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Bar-headed geese spurn the wind on trans-Himalayan trip

Bar-headed goose in flight.

On their migratory journey from India to Central Asia, over the Himalayan mountain range where they breed, bar-headed geese scale heights of up to 6,000 meters in a mere 8 hours. Previously, researchers had unearthed an array of avian adaptations that might enable the birds to scale mountains and cruise at high altitudes, but Lucy Hawkes et al. (pp. 9516–9519) attempted to answer a seemingly obvious question that has largely remained unexplored: Do the geese rely on the prevailing winds to ease their flight across the world's highest mountain range? By way of answer, the authors report that the geese climb in a single flight, without depending on the region's daytime updrafts or tailwinds that could potentially speed their climb. Instead, the authors found both northbound and southbound birds begin their flight during the night or early morning, when winds are light. Early flight, the authors suggest, might be attuned to the cool, dense morning air, which could help increase the birds' oxygen uptake, reduce the energy required for flapping, and dissipate metabolically produced heat from their bodies. Further, the birds may engage in a canny compromise by forgoing daytime wind-derived uplift: Stormy weather is more common in the Himalayas during the afternoon, so the early flights might offer more aerodynamic control and safety, according to the authors. — P.N.

Museum specimens reveal how fungal epidemic spread

For the last 3 decades, potential explanations for the mass extinction of neotropical amphibians have included habitat destruction, the pet trade, pollution, and climate change. Tina Cheng et al. (pp. 9502–9507) investigated the link between amphibian declines and the rise and spread of the infectious fungal pathogen *Batrachochytrium dendrobatidis* (Bd), which has caused amphibian declines in Australia, Panama, California, and Peru. The authors used PCR and other molecular techniques to test museum samples of amphibians gathered before, during, and after the current amphibian die-offs to investigate the role of the fungus in two perplexing amphibian extinctions: the disappearance of the golden toad and harlequin frog from Costa Rica's Monteverde Reserve in the late 1980s, and the loss of salamanders from the mountains of southern Mexico and western Guatemala in the 1970s and 1980s. The authors identified Bd in numerous museum specimens collected from Mexico, Guatemala, and Costa Rica. Examination of the museum samples revealed that the Bd epidemic began in Mexico and spread to Central America. The authors further confirmed, by infecting frogs and salamanders in the lab, that Bd infection can indeed prove lethal. — B.P.T.

Monteverde moss salamander, Monteverde Cloud Forest Preserve, Costa Rica.

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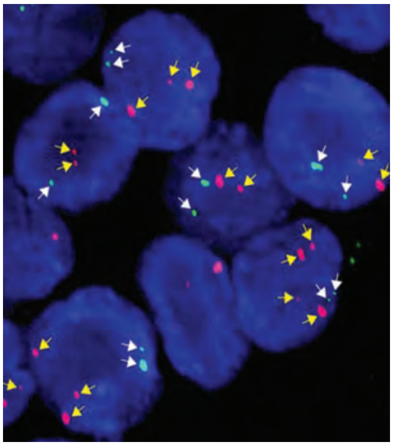
Radiation's mark on the human genome

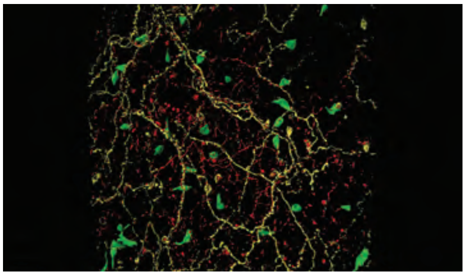


Radiation-induced genetic changes.

Linking genetic changes to radiation-induced cancers is a daunting challenge, partly because of the difficulty in singling out radiation-induced defects among the myriad of genetic changes that could lurk in an individual's cancer cells. Julia Heß et al. (pp. 9595–9600) used a genome-wide scan to search for genetic changes in thyroid cancer cells removed from 33 young patients who, at around the age of 1 year, were exposed to radioactive fallout from the Chernobyl nuclear reactor accident in 1986. The authors report that the cancer cells of nearly one-third of the exposed individuals harbored a region of amplified DNA in the long arm of chromosome 7. In contrast, the amplified DNA was not found in 19 age- and ethnicity-matched patients with thyroid cancer who, despite hailing from the same geographic region, escaped the fallout because they were born 9 months after the accident when radioactive iodine no longer lingered in the environment. In addition, cancer cells from individuals exposed to the fallout expressed higher levels of a gene dubbed CLIP2, whose role in chromosome separation during cell division previously implicated the gene in carcinogenesis. The authors suggest that the observed genetic changes could represent radiation's molecular trace, assuming the findings are confirmed in larger studies. — P.N.

Tracheal cells regulate respiratory reflex

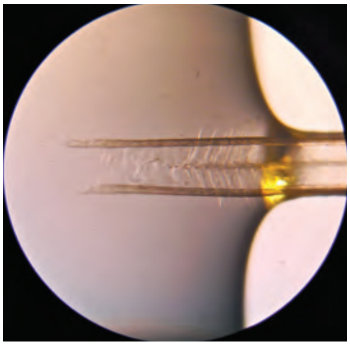
Cells that compose the respiratory epithelium of the lower airways, called "brush cells," are aptly named for the tufts of microvilli on their surfaces. Their function is unclear but their apparent likeness to nasal epithelial cells, which respond to bitter stimuli and control respiratory reflexes, led Gabriela Krasteva et al. (pp. 9478–9483) to test whether brush cells detect bitterness in the fluid lining the airway. The authors found that brush cells in mice express a bitter taste transduction system, including bitter taste receptors of the T2R family and the downstream signaling molecules α-gustducin and phospholipase $C_{\beta 2}$. The authors further demonstrated that brush cells use a form of communication known as cholinergic neurotransmission to coordinate the actions of sensory nerve fibers, which express nicotinic acetylcholine receptors and ultimately control respiratory reflexes. When the authors applied a bitter compound to the trachea of a mouse, they observed a long-lasting drop in respiratory rate that subsided when cholinergic transmission was blocked. The authors suggest that the respiratory reflex is an adaptive response to the presence of bacteria that emit bitter substances, and that such bitterness may lower the respiratory rate in an attempt to protect the animal from further inhalation of bacteria. — M.L.P.



Tracheal brush cells and sensory nerves.

How hummingbirds sip nectar

Since the idea was first proposed in 1833, researchers have widely accepted that hummingbird tongues use capillary action to capture flowers' nectar. Using highspeed video and other tests, Alejandro Rico-Guevara and Margaret Rubega (pp. 9356–9360) found that contrary to the capillary models, the tip of a hummingbird tongue rapidly changes shape while feeding to dynamically trap liquid. The researchers filmed 30 hummingbirds, representing 10 species, as they drank nectar from transparent feeders. In as little as one-twentieth of a second, a hummingbird's forked and fringed tongue unfurls into the liquid, then closes shut as the bird pulls its tongue back out into the air, the researchers observed. Tests on 120 alcohol-preserved bird specimens from 20 species and a handful of recently deceased specimens demonstrated that tongue furling and unfurling does not require muscular work. The researchers instead propose that nectar trapping results from differences in the effects of surface tension on the tongue when immersed in fluid and in the air, and note that the ends reopen when the tongue is completely dry. The authors suggest that other nectar-eating birds likely use this efficient method, and that the study may help engineers design low-energy mechanisms to collect and transport fluids. — J.M.



The tip of a fully unfurled hummingbird tongue, immersed in nectar.