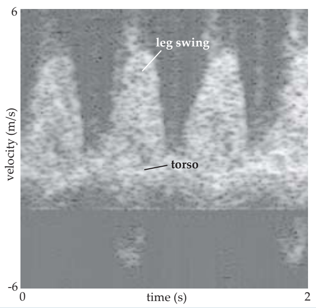
colleagues at Harvard University have demonstrated a way to couple two qubits. Among the factors influencing each qubit is the local electric field, which affects the qubit's charge distribution and causes its quantum state to evolve. When the two qubits' pairs of quantum dots are fabricated close to each other, as in the electron micrograph, the charge configuration of one affects the electric field of the other. Thanks to that coupling, the researchers were able to manipulate the pair of qubits and entangle them. Though the success of the entanglement, as captured by the fidelity parameter, was lower than that achieved by other solid-state qubit systems, the team foresees readily implemented improvements to their quantum gate. (M. D. Shulman et al., *Science* **336**, 202, 2012.) —RJF

Doppler sonar in air for border security. We normally think of ultrasound as emanating from a medical device pressed against the body and of sonar as useful mainly for submarines and bats. But now humans can usefully combine the two in open air. The audible Doppler effect is apparent to anyone who has heard a siren on a moving emergency vehicle. James Sabatier (University of Mississippi) and his colleagues are using the same principle with ultrasound at 40 kHz to detect and analyze human motion. With a sonar technique similar to radar, they previously identified key features of the human gait, such as isolated leg, foot, and torso velocities; his team also was able to distinguish walking humans from other animals. In two new papers, Sabatier and Marshall Bradley are bringing the work still closer to the real world. A new theoretical analysis of detection thresholds includes not only equipment shortcomings but also attenuation, environmental noise from wind, and signals backscattered by ground and vegetation. The conclusion? A walking person can be detected at a range of 10–17 meters, depending on the elevation of the sensor. An experimental follow-up confirmed the analysis and extracted some additional properties of adult gaits, as shown in the sonar gram. In particular, a value greater than about 3.6 m for the product of peak leg velocity and walk cycle time almost exclusively indicates men; smaller values are not gender specific. Such knowledge might prove useful for monitoring a trail or road near a border. (M. Bradley, J. M. Sabatier, *J. Acoust. Soc. Am.* **131**, EL203, 2012; **131**, EL210, 2012.) —SGB



Modeling the impact on Hawaii of the 2011 tsunami. The earthquake and tsunami that struck Japan on 11 March 2011 killed or injured about 46 000 people and damaged or destroyed just over a million buildings (see PHYSICS TODAY, December 2011, page 33). Seven hours after the quake's major tremor, the tsunami reached the Hawaiian Islands, where its energy took more than six hours to dissipate amid the islands' reefs, channels, and harbors. Even after traveling 6600 km across the Pacific Ocean, the tsunami packed enough energy to destroy boats and damage docks (see photo). Thanks to a network of tide gauges, pressure gauges, and current profilers, the pattern of waves that developed once the tsunami arrived was measured with high resolution and broad coverage. Yoshiki Yamazaki of the University of Hawaii at Manoa and his collaborators used that data trove to test a model of the tsunami's impact on the Honolulu coast. Besides the physics of wave propagation, their model has two ingredients: the profile of the megathrust that caused the tsunami and a high-resolution elevation map of the sea floor. The model calculates the wave field on four length scales—from 4 km, which suffices for the open ocean, down to 9 m, which suffices for reefs and harbors. The model not only matches the recorded data, it also provides a detailed view of the complex, multiperiod mix of standing waves that sloshed around the islands. In particular, the model could explain the observed damage: Although the maximum speed of the waves was a modest 1.3 m/s, the abrupt drop of 1.2 m when the waves retreated would have been enough to rip boats from their moorings. (Y. Yamazaki, K. F. Cheung, G. Pawlak, T. Lay, *Geophys. Res. Lett.* **39**, L09604, 2012. Photo courtesy of Hawaii State Civil Defense.) —CD

Building a virus the simple way. The assembly of a virus is a complicated macromolecular dance. Tens or hundreds of proteins—each several hundred amino acids in length—must organize by way of salt bridges, hydrogen bonds, and other chemical linkages to form a protective shell known as a capsid, which encases the virus's genetic material. But at least in some cases, that complex process can be fairly well replicated with a system of balls and springs. So conclude Murugappan Muthukumar and Jyoti Mahalik (both at the University of Massachusetts, Amherst), based on simulations that mimic the self-assembly of the so-called minute virus of mice. The capsomers—basic structural units of the capsid—are modeled as rigid, triangular assemblies of spheres, as seen in the left image. Some spheres (white) are treated as "sticky," others (pink) carry a positive charge, and all are forbidden from overlapping. Within a narrow temperature range, the simulated capsomers assemble successfully into an icosahedral shell, as shown at right. Thermodynamically, the process resembles crystallization: Once the first two or three capsomers have bonded—that is, once the capsid has nucleated—the remaining capsomers begin to fall quickly into place. The process slows during the final stages as the entropic penalty for inserting new capsomers grows. Interestingly, the inclusion of a DNA-like strand (blue), modeled as a chain of negatively charged spheres connected by springs, tends to speed up the proceedings, sometimes by an order of magnitude or more. (J. P. Mahalik, M. Muthukumar, *J. Chem. Phys.* **136**, 135101, 2012.) —AGS ■