

## RANDOM SELECTIONS

### **Crystal structure of a bacterial RNA polymerase holoenzyme at 2.6 Å resolution**

D. G. Vassilyev *et al.*  
*Nature*, 2002, **417**, 712–719

Binding of a 'sigma factor' is required for efficient and specific initiation of transcription by bacterial DNA-dependent RNA polymerases (RNAP). The core polymerase enzyme consists of five subunits with molecular mass 400 kDa. One of the sigma factors, sigma70, is required for transcription of housekeeping genes. The authors purified the holoenzyme of RNAP from *Thermus thermophilus* and high quality hexagonal crystals were subsequently grown for X-ray diffraction studies. The three-dimensional structure was modelled from electron density maps at a nominal resolution of 2.6 Å. A comparison of the holoenzyme structure with that of the core enzyme reveals that the 'RNA-exit-channel' is significantly altered upon sigma70 binding to the core enzyme.

### **Antifreeze protein from shorthorn sculpin: Identification of the ice-binding surface**

J. Baardsnes *et al.*  
*Protein Sci.*, 2001, **10**, 2566–2576

Antifreeze protein (AFP) in shorthorn sculpin, *Myoxocephalus scorpius* is essential for survival under frozen sea water. The major serum isoform of AFP from this organism was isolated from serum and purified by size-exclusion chromatography. This 42 amino acid protein was sequenced using mass-spectroscopy and several fragments of the native and variants were synthesized by solid phase synthesis. The activity of the protein and the peptide fragments were assayed for thermal hysteresis activity, and photomicroscopy observed for the formation of ice crystals in presence of such fragments. This investigation concluded that an alanine-rich region of the alpha-helix is required for interaction with the ice-surface, and that a hydrophilic lysine-rich region might be involved in enhancing the solubility of the protein.

### **Time-resolved *in situ* Raman spectroscopy of working catalysts: sulfated and tungstated zirconia**

S. Kuba and H. Knozinger  
*J. Raman Spectrosc.*, 2002, **33**, 325–332

Raman spectroscopy is useful for monitoring heterogeneous catalytic reactions

*in situ* since spectra could be obtained at high temperature and pressure. Time-resolved Raman spectroscopy is however difficult due to low sensitivity requiring long data collection time. Use of better filters and charge coupled device detectors could reduce data accumulation times to a minute or less. The authors studied the performance of zirconia-based catalyst for isomerization reaction of light alkanes. A fixed-bed reactor was used to obtain time-resolved *in situ* Raman spectra following the catalytic conversion, and the activity of the catalyst was simultaneously determined by online gas chromatography.

### **Self-organizing superstructures formed from hydrogen bonded biimidazolate metal complexes**

M. Tadokaro *et al.*  
*Proc. Natl. Acad. Sci. USA*, 2002, **99**, 4950–4955

Creation of novel molecular functional solid-state material employing crystal engineering techniques is being attempted. Such methods would utilize manipulation of self-organization in the crystals with the help of difunctional ligands. The 2,2'-biimidazolate monoanion (Hbim<sup>-1</sup>) has been used as difunctional bridge to connect stable metal-chelate complex and new intermolecular hydrogen bonding. Using Hbim<sup>-1</sup> dimers and metals (Ni, Ru, Co), it was possible to generate five controlled superstructures. End products of the synthesis of pre-programmed superstructures were zigzag ribbons, right-handed and left-handed helices, and a two-dimensional honeycomb sheet.

### **Self-assembly properties of a model RING domain**

A. Kentis, R. E. Gordon and K. L. B. Borden  
*Proc. Natl. Acad. Sci. USA*, 2002, **99**, 667–672

The family of Zn-containing RING-domain proteins is known to be involved in the regulation of cell growth, apoptosis, antiviral response and organelle biogenesis. Over 50 of the 200-members of the family are found in discrete sub-cellular structures that could be isolated as high molecular weight assemblies

(bodies). This paper reports the expression and purification of LCMV Z protein, containing a RING-domain, from bacterial expression system that assembled into spherical particles *in vitro*. Analytical gel filtration, ultrafiltration and mutagenesis studies pointed towards specific oligomeric self-assembly of the RING domain. Thermodynamic and kinetic aspects of the self-assembly were investigated using EM, analytical centrifugation, CD and light scattering. These experiments indicated a unique model of nonfibrillar homogeneous self-assembly that is different from assembly in tubulin and actin.

### **A collimated jet of molecular gas from a star on the asymptotic giant branch**

H. Imai *et al.*  
*Nature*, 2002, **417**, 829–831

Stars on the 'asymptotic giant branch (AGB)' are believed to be the progenitors which could evolve to become planetary nebulae. Evolved progenitors are usually spherically symmetric, but the planetary nebulae are not. To develop a physical mechanistic understanding of such intriguing phenomena, the authors investigate the jet of molecular gas emanating from an AGB star, W43A, located about 2.6 kpc from the Sun. Analysis of the water vapour MASER spots concluded that elongated planetary nebulae are formed during the transition from a proto-planetary to a planetary nebulae over a relatively short period of 1000 years or less. It is postulated that such collimated jets could be the result of dynamo action of the rotating magnetic forces, or due to the ejection from a mass-losing star in a binary system.

### **Rapid changes in flowering time in British plants**

A. H. Fitter and R. S. R. Fitter  
*Science*, 2002, **296**, 1689–1691

Flowering in plants is quite sensitive to climatic temperature changes. Global warming could possibly disrupt the stability in the ecosystem through its effect on the flowering patterns of plants. The authors corroborate alarming evidence to suggest that climate changes will alter community dynamics with profound evolutionary consequences.