the Eastern Ghats belt. Reaction modelling and reconstruction of metamorphic *P–T* path from metamorphic reaction textures, especially coronas and reaction rims, was discussed by S. K. Bhowmik (IIT, Kharagpur). K. Das (ISM) dealt with recognition of extreme conditions of metamorphism from inclusions and intergrowths in porphyroblasts. The time relationship between deformation, crystallization and metamorphism was outlined by R. K. Lal (Varanasi). The techniques and essence of identification of shear zone fabric both in field and under microscope was explained by T. R. K. Chetty (NGRI, Hyderabad). Textures and structures in ductile shear zone, including shear sense determination were also discussed by A. K. Jain (IIT, Roorkee) with the help of numerous photomicrographs. R. S. Sharma (Jaipur) discussed the origin and interpretation of igneous textures from common phase diagrams. Overview of igneous textures and their variability was given by J. P. Shrivastava (Delhi). Y. J. Bhaskar Rao (NGRI) provided insights into new trends and applications on zircon *in situ* U–Th–Pb geochronology, Hf and Nd isotopic systematics and trace element geo-

*A report on the DST-sponsored contact programme on 'Art of Petrography' held in the Department of Geology, Banaras Hindu University (BHU) under the guidance of Anand Mohan, Department of Geology, BHU, during 17–27 April 2006.

chemistry with ICP–MS. Ore textures with several classical illustrations were the highlight of the talk delivered by G. S. Roonwal (Delhi). N. C. Pant (GSI, Faridabad) dealt with the role of electron microprobe analysis in petrography and the significance of REE and accessory minerals in chemical dating of rocks in two separate lectures.

Practical sessions were conducted with the help of a micro-image display system. Excellent thin-section slides were shown by several resource persons. Presentations by the participants on their research findings followed by discussions were an integral part of the course. Participants were also evaluated by a few resource persons through oral/written assignments. On the penultimate day, S. Mukherjee (GSI, Faridabad) shared his experience of the Antarctica expeditions through photos/slides.

The chief guest at the valedictory function T. V. Ramakrishnan (Indian Academy of Sciences, Bangalore) distributed certificates to each participant. A few participants spoke on the occasion. A volume containing all the lecture material was also published. The participants were of the opinion that this course on petrography was timely and that more such courses should be conducted in different parts of the country to help young scientists look at rocks through the eyes of a petrographer and mind of a petrologist.

Sarajit Sensarma*, Department of Geology, St. Anthony's College, Shillong 793 001, India; **M. Banerjee** and **Lopamudra Saha,** Department of Geology and Geophysics, Indian Institute of Technology, Kharagpur 721 302, India; **P. Udayaganesan,** Department of Geology, Alagappa Govt College, Karaikudi 630 003, India
*e-mail: sensarma2002@yahoo.co.in

COMMENTARY

Flowering asynchrony can maintain genetic purity in rice landraces

Debal Deb

Although contribution of genes from wild relatives has over centuries enhanced the genetic base of rice, genetic 'contamination' from modern rice cultivars, especially hybrids incorporating genes from *japonica* and *indica* varieties of cultivated rice (*Oryza sativa*), may cause loss of many characteristics (like aroma, slenderness or colour of grains) of an established landrace preferred by folk farmers. Transgenic rice varieties may further enhance chances of contamination of farmers' landraces with alien or incompatible genes[1], and raise concerns of biosafety[2].

Genetic impurity in rice varieties is caused more frequently from anthropogenic seed dispersal during planting than due to cross-pollination at flowering[3,4]. With the erosion of traditional practices regarding careful separation of seeds of different varieties, mixing of breeders' seeds is a frequent phenomenon. Most modern farmers in the global South have either forgotten or tend to neglect the traditional practice of 'roguing' for retaining genetic purity of their preferred landraces. Roguing is the removal of off-type rice plants from both parents[5], on the basis of morphological characters (like plant stature, leaf length and width, flag leaf angle, panicle shape and panicle size). With the erosion of the knowledge and practice of rouging, physical and genetic mixing is now commonplace in most local rice varieties.

An apparently uncontrollable source of varietal intermixing is cross-pollination, which occurs at a considerably low frequency between the cultivated rice and its wild relatives (especially *O. rufipogon*), and between landraces of the former. The frequency of out-crossing does not exceed 1%, even when panicles of donor rice plants were clipped with those of the acceptors, and when the acceptors had longest stigmas and highest degree of stigma exsertion[6]. The principal factors that physically reduce cross-pollination frequencies include a short style and stigma, short anthers, limited pollen availability, short-lived pollen, progressive decline of pollen viability, and a brief period (between 30 s and 9 min) between opening of florets and release of pollen[4,7]. Rice flowers often remain open for periods of less than 3 h, and only during daytime[8], which further delimits the scope of out-crossing.

Nevertheless, low rates of cross-pollination can occur in cultivated rice when plants with synchronous or overlapping flowering times grow in close proximity[9,10]. In order to prevent the risk of cross-pollination, rice researchers recommend a spatial isolation of about 110 m from seed production plots to other rice varieties[10,11]. Some authors[5] recommend an isolation distance of up to 200 m for male sterile (A line) multiplication, while for other varieties, it is sufficient to keep an isolation distance of 3 to 5 m.

However, it may not be feasible for small and marginal farmers in South and South East Asia to leave gaps of 110 m – or even 5 m – between plots of rice crops on their typically small farms growing two or more local rice landraces. Besides, a spatial gap of 5 m may not ensure zero out-crossing, as far as wind-borne transmission of pollen is concerned. The alternative measure of maintaining barrier isolation with sorghum, pigeonpea or sugarcane, with 30–40 m distance[10] is not an economical option for small farmers. Besides, plant barriers often have wide holes sufficient to allow pollens to fly across into plots on both sides.

As a more practicable alternative, I suggest here to maintain a temporal distance between cultivars in terms of flowering time. Some scholars recommend keeping a gap of at least 30 days between the flowering stage of the parental lines in the seed-production field and that of other varieties grown within the area to avoid contamination by pollen[5]. However, I argue here that a temporal separation by 12 h between the onset of flowering of one cultivar and the beginning of the milking stage of its neighbour is sufficient to check out-crossing.

The rice flower biology ensures that a small time gap between pollen release