In this roundup, associate editor Nicholas Gerbis summarizes notable recent developments in scientific research, selected from reports compiled in the free electronic newsletter *Sigma Xi SmartBrief*: www.smartbrief.com/sigmaxi/

The Earthshaking Squeak

Nothing says basketball like the squeak of sneakers on a hardwood court. Now, researchers grasp the factors behind those shrill noises well enough to tune a tennis shoe for the philharmonic. Surfaces that rub against each other don't slide smoothly or uniformly; rather, small imperfections (or even tiny sparks of static electricity "lightning") produce tiny slips called *opening pulses*, which ripple along contact points at roughly the speed of sound for that material. By sliding blocks of silicone rubber on rigid glass surfaces and applying high-speed imaging and acoustic analysis, a team led by Harvard University researchers found that flat "soles" produced more chaotic ripples that damp each other out, squelching squeaks. Soles with thick ridges, like the chunky tread of hiking boots, also resist squeaking. Conversely, thin ridges such as the grip patterns on athletic shoes act like waveguides, channeling the pulses into a single dominant squeak, the frequency of which depends on the thickness of the sliding surface (the "sole"). The findings apply to the rubbing of any two surfaces of different elasticities, from a human hand sliding down a window to the motion of slip-pulse earthquakes.

Djellouli, A., et al. 2026. Squeaking at soft–rigid frictional interfaces. Nature *650:891–897.*

Magnetar-Powered Supernovae

A team led by astronomers at Las Cumbres Observatory in Goleta, California, has reported new observational support for the long-standing hypothesis that some superluminous supernovae (SLSNe) are powered by *magnetars*—neutron stars that form during supernovae and boast extremely powerful magnetic fields. The findings change such SLSNe from mysterious objects to laboratories for relativity and stellar evolution. The work could explain a decades-long mystery regarding why some supernovae are 10 to 100 times brighter than others: Unlike the limited energy available to their dimmer counterparts from radioactive decay, the *ejecta* surrounding these supernovae receive vast injections of energy as rotation from their spinning stellar core is converted into radiation. The scientists also propose a mechanism that explains why some of the brightest supernovae puzzlingly have multiple, quasiperiodic bumps in brightness. The authors argue that a disk of ejecta created when supernova SN 2024afav exploded is wobbling, or precessing, a bit like a spinning coin losing energy. This precession—an effect of general relativity—could affect how much energy periodically gets into the ejecta along the observer's line of sight, thus modulating brightness.

Farah, J. R., et al. 2026. Lense–Thirring precessing magnetar engine drives a superluminous supernova. Nature *651:321–325.*

Water-Breathing Bee Queens

During the dormancy period called *diapause*, queens of the common eastern bumble bee (*Bombus impatiens*) can survive a week of submersion by breathing air while underwater. This ability, rare among adult terrestrial flying insects, could prove increasingly vital as the burrows of these critical pollinators face unpredictable flooding due to climate change. The queens lower their metabolic rates by more than 99 percent, which lets them use less oxygen and supplement their respiration with anaerobic metabolism. Such are the findings of experiments conducted at the University of Ottawa in Ontario, Canada, involving measurements taken in a respiratory chamber containing a queen, both before and after submersion in cold water. Successful submersion strategies in other insects include exchanging gases with water via tracheal systems or carrying an air bubble underwater. The team believes *B. impatiens* uses a *plastron*—a microscopic "jacket" of air trapped by water-repelling hairs. Much like fish gills, plastrons let oxygen diffuse in and carbon dioxide diffuse out, creating a rechargeable "aqualung."

Darveau, C.-A., S. Rondeau, and S. L. Rojas. 2026. Diapausing bumble bee queens avoid drowning by using underwater respiration, anaerobic metabolism and profound metabolic depression. Proceedings of the Royal Society B: Biological Sciences *293:20253141.*

Elaborate Pre-Inca Parrot Trade

Scientists have found direct biological evidence that pre-Inca cultures used a sophisticated trade network to acquire parrot feathers—coveted symbols of status, power, and cosmology among many ancient trans-Andean groups. The researchers are the first to have worked out specific trade routes using only feathers and cross-disciplinary techniques. Their paper challenges the notion that pre-Inca societies were largely isolated by the region's rugged peaks and valleys and describes new techniques for locating ancient trade networks. Scientists from the Australian National University in Canberra; the Aragonese Foundation for Research & Development in Zaragoza, Spain; and the Pachacamac Archaeological Project led the team, which used genomics and isotopic analysis to identify and trace the origins of parrot feathers in funerary bundles (*see image at right*) found in an elite tomb at the coastal religious center of Pachacamac. The masonry burial chamber traces back to the Ychsma culture, which flourished around 1000–1470 CE and was later absorbed by the Inca Empire. The birds' genetic diversity reveals that they were captured from wild populations in lowland tropical rainforests and palm swamps located hundreds of kilometers away on the other side of the Andes. Together with stable carbon and nitrogen isotope analysis, which reveal that the parrots consumed a coastal diet of maize possibly fertilized by seabird guano, this evidence suggests that the birds were transported live across the Andes to the coast, where they were kept and fed. This arduous and expensive enterprise was likely managed by the Ychsma through intermediaries such as the Chimú empire.

Olah, G., P. Bover, B. Llamas, H. Heiniger, R. S. Llanos, and I. Shimada. 2026. Ancient DNA and spatial modeling reveal a pre-Inca trans-Andean parrot trade. Nature Communications *17:2117.*

Farah, 2026; Olah, 2026 / Photo by I. Shimada