May 24, 2005 | vol. 102 | no. 21 | 7403–7776

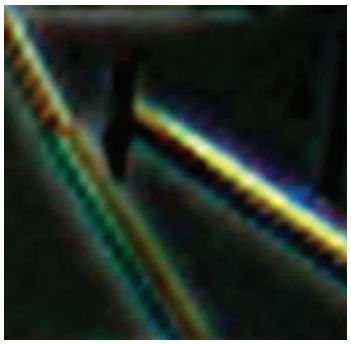
In This Issue

PNAS
Proceedings of the National Academy of Sciences of the United States of America
www.pnas.org

APPLIED PHYSICAL SCIENCES

Imaging of self-assembled phospholipid tubules

Tilt ordering of chiral phospholipids in self-assembled tubules has been imaged with a liquid-crystal optical amplification system, Yue Zhao *et al.* report. The authors found that the tubules can have both uniform and modulated tilt states. Chiral phospholipids and other related molecules can self-assemble and form cylindrical tubular structures. Based on the chiral interaction, coupled with molecular tilt, theorists predict uniform and modulated tilt states for the tubules. In the uniform tilt state, the tubule has a constant orientation of the molecular tilt with respect to the equator of the cylinder. In the modulated tilt state, the tubule has a periodic modulated orientation of the molecular tilt winding around the cylinder. Zhao *et al.* used liquid-crystal optical amplification and a polarizing optical microscope to image the tubules and made separate measurements of the tubules' surface with atomic force microscopy. The authors observed that the tubules organized themselves into the uniform and modulated tilt states. Zhao *et al.* suggest that understanding molecular tilt orientation is a key step in controlling the size and shape of tubules and designing novel nanoscale structures.



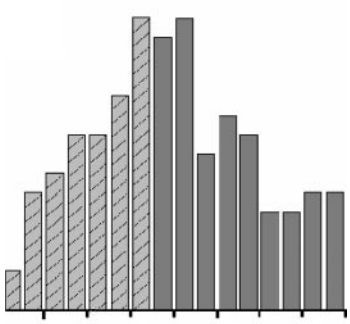
Liquid-crystal image of modulated tilt tubules.

"Liquid-crystal imaging of molecular-tilt ordering in self-assembled lipid tubules" by Yue Zhao, Nidhi Mahajan, Ruibo Lu, and Jiyu Fang (see pages 7438–7442)

ENVIRONMENTAL SCIENCES

Human-induced climate change triggers wildlife behavioral shifts

Terry Root *et al.* report that plant and animal responses to warmer temperatures can be linked to anthropogenic disturbances like greenhouse gas and aerosol production. The authors tested whether observed phenological traits, such as shifts in time of blooming or migration, were linked to temperature trends generated by the HadCM3 General Circulation Model. The authors considered three forcing scenarios: natural, anthropogenic, and combination of natural and anthropogenic forces. Temperatures generated in the combined scenario represent the closest match to actual 20th century climates. Examining 145 species from Europe, North America, and Asia, Root *et al.* found statistically significant shifts in traits during the spring. Most shifts were negative, with changes occurring earlier in the year at global, hemispheric, regional, and local scales. Larger shifts (−4.4 days/decade) were seen in species at higher latitudes than in those nearer the equator. The most significant associations occurred between species shifts and temperature trends generated via the HadCM3 General Circulation Model combined scenario, as well as the anthropogenic model. These results suggest "joint attribution," in which human-generated greenhouse gases and aerosols are likely changing surface-air temperatures at all scales, including regional and local, and in turn inducing detectable changes in wild species.



Correlation of species traits and temperatures, from natural and anthropogenic forces.

"Human-modified temperatures induce species changes: Joint attribution" by Terry L. Root, Dena P MacMynowski, Michael D. Mastrandrea, and Stephen H. Schneider (see pages 7465–7469)