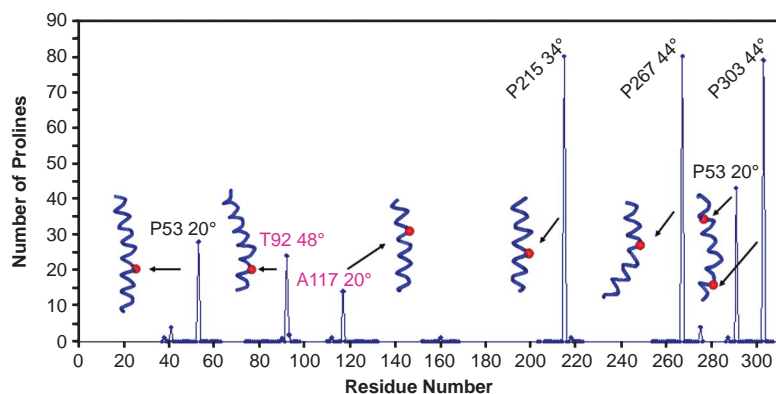


edited by Gilbert Chin



Locations of prolines (P) and kinks (red circles) in rhodopsin helices (blue).

why helices that contain internal proline residues are not straight, but bent.

Using experimentally solved crystal structures of transmembrane helices as exemplars, Yohannan *et al.* have aligned the amino acid sequences of homologous proteins and looked at prolines. Their startling finding is that there is a strong correlation between the frequency of prolines at a position and a bend in the helix at that site, even if the helix of known three-dimensional structure does not itself contain a proline. They suggest that kinked helices lacking proline have arisen via compensatory mutations; these serve to stabilize the bent conformation (which provided an evolutionarily advantageous function) to such an extent that proline is no longer necessary. Finally, they have extended this classification to the large and pharmaceutically relevant family of G protein-coupled receptors, defining three structural groups that differ in which of the seven transmembrane helices are bent and where. — GJC

*Proc. Natl. Acad. Sci. U.S.A.* **101**, 959 (2004).

## IMMUNOLOGY

### Ignition Without Transmission

To ensure optimal replication within its host, the human immunodeficiency virus (HIV) must surmount multiple barriers. One example is the predicament faced by the virus as a result of its need to activate T cells for replication, because activation has the undesired effect of bolstering antiviral immunity.

In their study of the HIV accessory protein Nef, Janardhan *et al.* show how the virus coopts this adapter protein, which has multiple roles in HIV replication, both in the activation of host T cells and in various forms of immune evasion. Nef was found to associate with and activate the GTPase Rac in T cells. This required association of the Rac-Nef complex with the proteins DOCK2 and ELMO1, and resulted in the impaired responsiveness of activated, Nef-expressing T cells

toward chemotactic stimuli. By uniting Rac with its activators, Nef simultaneously facilitates signals that activate HIV-infected cells and those that cripple their capacity to migrate to lymphoid tissues, thus ultimately diminishing the potential for antiviral immunity. — SJS

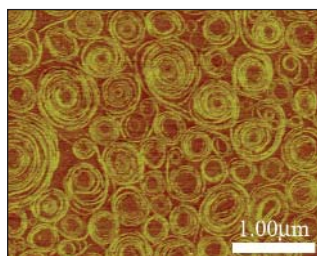
*PLoS Biol.* **2**, 65 (2004).

## CHEMISTRY

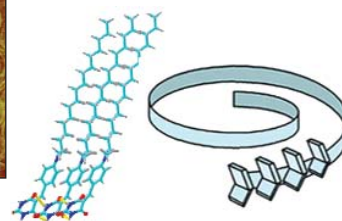
### All Wound Up

When achiral molecules form two-dimensional films, symmetry breaking can occur, creating chiral patterns. Huang *et al.* found that Langmuir-

Blodgett films of an achiral molecule, an amphiphilic derivative of barbituric acid, were composed of arrays of spiral structures. Monolayers of these molecules were formed at an air-water interface and then transferred to solid supports and imaged with an atomic force microscope (AFM). The authors argue that compression of the films closely packs the aromatic rings of the head groups and that the directionality of hydrogen bonding interactions induces a preferential tilting of neighboring molecules; together, they produce spirals. The tilt appears to be a spontaneous symmetry breaking in that the circular dichroism signal is the



AFM image (above) and formation of spirals (right).



## BIOCHEMISTRY

### An Evolutionary Bent

One of the facts that students of introductory biochemistry are taught is that proline is special because it contains a secondary amine, unlike the primary amine found in other amino acids. This difference in chemistry explains

same throughout a film, but the sign of the signal changes from batch to batch. — PDS  
*J. Am. Chem. Soc.* **10.1021/ja036878i** (2004).

## PHYSICS

### Riding the Attosecond Train

The lyrics from the Curtis Mayfield song, "People get ready, there's a train a-comin' ... you just get on board" could be adopted as the motto of the ultrafast laser community. With the advent of attosecond laser pulses now comes the potential for probing and controlling some of the fastest electronic processes known—the electron dynamics within the atom. When an atom is hit by an intense laser beam, the electrons can be excited by the laser field and flung into higher energy orbits around the nucleus. With relatively long laser pulses, these orbits are a coherent sum of many different quantum paths and are generally nonspecific. Schafer *et al.* present calculations showing that by subjecting the atoms to a train of attosecond laser pulses at just the right time during the cycle of the longer pulse, the electrons can be made to track specific orbits. The ability to control the quantum paths of electrons around atoms will find immediate use across a range of applications from precision spectroscopy to metrological clocks. — ISO

*Phys. Rev. Lett.* **92**, 023003 (2004).

## BIOTECHNOLOGY

### You Aren't What You Eat

One of the concerns about genetically modified foods is the potential for transfer of foreign genetic material (for instance, antibiotic resistance genes) into either our own cells or those of organisms

CONTINUED ON PAGE 593

resident within our bodies, such as intestinal bacteria. Studies of gene transfer from plants to livestock have generally shown that most DNA is destroyed in the harsh conditions of the gut and hence little is found in animal feces.

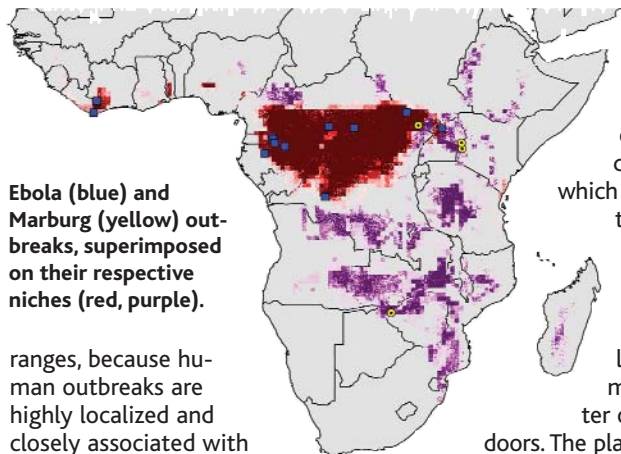
Netherwood *et al.* have carried out a similar test in seven human volunteers who had undergone ileostomy, a procedure in which the last section of the small intestine is removed and the intestinal contents are diverted into a colostomy bag. After a breakfast of a soy burger and milk shake, the levels of the herbicide resistance transgene 5-enolpyruvylshikimate-3-phosphate synthase were measured, with only 3.7% of the initial amount consumed found in one individual's digesta and much less in the other six people. In a trial of humans with intact gastrointestinal tracts fed the same meal, none of the transgene was detected in their feces, suggesting that DNases produced by flora of the large intestine degrade whatever survives transit through the stomach and small intestine. — GJC

*Nature Biotechnol.* 10.1038/nbt934 (2004).

#### VIROLOGY

### Desperately Seeking Reservoirs

The filoviruses Ebola and Marburg cause terrifying hemorrhagic fevers in people and kill most of those infected. The reservoir hosts remain elusive but are likely to be small mammals with limited



**Ebola (blue) and Marburg (yellow) outbreaks, superimposed on their respective niches (red, purple).**

ranges, because human outbreaks are highly localized and closely associated with hunting activities; there also have been notorious disease outbreaks in endangered species of wild apes.

Peterson *et al.* have been trying to use ecological constraints acting on these viruses to map possible reservoirs. Although they acknowledge the severe

limitations posed by small sample size, they have developed an ecological niche comparison model that integrates geographical and climate data with outbreaks. Essentially, Ebola Zaire and Ivory Coast seem to be restricted to patches of hot, humid, broad-leafed forests of central Africa. Ebola Sudan and Ebola Reston clearly occur under different geoclimatic conditions, and the phylogenetically distinct Marburg virus is found in drier conditions prevailing in eastern and southern Africa. The origins of Ebola Reston are mysterious. It was isolated from macaques bred in the Philippines, and prevailing ecological conditions in parts of Mindanao could support Ebola, but the indications are that Ebola Sudan might offer a stronger clue to Reston's origin. — CA

*Emerg. Infect. Dis.* 10, 40 (2004).

#### CHEMISTRY

### Pockets of Gold and Silver

In the adaptation of technologies for use in the developing world or for broad use by first-line emergency responders, it is key that they be low-cost and require minimal supporting infrastructure and personnel. With these two principles in mind, Sia *et al.* have designed a portable, cost-effective immunoassay with sensitivities and detection limits comparable to those of the standard enzyme-linked immunosorbent assay (ELISA). Instead of linking amplifying enzymes to the antibodies, the authors attached 10-nm colloidal gold particles, which in the presence of hydroquinone reduced silver ions to silver, which then catalyzes the reduction reaction. The silver film produced is easily and quantitatively detected with a low-power laser diode. By operating the light source in a pulsed mode, it was possible to filter out ambient light, even outdoors. The platforms for the detectors were fabricated with soft lithography, and both microwell plates and microfluidic channels could be used. Although microfluidic ELISA runs into detection problems because of enzyme product diffusion, this is not observed with the colloidal gold antibodies. — MSL

*Angew. Chem. Int. Ed.* 43, 498 (2004).

# Qs & AAs

## Questions and Answers.

We live in a demanding world, a world of questions. Science is being asked to help deliver answers more quickly than ever before. Keeping up to date with the latest scientific news and developments is ever more critical at this time in order to succeed. The question is how.

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