

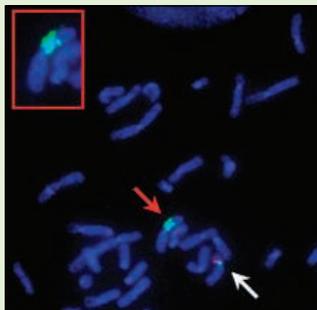
edited by Gilbert Chin

## BIOMEDICINE

## Tracking the Origins of Lung Cancer

Lung cancer is the leading cause of cancer deaths in the United States. Most patients are diagnosed at an advanced stage of the disease, which has hampered research into its molecular and cellular origins. Consequently, only 15% of patients who are diagnosed today with the most common subtype of lung cancer will survive for 5 years—a bleak statistic that has not changed over the past 15 years.

Two reports illustrate that there may be reasons for optimism, due largely to recent advances in how the disease is approached methodologically and conceptually. To identify genes that play a role in the pathogenesis of the distinct subtypes of lung cancer, Tonon *et al.* studied human tumors by comparative genomic hybridization and expression profiling, two methods that, when integrated, provide a comprehensive picture of the critical genomic alterations that characterize each subtype. Interestingly, adenocarcinomas and squamous cell carcinomas (SCCs), two sub-



Both adenocarcinomas and SCCs exhibit amplification (green dots) of a region on chromosome 8.

types previously thought to have diverse etiologies because of their distinct histopathological features, were found to have nearly identical genomic signatures, suggesting that they may in fact arise from a common stem/progenitor cell.

The possible stem cell origin of lung cancer was the focus of independent work by Kim *et al.* Using a mouse model, they identified a population of cells, termed BASCs (bronchioalveolar stem cells), whose anatomical location and ability to self-renew and differentiate into multiple lung cell types are features consistent with those predicted for a lung stem/progenitor cell. Remarkably, BASCs were enriched in early-stage lung tumors in mice, and they expanded in response to oncogenic stimuli in cell culture, suggesting that they might play a role in tumorigenesis. Should future studies identify BASC counterparts with a

causal role in human lung cancer, this could lead to new therapies that target the earliest stage of disease, a development that is desperately needed. — PAK

*Proc. Natl. Acad. Sci. U.S.A.* **102**, 9625 (2005); *Cell* **121**, 823 (2005).

revealed that the dominant male was responsible for 85% of paternity. The subordinate male is typically unrelated to the dominant, having joined the group after migrating from another. When combined with the genetic data, behavioral observations suggested that the most likely explanation for the dominant male's lack of a reproductive monopoly is that he is unable to prevent the subordinate from having access to the females. This is an example of the "tug-of-war" model of reproductive skew in animal societies, as opposed to the "concessions" model, where the dominant male permits limited matings by subordinates—a situation that is more likely when the males are related to one another. — AMS

*Proc. Natl. Acad. Sci. U.S.A.* **102**, 9418 (2005).

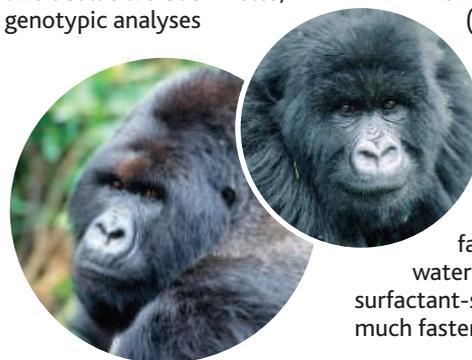
## MATERIALS SCIENCE

## Silanized Bubbles

Foams (for example, the head on a pint of beer) are mixtures of fluid and millimeter-sized gas bubbles. To retard collapse of the foam due to leakage of the fluid component, organic molecules such as surfactants or proteins are usually added.

Binks and Horozov describe a different approach to the stabilization of foams by showing that silica nanoparticles can serve as stabilizers. The foam volume depends on

how hydrophobic (water-repelling) the nanoparticles are. Comparison of the foam stability to that of a foam made with a commonly used surfactant shows that water drains out of the surfactant-stabilized foam much faster (within minutes)



Mountain gorillas.

## APPLIED PHYSICS

## Holographic Sensors

Chemical sensors generally depend on the response of an absorbing or adsorbing material when it is exposed to the chemical of interest. Optimum performance is usually a trade-off between sensitivity and response time. Ye *et al.* describe a chemical sensor, based on holographic interferometry, in which the presence of a chemical on a suitably sensitive material results in a detectable shift in the optical path length through that material. The use of holography allows a large area to be scanned at one time, which offers the potential of storing a two-dimensional odor image in the hologram. They demonstrate the ability to sense

ethyl alcohol down to the level of 40 parts per billion, with a relatively fast measurement window of 5 s—a response time that may allow dynamical sensing to be achieved. — ISO

*Opt. Lett.* **30**, 1467 (2005).

## ECOLOGY/EVOLUTION

## Second Banana

The mountain gorilla is one of our closest living relatives, surviving in the wild as a population of perhaps no more than a few hundred individuals. Despite the gorillas' extreme rarity, their wariness of humans, and the remoteness of their habitat, an understanding of their ecology and behavior is slowly emerging through decades of patient observation.

In the latest example of such work, Bradley *et al.* investigated patterns of dominance and reproduction in wild populations of the mountain gorilla in Rwanda over a 15-year period, with a particular focus on how reproduction is apportioned between the adult males. In groups with two adult silverback males, genotypic analyses

than out of the nanoparticle-stabilized foam (within hours). Addition of a small amount of salt (à la Stan Murch) further improves foam longevity. Nanoparticle-stabilized foams of this kind may find application in the food, detergent, and cosmetics industries. — JFU

*Angew. Chem. Int. Ed.* **44**, 3722 (2005).

## NEUROSCIENCE

### Preserving Memories

Long-term potentiation (LTP), one of the most widely studied forms of neuronal plasticity, has been amply documented in excitatory synapses on pyramidal neurons. However, there is scant evidence for this phenomenon in inhibitory interneurons.

Using perforated-patch recordings, Lamsa *et al.* elicited robust Hebbian-type LTP in hippocampal stratum radiatum interneurons. This pathway-specific LTP does not require dendritic spines and depends on disynaptic feedforward inhibition of pyramidal cells. If memory encoding mediated by LTP were to enhance only monosynaptic excitation and not disynaptic inhibition of pyramidal neurons, this would degrade the fidelity of information processing. However, the temporal fidelity of synaptic integration and action potential generation can be preserved if LTP also occurs in feedforward interneurons. — PRS

*Nat. Neurosci.* **8**, 916 (2005).

## CHEMISTRY

### Signal When You Get There

Quantitating how readily DNA can pass through a thin film is important for designing a gene therapy or drug release system. Measuring permeability accu-

rately requires a method for detecting small amounts of nucleic acid, preferably without the added complication of having to rely on derivatizing the DNA with bulky fluorophores.

Johnston and Caruso have used a molecular beacon approach to monitor the passage of unaltered DNA segments through an organic film that was applied to a mesoporous silica particle with layer-by-layer assembly. Their detector is an encapsulated single-stranded DNA that forms a stem-loop structure and whose ends are labeled with a fluorophore and a quencher. When a complementary DNA molecule passes through the film, it disrupts the stem-loop, freeing the fluorophore to emit a signal. Using this arrangement, they were able to observe the slowing of permeation as the length of the target DNA molecules was increased from 15 to 60 bases. — PDS

*J. Am. Chem. Soc.* **10.1021/ja0527166** (2005).

## EVOLUTION

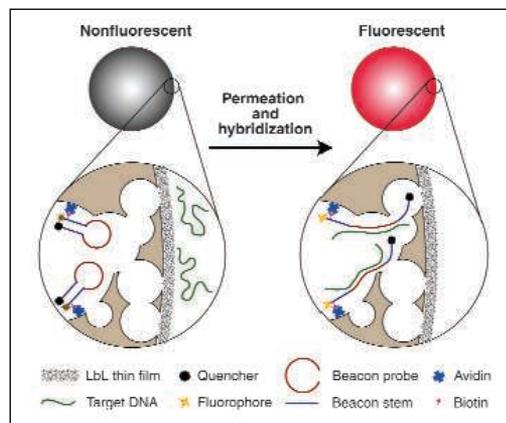
### Lianas for Phylogenetic Trees

Patterns of evolutionary descent are traditionally depicted as phylogenetic trees. This concept has become too constraining for microbial taxonomists whose subjects appear to swap chunks of DNA promiscuously, gratuitously obscuring clean lines of descent.

Kunin *et al.* have developed a model, assuming that the main tracks of inheritance in microorganisms do follow vertical, treelike routes. Nevertheless, swapping events (lateral gene transfer, or LGT) between genomes can be traced and mapped as many, thin vines swinging through the branches of the tree of life to link phylogenetically distant organisms.

The two types of inheritance mapping can be separated, allowing the consistency of the vine network to be tested. The vines tend to arise from definable nodes or network hubs, so LGT is not random or universal, although it is scale-free, and can occur at any time and very rapidly. One benefit of this approach is being able to locate sources of LGT. Whichever tree was used, some species, including *Erwinia carotovora* and *Bradyrhizobium japonicum*, were consistently revealed as hubs for LGT, and it appears that these species may act like bacterial gene banks for a particular environment. — CA

*Genome Res.* **15**, 954 (2005).



Schematic of DNA detection.

## Tracking the Origins of Lung Cancer

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DOI: 10.1126/science.309.5733.357a

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