

**Folding network**

MYOSIN is known to be involved in the movements of many types of cells other than muscle, but no specific organization of arrays of this molecule into a structure analogous to the sarcomeres of skeletal muscle has been observed in non-muscle cells. Until now, that is, for A. Verkhovsky and G. Borisy (*J. Cell Biol.* **123**, 637–652; 1993), using a specific fluorescent label, have traced the myosin distribution in living fibroblast cells, after removing all other cytoskeletal fibrillar structures (actin, microtubules and intermediate filaments). The authors then examined platinum replicas of the same cells by electron microscopy and discovered a network of myosin minifilaments. Each minifilament contacts its neighbour at the globular head region of the molecule, suggesting that the cell may contract by folding of the myosin filament network.

**Blood curdling**

THE deerfly, *Chrysops*, is another of those unlovable creatures that evolution has endowed with a biologically active molecule of unusual biochemical interest. Like other bloodsuckers, the insect secretes an inhibitor of clotting, and S. A. Grevelink and co-workers (*Proc. natn. Acad. Sci. U.S.A.* **90**, 9155–9158; 1993) have now found that this is a salivary protein, which eliminates platelet aggregation at minute concentrations. Unlike many common inhibitors of platelet function, the protein does not act by intervening in the second messenger cascade, but rather by competing with fibrinogen at its receptor on the platelet surface. Grevelink *et al.* leave the therapeutic possibilities of the new protein hanging in the air.

**Ice and rice**

THE ancient methane content of the atmosphere can be reconstructed to some extent from the gas contents of bubbles trapped in the polar ice sheets. How are anthropogenic emissions affecting the record? Profiting from the increased precision of a newly developed ice-milling method to look at the past thousand years' worth of an ice core drilled in central Greenland (the 'Eurocore'), T. Blunier and co-workers have found a strong correlation between methane concentrations and the population of China in the eighteenth century, both of which began to climb steeply after about AD 1750 (*Geophys. Res. Lett.* **20**, 2219–2222; 1993). Wetlands are one key source of methane emission, and the increasing cultivation of rice fields could account for part (although, as the authors are careful to point out, not all) of the increase in concentration. Even before the industrial revolution, man's effect on the methane cycle seems to have been far from negligible.

**Construction amid destruction**

J. Donald Rimstidt

That one might read the book of fate  
And see the revolution of the times  
Make mountains level, and the Continent,  
Weary of solid firmness, melt itself  
Into the sea.  
(Henry IV Part 2, Act III, Scene I)

ALTHOUGH the destruction of rock by chemical weathering is ever so slow at the macroscopic level, as asserted by Shakespeare, it is dynamic in the extreme at the microscopic level, as recounted by William Casey and colleagues on page 253 of this issue (W. H. Casey, H. R. Westrich, J. F. Banfield, G. Ferruzzi and G. W. Arnold, *Nature* **366**, 253–256; 1993).

The pyroxene and pyroxenoid silicate minerals studied consist of parallel chains of covalently bonded silica tetrahedra decorated with calcium and/or magnesium ions held in place by ionic bonds. Their destruction by chemical weathering proceeds in steps: first, hydrogen ions exchange with the calcium or magnesium cations; next, the cations are leached from the solid.

This leaves behind a leached layer consisting of amorphous silica. The common wisdom amongst geochemists has been that the amorphous layer is quickly destroyed by depolymerization and dissolution. Far from it! Raman spectra obtained by Casey and co-workers show that the silica in the leached layer can react to form four-membered silicate rings. This, together with similar reconstructive processes, seems to stabilize the leached layer to slow its rate of dissolution. Casey and colleagues speculate that, as rocks are weathered, the silica in this reconstructed, leached layer subsequently reacts with cations from the surrounding solution to create new minerals. This model suggests that clay minerals, which are common weathering products, grow through the reconstruction of residual silicate material on weathered minerals rather than by direct precipitation from solution.

Weathering reactions convert minerals to the soil that mantles the continents, and the cations leached from these minerals are carried to the ocean by rivers; both are important steps in the geochemical cycling of elements. Geochemists have long struggled to reconcile the discrepancy between laboratory-measured cation leaching rates and cation fluxes measured in the field, the latter being consistently slower. Could the leached layer that forms on weathered minerals in soils be responsible?

There are two different ways in which it could do this. Leached layers may act as barriers to the attack of hydrogen ions and

thus reduce the rate of the leaching reaction, or they may react with some of the leached cations to form new minerals and thus reduce the apparent rate of leaching. Either effect would explain the slower rate of cation release that is found in field studies, while both effects develop too slowly to be observed in most laboratory studies. In addition, it would explain the apparent topotactic growth of new minerals on the ones being destroyed by weathering (topotaxy is the strongly preferred orientation of crystals produced when a new phase grows on the original phase so as to preserve most of the original bonds). Altogether, this is a compelling explanation.

As with any good scientific investigation, this one creates at least as many interesting questions as it answers. For example, do other silicate minerals show similar evidence of reconstruction during dissolution? And what are the chemical steps that lead to the formation of new minerals from the leached surface? These steps are presumably similar to those that take place during the synthesis of zeolites from the aluminosilicate gels, so if we could understand one of these processes, we would probably find that we had solved the other.

Then there are the biological aspects to consider. How might the silica-rich, leached mineral surfaces interact with lung tissue? Every day we inhale substantial quantities of mineral dusts, some of which remains in our lungs. We already know that some kinds of mineral dust — asbestos minerals inevitably come to mind — cause fibrosis, lung cancer and mesothelioma. Perhaps, however, these diseases are the result of biochemical interactions not with fresh, unleached mineral surfaces but with leached and partly reconstructed surfaces.

Finally, how do these surfaces interact with soil solutions? They might, for instance, sequester plant nutrients so they are not carried away by infiltrating rain water; amorphous silica is widely used in chromatographic separations of organic and biochemical compounds because of its sorptive capacity, and it would be interesting to know how the reconstructed layer on weathering silicate minerals compares to chromatography silica. Can these layers immobilize toxic organic compounds in soils? Casey and co-workers may well find that they have started a flood of new geochemical research. □

J. Donald Rimstidt is in the Department of Geological Sciences, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061, USA.