



Testing pitch perception. An infant participant listens to a series of harmonic complexes through an earphone. Whenever the fundamental frequency changes, a mechanical toy to the infant's right (not shown) turns on. The stuffed lion keeps the infant otherwise facing forward. An experimenter observes the infant's behavior from another room. (Courtesy of Bonnie Lau.)

ten for "the sound that makes the toy come on." "We tried to keep the testing as similar as possible," explains Lau. "Adults weren't told explicitly to respond to a pitch change because infants were not told to."

Adult participants who had had any musical training—defined loosely

with several previous studies showing that regardless of musical training, adults can indeed perceive the pitch of high-harmonic complexes.²

To reconcile that discrepancy, Lau and Werner hypothesize that adults are more easily distracted than infants by changes of timbre rather than pitch.

Perhaps infants perceive pitch and timbre with different relative priority than adults do—or perhaps they don't perceive changes in timbre at all. Says Lau, "That's an experiment we're working on right now."

Johanna Miller

References

1. B. K. Lau, L. A. Werner, *J. Acoust. Soc. Am.* **136**, 760 (2014).
2. A. J. M. Houtma, J. Smurzynski, *J. Acoust. Soc. Am.* **87**, 304 (1990); T. M. Shackleton, R. P. Carlyon, *J. Acoust. Soc. Am.* **95**, 3529 (1994); J. G. Bernstein, A. J. Oxenham, *J. Acoust. Soc. Am.* **113** 3323 (2003).

strate behaves like a magnetic vacuum, isolating the ³¹P atom's unpaired electron and enabling exceptionally long coherence times. The researchers show that for experimentally realizable configurations, the coupling between the spin and the microwave circuit should be strong enough to allow coherent control and nondemolition measurement of the spin state. (G. Tosi et al., *AIP Advances* **4**, 087122, 2014.) —RJF

An elementary particle collision never before observed.

In the standard model of particle physics, the W^+ , W^- , and Z are so-called vector bosons that transmit the weak force responsible for nuclear decay. But those bosons can also scatter off each other with a cross section that is sensitive to the many details of the theory. Vector-boson scattering is rare; for example, at the Large Hadron Collider the process happens less often

than Higgs boson production. Thus, it had never been used to probe particle theory's accepted paradigm. But ATLAS team members at the LHC have now spotted 34 candidate WW scattering events. The W bosons are neither the particles crashed together by the LHC (those are protons) nor the outgoing particles detected by ATLAS. Rather, as illustrated in the Feynman diagram, during the collision a W (here a W^+) is radiated by a quark in each of the protons. After scattering, each W^+ decays into a positron or antimuon—both members of a larger particle class called leptons—and an undetected neutrino. The outgoing quarks, which cannot exist in isolation, are manifest as particle jets. The experimental signature of the W^+W^+ scattering is thus two positive leptons, two jets, and missing neutrino energy. With sophisticated numerical calculations and background corrections, the ATLAS researchers conclude that their observations are consistent with the standard model. As the LHC collision energy rises and precision

improves, vector-boson scattering may test the Higgs mechanism of the model in detail and even point to new, nonstandard physics. (G. Aad et al., ATLAS collaboration, *Phys. Rev. Lett.*, in press.) —SKB

How a river transports sediment. Fine-grained sediment is both light enough to be carried by a river's current and heavy enough to settle on its floodplain. How far do grains travel before settling? To answer that question, Jim Pizzuto of the University of Delaware turned an episode of industrial pollution into an experiment. From 1929 to 1950, DuPont's rayon mill in Waynesboro, Virginia, used mercury as a catalyst. Mercury subsequently leaked into the nearby South River, where it remains a health hazard. Because mercury readily attaches to suspended grains, its presence in a river's floodplain can be used to trace sediment transport both in space (by extracting cores at different locations) and in time (by dating a core's layers). Pizzuto analyzed the spatial distribution of mercury taken from cores along a 37-km-long stretch of the South River downstream of Waynesboro. A previous study had established that the concentration of mercury averaged along the same stretch peaked sharply between



1940 and 1960. Mercury-tagged sediment evidently made its way downstream in a single, decades-wide pulse. Indeed, Pizzuto found that the mercury concentration falls off exponentially as a function of downstream distance, consistent with a moving, gradually depleting pulse. The derived decay length of just 10 km suggests that fine sediment moves down the South River in a sequence of short hops that occur only when flood conditions strengthen the river's current. (J. E. Pizzuto, *Geophys. Res. Lett.*, in press.) —CD