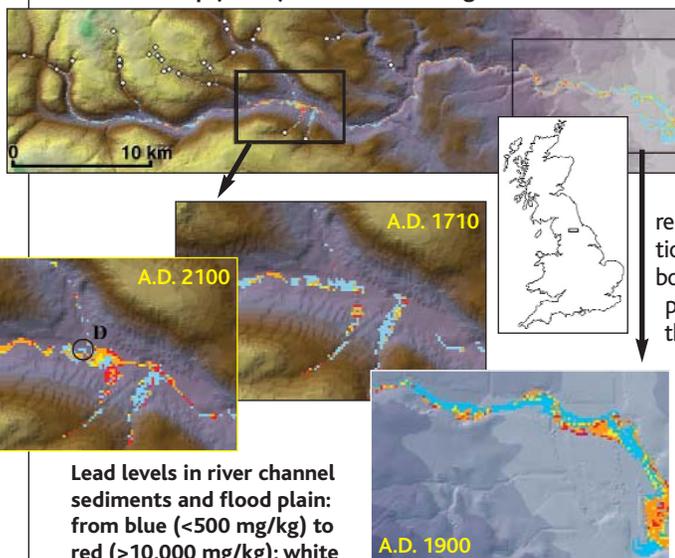


edited by Gilbert Chin

Center of map (Reeth) Lat.: 54°23'N; Long.: 1°57'W.



Lead levels in river channel sediments and flood plain: from blue (<500 mg/kg) to red (>10,000 mg/kg); white dots are grinding mills.

ENVIRONMENTAL SCIENCE Forgotten, But Not Gone

Many of the most contaminated and polluted sites around the world are related to abandoned mines. Water pollution due to acidification, toxic wastes, or both is common. Heavy metals from ore processing are distributed as particles throughout a watershed in such a way that areas downstream can be more heavily contaminated than sites close to the mine. Identifying these areas and understanding how land use or future climate changes might affect watershed sediments is critical.

Coulthart and Macklin present a simulation of how heavy metals have been and may continue to be distrib-

uted, focusing on the River Swale in England, an area that has been mined since Roman times. The model includes many aspects of river dynamics, such as channel migration and bank erosion, and accounts for sediment transfer down river networks. The simulations show that metals may accumulate in the downstream floodplain at levels exceeding that of deposits near the mine and that pollutants may persist locally for hundreds of years after mine closure. — BH

Geology 31, 451 (2003).

nonhydrogen atoms. Data were collected in 1 day, and the structure was solved the next day, suggesting that larger, more complex structures may also be tackled in this fashion. — JFU

Angew. Chem. Int. Ed. 42, 2029 (2003).

ECOLOGY/EVOLUTION Underneath the Litter

The European beech is one of the predominant trees of the natural forests in Europe. Over the past several centuries, foresters have replaced many of the beech-dominated forests with plantations of Norway spruce. Spruce needles and beech leaves produce litter with different structures and patterns of decay. Under spruce, soils are more acidic, and inorganic nutrients become locked up in organic matter, with ultimately deleterious consequences on food webs of soil organisms. In order to assess whether these consequences could be mitigated by planting mixed stands of beech and spruce, Scheu *et al.* have compared the soil communities of pure and mixed forests. Although microbial biomass was similar in the two types, that of most soil animal groups decreased under pure spruce and under mixed stands as compared to pure beech.

However, the structures of food webs, in terms of the ratio of predators to prey, were more similar in the pure beech and mixed stands, suggesting that mixed stands might enhance the preservation of ecological interactions. — AMS

Oikos 101, 225 (2003).

CELL BIOLOGY Critical Junctions

Mutations in the *neurofibromatosis type 2 (NF2)* gene, which encodes the protein merlin, result in aggressive

BIOMEDICINE

Antipericyte Drugs

Tumors require a blood supply for growth, and many new cancer therapies are designed to cut off that blood supply by disrupting the tumor vasculature. The majority of these drugs target the endothelial cells in the tumor vasculature, either by inhibiting their growth or by promoting their apoptosis. Recent work suggests that another constituent of tumor blood vessels—the pericytes (contractile cells that stabilize vessel walls)—may merit equal attention as a cellular target for cancer drugs.

Studying angiogenesis inhibitors in a mouse tumor model, Bergers *et al.* found that the therapeutic efficacy of an endothelial cell-targeted drug (a vascular endothelial growth factor receptor inhibitor) was greatly enhanced when it was combined with Gleevec, a drug that inhibits a protein expressed in pericytes: platelet-derived growth factor receptor. In independent work, Reinmuth

et al. concluded that the anti-tumor efficacy of an $\alpha V\beta 3$ integrin antagonist, another endothelial cell-targeted drug, was due in part to its impairment of pericyte function in the tumor vessels. Thus, combination cancer therapies targeting multiple components of the tumor vasculature may offer the greatest hope for clinical success. — PAK

J. Clin. Invest. 111, 1287 (2003);
Cancer Res. 63, 2079 (2003).

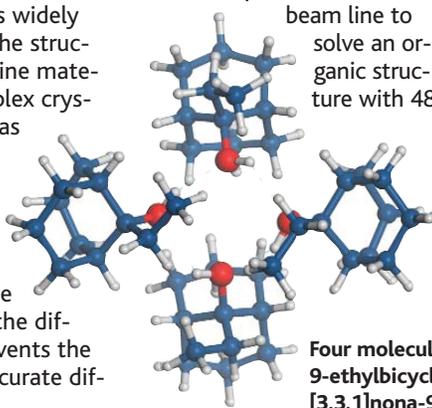
PHYSICAL CHEMISTRY

Taking a Powder

Powder diffraction is widely used to determine the structures of polycrystalline materials. However, complex crystal structures (such as organic molecules with more than 30 nonhydrogen atoms) often cannot be solved in this way, because the overlap of peaks in the diffraction pattern prevents the determination of accurate diffraction intensities.

Brunelli *et al.* put into practice an approach first suggested 40 years ago to facilitate the determination of complex molecular structures from powder diffraction. The method is based on the direction-dependent (or anisotropic) expansion of many low-symmetry materials with temperature. This expansion shifts the relative positions of the diffraction peaks. Hence, reflections that may overlap at one temperature are resolved at another. The authors used a recently upgraded, high-resolution powder diffraction

beam line to solve an organic structure with 48



Four molecules of 9-ethylbicyclo[3.3.1]nona-9-ol.

CONTINUED ON PAGE 1205

tumors of the nervous system. Like proteins (ezrin, radixin, moesin) to which it is related, merlin resides at the interface between the cell membrane and actin cytoskeleton, but a relationship between its location and tumor suppressor function has not been clear. Lallemand *et al.* have found that cultured fibroblast cells derived from *NF2*-null (merlin-deficient) mice are identical to wild-type cells in appearance and growth rate, except that they do not stop proliferating when the cells contact each other. The merlin-deficient cells were also unable to establish cell-cell contacts through adherens junctions, assemblies known to mediate the contact-dependent arrest of cell growth. Although the core components of adherens junctions were present, assembly of the final structures required merlin, and adding it back restored both junction formation and normal cell growth. — LDC

Genes Dev. 17, 1090 (2003).

PARASITOLOGY

Integral to Invasion

Intracellular parasites such as *Toxoplasma gondii* invade vertebrate cells via internalization after binding to the plasma membrane. They then set themselves up to replicate within a privileged membrane-bound vacuole residing in the host cell cytoplasm. In examining this process, Huynh *et al.* discovered that the protein

M2AP, which is found in the invasive organelle of the parasite (the microneme), is required for successful entry. Parasites engineered to lack M2AP were severely defective in host cell invasion. It appears that the ab-

Bound (red) and internalized (green) parasites; blue, host cell nuclei.

sence of M2AP resulted in retention within the *T. gondii* endoplasmic reticulum of the integral membrane protein MIC2, which normally would be rapidly secreted upon host cell attachment. Together these two proteins appear to form an adhesion complex that promotes efficient parasite invasion at the point of host cell-parasite contact. — SMH

EMBO J. 22, 2082 (2003).

CHEMISTRY

Stackable Conductors

Compounds that form columnar discotic liquid crystalline phases, where the disc-shaped molecules align in stacks, are of particular interest for creating organic semiconducting materials because of the potential for overlapping orbitals along the length of the stack. Molecules containing the oxadiazole moiety have been examined in detail as conductors because of their high electron mobilities. Zhang *et al.* synthesized a family of tris(oxadiazole) molecules with benzene cores and examined the liquid crystalline and electron-conducting properties. Focusing on one member of this family, they found that it exhibited a columnar discotic phase from 38° to 211°C. Optical microscopy showed that the columnar structure was retained in the solid formed when the liquid crystalline state was cooled. The electron mobility of this material (between 10⁻³ to 10⁻⁴ centimeter squared per volt per second) is comparable to that of other oxadiazoles. — MSL

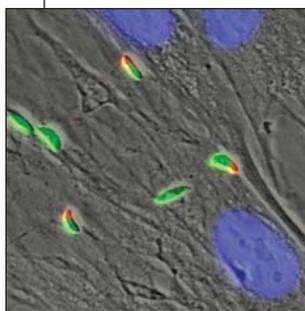
Langmuir, 10.1021/la0341456 (2003).

CLIMATE SCIENCE

An Off-Season Carbon Sink

In most plant species, the efficiency of water use during photosynthesis is increased by higher CO₂ concentrations. Therefore, elevated atmospheric CO₂ concentrations (from the burning of fossil fuels) would permit afforestation in drier regions. Drylands occupy vast areas of the globe, and greater forest cover would presumably increase carbon sequestration as well as provide a natural resource for local populations. In order to determine whether such an opportunity might exist, Grünzweig *et al.* conducted eddy flux, physiological, and inventory measurements in a 35-year-old forest (2800 hectares) at the edge of the Negev desert and evaluated the carbon balance of this system. The dryland forest stores 6.5 kg of C m⁻² and accumulates 0.13 to 0.24 of kg C m⁻² yearly. The uptake of CO₂ is highest during the winter, which is out of phase with most Northern Hemisphere forest activity and would expose low-latitude forests to CO₂ concentrations ~10 ppm higher than those in the summer. Expanding such afforestation efforts into regions of sparse shrubs and C4 grasses could lead to significant carbon sequestration. — HJS

Global Change Biol. 9, 791 (2003).



Antipericyte Drugs

Paula A. Kiberstis

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