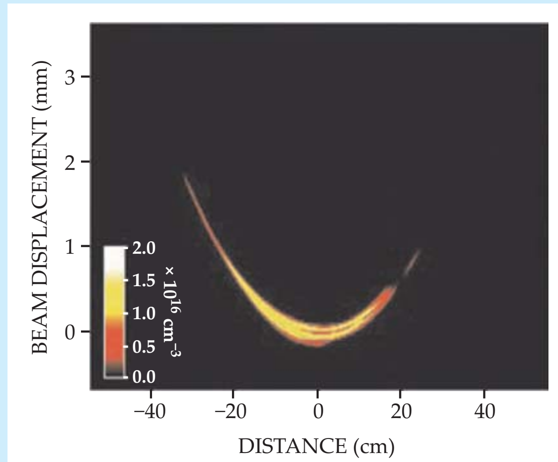
immediate antecedent. Rao and colleagues identified the N most common tokens in the Indus script, various languages, and nonlinguistic systems and plotted the conditional entropy against N. The curves for the Indus system and the natural languages bunched together and were clearly distinct from those corresponding to rigid or unimportant orderings. And the conditional entropy of the Indus system seemed especially closely related to Old Tamil, consistent with the conclusions of scholars who have analyzed the Indus script with more conventional means. (R. P. N. Rao et al., *Science*, 2009, doi:10.1126/science.1170391.) —SKB

J. M. KENOYER/HARAPPA.COM

Probing elasticity in diseased tissue. The unusual stiffness or sponginess of dead and decaying biological tissue is readily apparent to the human touch. However, early detection of such mechanical property changes in a tissue's extracellular matrix could signal the onset of disease. To measure the elasticity of tissue in living patients, needle-based indentation methods are more direct and less expensive alternatives to MRI, ultrasound, and electrical impedance. Such a probe has recently been developed by University of California, Santa Barbara, physicist Paul Hansma and his collaborators. The handheld tissue diagnostic instrument (TDI) consists of a stainless steel probe—175 µm to 1 mm in diameter depending on the tissue sample—that longitudinally oscillates at 4 Hz in a needle-thin stationary sheath. The force from the magnetically controlled oscillation of the probe produces a corresponding displacement in the tissue. The tissue's elastic modulus, or stiffness, is proportional to the slope of the force–displacement curve, and energy dissipation in the tissue is proportional to the area under that curve. The researchers measured, with millimeter spatial resolution, healthy and diseased tissue samples ranging in elastic moduli from around 1 kPa to 12 GPa. Among them were mouse breast tissue, which hardens when it becomes tumorous, and human tooth dentin (see schematic), which softens and decays when infection sets in. The researchers say the instrument could be used in the future to simultaneously test and biopsy a tumor or, if the probe is coated with antibodies, to measure single-molecule interaction forces. (P. Hansma et al., *Rev. Sci. Instrum.*, in press.) —JNAM

Throwing light for a curve. Ultrashort, ultraintense laser pulses undergo competing interactions: The nonlinear Kerr effect self-focuses the beam, while multiphoton ionization generates a plasma that defocuses the beam and prevents it from collapsing. The result is a self-channeled, nondiffracting beam with a tight core, termed a filament, consisting of the intense laser field and the generated plasma (see PHYSICS TODAY, August 2001, page 17). Filaments are self-healing and emit broadband light in the forward direction, properties that yield a variety of applications, including remote atmospheric sensing and spectroscopy. Recent work by Pavel Polynkin (University of Arizona), Demetrios Christodoulides (University of Central Florida), and colleagues has put a new twist on the filaments. Unlike earlier studies, which relied on Gaussian or other axially symmetric beam profiles, Polynkin and company used axially asymmetric beams: With a phase modulator, they shaped the transverse profile of their femtosecond pulses into the form of a two-dimensional Airy function. The resulting beams remained diffraction free, but their peak intensities followed a parabolic trajectory reminiscent of projectile motion. (Momentum was still conserved, however, thanks to the momentum of the other parts of the beam.) The figure shows the calculated plasma density that accompanies a 5-mJ Airy beam as its peak traces its parabolic path. The curvature could be controlled experimentally by changing the focal lengths of the lenses used. The forward emission from curved laser filaments could find use as a broadband, wide-angle illumination source for remote sensing and for laser-induced breakdown spectroscopy. (P. Polynkin et al., *Science* **324**, 229, 2009.) —RJF



Sequencing neurotoxic peptides. The venoms from spiders, scorpions, some marine snails, and certain other animals immobilize victims by blocking ion channels that control nerve cells. The bioactive molecules in the venoms are incredibly diverse—cone snails alone produce more than 50 000 distinct peptide venoms—and researchers hope to mine them for potential pharmaceuticals that, say, kill pain or unblock diseased ion channels. Knowing the amino acid sequences would help in that effort. Researchers typically turn to mass spectrometry, in which the peptides are fragmented and the amino acid sequence deduced, usually in combination with searching a protein database. Unfortunately, the organisms do not have sequenced genomes, so the amino acid sequence has to be determined from mass spectrometry alone. Such de novo sequencing has been hampered by an inability to produce sufficient fragmentation. Now, Beatrix Ueberheide, David Fenyö, and Brian Chait of the Rockefeller University and Paul Alewood of the University of Queensland have devised a method to solve that problem. They realized that a simple chemical trick—the conversion of cysteine, an abundant amino acid in peptide venoms, to a lysine-like charged residue—would put the molecules in a highly positive charged state. The peptides could then be more efficiently fragmented using a technique known as electron transfer dissociation and thereby give rise to a rich mass spectrum. As proof of principle, the team reconstructed the complete sequence for 31 distinct peptide toxins using just 7% of the venom from the gland of a single cone snail. (B. M. Ueberheide et al., *Proc. Natl. Acad. Sci. USA* **106**, 6910, 2009.) —RMW ■