EDITORS' CHOICE

edited by Gilbert Chin

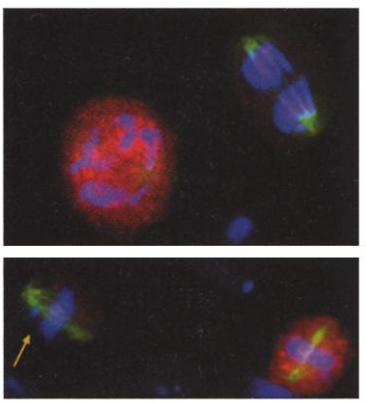
CELL BIOLOGY

Controlling Chromosome Movement

The congregation of condensed chromosomes at the equator of the mitotic spindle and their subsequent partitioning towards the poles is one of the most visually fascinating events of cell biology. Four groups looking at the mechanism of chromosome segregation now describe the roles played by several proteins in this process.

Savoian *et al.* report how *Drosophila* mutants lacking either of two proteins—ZW10 and Rod—separate chromosomes along the mitotic spindle at reduced rates, probably due to a failure to recruit the molecular motor dynein. Chan *et al.* have looked at the human versions of Rod and ZW10 and found that they are inspected at a mitotic checkpoint; if they're missing, cells may move from metaphase into anaphase inappropriately. Additional evidence for the importance of this pair of proteins at the mitotic spindle checkpoint in *Drosophila* neuroblasts is provided by Basto *et al.* Finally, a study by Sharp *et al.* supports the notion that dynein is important in promoting the poleward motion of chromosomes during mitosis. Together these findings demonstrate that chromosome segregation is tightly regulated, that the kinetochore proteins ZW10 and Rod are components of this system, and that the key motor is dynein. — SMH

Nature Cell Biol. **2**, 948; 944; 939; 922 (2000).



The amount of the checkpoint regulator cyclin B (red; DNA, blue; microtubules, green) in wild-type cells is high in prometaphase and low in anaphase; in a cell lacking Rod (arrow), cyclin B already is low in prometaphase.

SOURCE: (RIGHT) BRIZIUS *ET AL.*, *J. AM. CHEM. SOC.*, IN PRESS; (LEFT) BASTO *ET AL.*, *NATURE CELL BIOL.* **2**, 939 (2000).

CLIMATOLOGY

Low Clouds and Cosmic Rays

If the study of global climate change were a card game, one of the wild cards would be the role of clouds. Clouds are a primary influence on the energy budget of Earth's surface and atmosphere because of their effects on the reflection and absorption of solar radiation and their trapping of outgoing long-wave radiation. Clouds differ in their radiative properties, however, and the complexity of cloud formation is greater than our understanding of all of the factors that control their distribution and composition. Solar cosmic rays may influence global cloud cover because they can ionize atmospheric particles and thus create condensation nuclei for cloud droplet formation. The terrestrial cosmic ray flux depends on solar output and is modulated by Earth's magnetic field; both of these quantities are known to vary.

Marsh and Svensmark have measured global average monthly cloud anomalies for lower, middle, and upper troposphere, and correlated them with changes in the cosmic ray flux. They found, surprisingly, that cloud cover at altitudes of less than 3.2 kilometers covaries with cosmic ray fluxes from 1980 to 1995, but no correlation was seen for higher altitude clouds. If this relation is systematic, cosmic ray variability could have a significant effect on the evolution of climate. — HJS

Phys. Rev. Lett. **85**, 5004 (2000).

PSYCHIATRY

Future Progress

The prevalence and complexity and societal costs of mental illnesses, such as schizophrenia, obsessive-compulsive disorder, and unipolar depression, are detailed in a set of reviews with a preface by Hyman. What emerges is the realization that the understanding of the biological bases of these disorders is fragmentary. From twin and familial studies, there clearly are strong genetic components to many of these disorders, but multiple loci are likely to be involved. Effective pharmacological intervention has hinted at specific neurotransmitter systems, but the diversity of transmitters and overlapping receptor affinities have thwarted any simple linkage of behavioral and molecular phenotypes. More recently, brain imaging investigations have identified candidate structural and functional abnormalities, but these, too, have been hard to incorporate into a satisfying mechanistic explanation. What brings future progress in understanding within reach, however, is the promise of integrated efforts based on advances in systems neuroscience and the human genome. — GJC

Neuron **28**, 321 (2000).

BIOCHEMISTRY

A Bucket Brigade

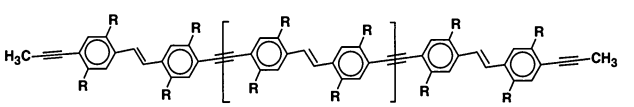
In *Escherichia coli*, disulfide bond formation occurs in the periplasm under the control of the Dsb system. The cytoplasmic membrane protein, DsbD mediates electron transfer from the cytoplasm to the periplasm by providing reducing equivalents that then are used by the periplasmic protein DsbC to catalyze the rearrangement of disulfide bonds.

Katzen and Beckwith split DsbD into its three structural domains—an amino terminal periplasmic domain, a trans-

CHEMISTRY

Simple Synthesis of Conjugated Polymers

Homogeneous transition-metal catalysts often require elegant and complex synthetic design. Brizius *et al.* show that a simpler approach can yield an efficient catalyst for polymerization reactions. Alkyne metathesis (swapping substituents of the triple bonds of two molecules) proceeds for a wide variety of alkynes in 1,2-dichlorobenzene when $Mo(CO)_6$ and 4-chlorophenol are added.



A poly(*p*-phenyleneethynylene)/poly(*p*-phenylenevinylene) hybrid.

The reactions are not affected by the presence of alkene groups in the same molecule. This approach can be used to make highly substituted conjugated polymers like those used in light-emitting diodes or thin-film transistors but with the advantage that these hybrid polymers can incorporate both double and triple bonds bridging the phenyl groups. — PDS

J. Am. Chem. Soc., in press.

CONTINUED ON PAGE 2035

membrane domain, and a carboxyl terminal domain—and showed that electrons are transferred directly from cytoplasmic thioredoxin to a pair of cysteine residues in the transmembrane domain of DsbD. In a cascade of disulfide bond reduction and formation, the reducing equivalents are then shuttled via more cysteines through the thioredoxin-like carboxyl terminal domain into the amino terminal catalytic domain. From here the electrons are transferred directly to periplasmic substrates such as DsbC. Krupp *et al.* have used cysteine substitution mutants to trap mixed disulfide intermediates between intact DsbD and both thioredoxin and DsbC, delineating the same pathway. One outstanding question is how the cysteine pair in the transmembrane domain of DsbD becomes accessible sequentially to cytoplasmic thioredoxin and to the periplasm. — VV

Cell **103**, 769 (2000); *J. Biol. Chem.*, in press.

ECOLOGY/EVOLUTION

Long-distance Violets

The Hawaiian archipelago continues to produce surprises for evolutionary biologists. Because all of the islands of the archipelago originated *de novo* from a volcanic hotspot in the central Pacific, the entire biota must trace its ancestry to propagules that traversed enormous distances by dispersal from other islands and from the continental Pacific Rim. For extant plants alone, nearly 300 successful colonizing events are estimated to have occurred.

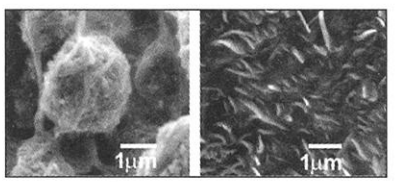
Most of the biogeographic affinities of the islands are with other tropical regions, but Ballard and Sytsma now reveal an unsuspected connection to the Arctic. A molecular phylogenetic analysis of the relationships of Hawaiian woody violets links them to other Alaskan and Siberian violet species—rather than to South American ones as previously assumed. A large number of Alaskan bird species winter in Hawaii, suggesting a probable means of dispersal; experiments with violet seeds indicate that transport and survival in birds' crops is a viable mechanism. Molecular analyses may reveal more instances of unexpected biological relationships between tropical islands and the Arctic. — AMS

Evolution **54**, 1521 (2000).

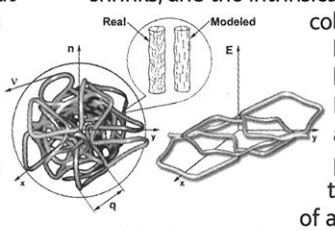
POLYMER SCIENCE

Spinning a Yarn Ball

One approach for directing polymer morphology is to use a microporous template to control polymerization reactions. Kossyrev and Crawford used an alumina membrane with cylindrical pores (0.2 micrometer in diameter) and coated the interior of these pores with a liquid crystalline monomer before triggering photopolymerization. Hollow tubes formed within untreated pores, but pretreating the pores with lecithin resulted in the formation of polymer threads. When these threads are released by etching away the alumina, the polymer skin shrinks, and the intrinsically straight thread collapses into a tightly packed "yarn ball" configuration. Because of the alignment of the polymer within the thread, application of an electric field (5 to 10 volts per micrometer) reverses the structural collapse and converts the yarn ball back into an untangled thread. — PDS



Scanning electron micrographs of the yarn balls (left) and unraveled threads (right), and a model of the polymer thread (below).



Appl. Phys. Lett. **77**, 3752 (2000).

GEOLOGY

A Massive Slam-Slump

The impact of a large comet or asteroid at the end of the Cretaceous had wide-ranging effects on life and geologic processes. It generated fires and a globally distributed layer of debris, blasted material over much of the western Hemisphere, likely released seismic energy equivalent to an earthquake of magnitude 10 to 13, produced giant tsunamis in the Gulf of Mexico region, and led to a global mass extinction. Norris *et al.* show that the impact also resulted in widespread and massive failure and slumping along much of the eastern North American continental margin and slope. The authors identified mass flow deposits in two drill cores along the margin and correlated these layers, which occur at the Cretaceous-Tertiary boundary, with geophysical data and other studies along the continental margin from Bermuda to the Grand Banks. Collectively, these deposits may represent the largest mass-wasting deposits known on Earth. — BH

Geology **28**, 1119 (2000).

CREDITS: KOSSYREV AND CRAWFORD, *APPL. PHYS. LETT.* **77**, 3752 (2000).