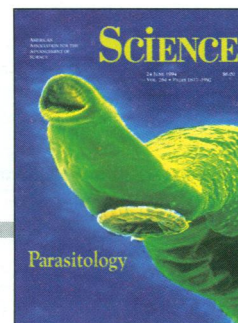


A false-colored scanning electron micrograph of *Schistosoma mansoni* (magnification $\times 2500$). This blood fluke penetrates the skin of humans after spending part of its life cycle in freshwater snails. Infection causes schistosomiasis, with the anemia and inflammation that result from the fluke settling in

intestinal blood vessels. The special section beginning on page 1857 focuses on the biology of parasites and the impact of parasitic diseases. The section pages are identified by an icon representing the head of the tapeworm *Taenia solium*. [Cover micrograph: CNRI/Science Photo Library/Photo Researchers, Inc.]



ARTICLE

- Low-Barrier Hydrogen Bonds and Enzymic Catalysis** ■ 1887
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- African *Homo erectus*: Old Radiometric Ages and Young Oldowan Assemblages in the Middle Awash Valley, Ethiopia** 1907
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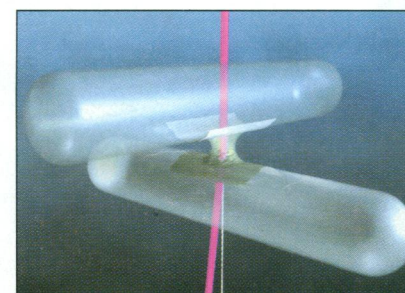
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1915

Complex fluid confinement

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Easier up than down

Recent modeling of mantle convection has focused on the effect of the phase transition between the upper and lower mantle on the pattern of convection. Liu (p. 1904) notes that the Clapeyron slope of the reaction changes from negative at temperatures below 1700° to 2000°C to neutral to slightly positive at higher temperatures, which might be appropriate for regions of upwelling in the mantle. In convection models containing this effect, hot plumes ascend easily through the region of the phase transition, whereas cold downwellings are impeded at it.

■

Tool transition

A key locality for understanding the transition from *Homo erectus* to *Homo sapiens* and for determining the timing and evolution of tool use is the Middle Awash Valley, Ethiopia. Stratigraphic correlations have been hampered by faults and poor age control. Argon-argon dates on interbedded tuff and a revised stratigraphic correlation by Clark *et al.* (p. 1907) imply that the fossil transition occurred at least by 600,000 years ago here. A change from Oldowan to Acheulean artifacts appears to be associated with a change in sedimentary facies, not hominid fauna, and thus suggests that hominids used different tools in different settings.

■

Clearing the picture

Conventional optical imaging methods are difficult to use when the object of study is embedded in a material that strongly scatters light. Ultrafast lasers and optical gates make it possible to ignore the highly scattered pho-

DNA polymerase: Structures and mechanism

Although a number of DNA polymerase structures have been reported, the mechanistic steps involved in elongating the DNA strand can be hard to infer in part because these enzymes are large and have domains that perform other catalytic functions. However, DNA polymerase β (pol β) is relatively small (335 residues), highly conserved, and has no other known functions. In a research article, Pelletier *et al.* (p. 1891) present crystal structures of two ternary complexes of the 31-kilodalton catalytic domain of rat pol β with a DNA strand (an 11-nucleotide template and a 6-nucleotide primer) and a chain terminator, 2',3'-dideoxycytidine triphosphate. Three aspartate residues (Asp¹⁹⁰, Asp¹⁹², and Asp²⁵⁶) coordinate two magnesium ions and the 3'-OH group that effects the lengthening of the DNA chain. In an accompanying report, Sawaya *et al.* (p. 1930) present the structure of whole pol β enzyme and compare it with other known polymerase structures. They argue that the presence of two invariant Asp residues suggests a common nucleotidyl transfer mechanism.

tons and capture those of interest. Alfano *et al.* (p. 1913) report imaging results in which a Kerr-Fourier gating configuration was used to image translucent drops in scattering solution. In contrast to studies with solid test object, the droplets have no sharp boundaries and differ only in concentration from the background material.

■

Seeing the squeeze

When confined or put under stress, complex fluids such as liquid crystals undergo structural rearrangements. Idziak *et al.* (p. 1915) report the development of an apparatus to study such complex liquids by means of x-ray diffraction. A surface forces apparatus, which permits control of the separation of two mica surfaces to ± 1 angstrom, was modified for use in an intense synchrotron x-ray beam. Under conditions of confinement and shear, the smectic liquid crystal 4-cyano-4'-octylbiphenyl adopted distinct planar configurations, including one that is not normally seen under flow conditions.

Maternal rescue

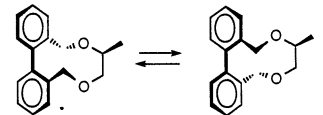
The embryonic expression pattern of transforming growth factor- $\beta 1$ (TGF- $\beta 1$) suggests that this multifunctional protein plays a vital role in mammalian development. Surprisingly, though, mice carrying two inactivated alleles of the TGF- $\beta 1$ gene appear to develop normally for the first 7 days of life. Letterio *et al.* (p. 1936) provide evidence that the survival of these "knock-out" mice can be attributed in part to maternal TGF- $\beta 1$, supplied to the pups transplacentally and in breast milk. These results illustrate that a gene knockout is not necessarily the same as a protein knockout, and thus sound a general cautionary note about the interpretation of such experiments.

■

Catalysts from RNA

Although RNA consists of only four distinct ribonucleotides, it can interact specifically with a surprisingly wide variety of small biological molecules. Prudent *et al.* (p. 1924) combined automated synthesis of one to two

hundred nucleotide-long segments of RNA and amplification of rare sequences by the polymerase chain reaction to generate a library of RNAs with randomized sequences. They then sifted through this library to find RNAs that catalyze the isomerization of a



simple, substituted biphenyl molecule. Acceleration of the reaction seems to occur through stabilization of the transition state and energy realized from binding of the substrate. That RNAs might perform such functions, in accordance with general principles of catalysis, suggests that prebiotic RNAs may have had similar abilities.

■

Foiling the clot

Proteins secreted from the salivary glands of leeches interfere with blood clotting, thus permitting the leech to suck blood from its host. These proteins inhibit binding and proteolytic reactions that would normally serve to localize and activate host processes such as platelet aggregation and generation of the fibrin clot. Krezel *et al.* (p. 1944) solved the solution structure of decorsin, one member of this group of leech proteins, that contains the sequence of amino acids arginine-glycine-aspartate that is recognized by host cell adhesion proteins known as integrins. Further, in comparison with other leech salivary proteins, a common three-dimensional structural motif is apparent even though these proteins share little amino acid sequence similarity and inhibit by different mechanisms.