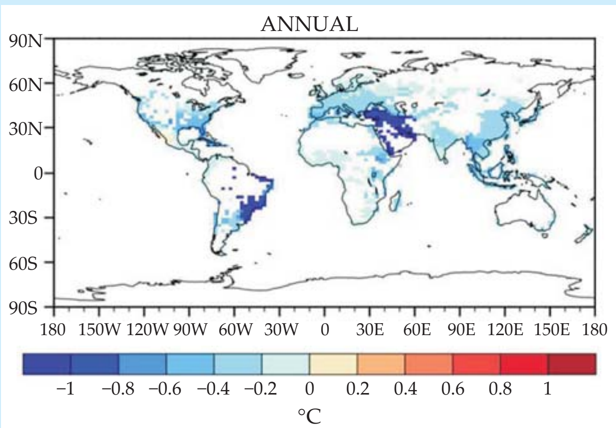
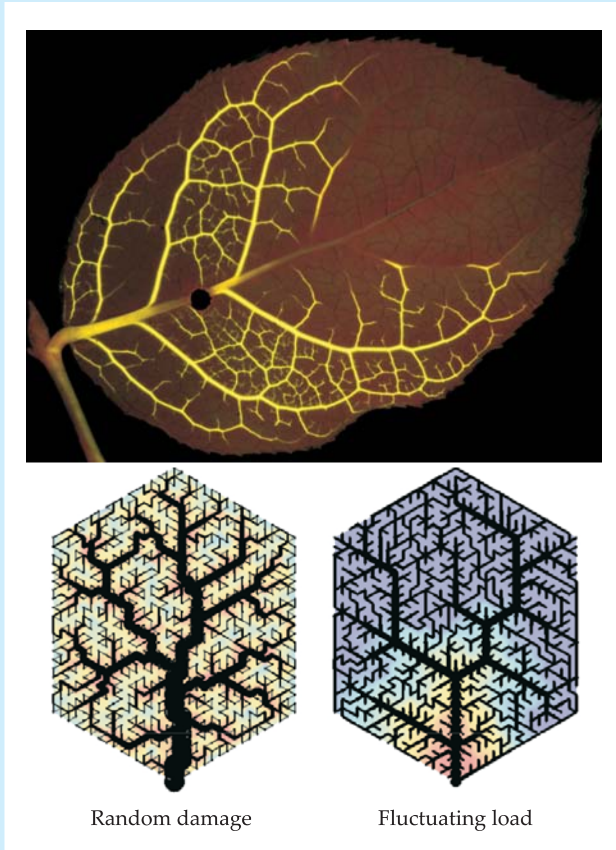
perform similarly. Perhaps more significantly, Tero and company imitated slime-mold networks in numerical simulations that don't incorporate detailed biochemistry. Instead, they include a feedback step in which tubular links carrying a large protoplasm flux grow wider and flux-poor links contract. By tweaking their simulation parameters, the researchers could nudge the network toward, for example, greater cost efficiency. With optimal parameters, they could even improve upon the work of slime molds and human engineers. (A. Tero et al., *Science* **237**, 439, 2010.) —SKB

White roofs, cool cities. Light-colored (high-albedo) surfaces reflect more sunlight than dark surfaces and therefore have a lower surface temperature and are surrounded by cooler air. The proposal that painting a building's roof white can save energy for the occupant has been around for more than a decade. In recent years, region-wide modeling of so-called urban heat islands has included albedo effects. Keith Oleson (National Center for Atmospheric Research, Boulder, Colorado) and his colleagues have now gone global. They started with a dataset of urban extent and urban properties in 33 regions of the world, and a sophisticated model that includes factors like building heights, street widths, and thermal and radiative properties of roofs, walls, and streets. Next, they imposed interior building temperature ranges consistent with climate and socioeconomic conditions. Finally, they coupled the model to a global climate model and varied the roofs' albedos. All grid cells in the final model contained rural regions and some also had urban areas. The figure shows the average annual difference in the heat island due to white roofs. (White cells on the map included no urban areas.) The heat-island effect



of cities is noticeably reduced. During the summer months, the use of air conditioning would also be reduced. Interestingly a closer look at data for the winter months showed a reversal at high latitudes, where the extra albedo effect prompts additional internal heating of buildings. (K. W. Oleson, G. B. Bonan, J. Feddema, *Geophys. Res. Lett.* **37**, L03701, 2010.) —SGB

Loopy leaf veins. Unlike the branches of a tree, the network of veins in a typical leaf is full of closed loops. Even after a visit by a hungry insect, no part of the leaf is cut off from the network, as shown in the top part of the figure. But is a leaf's fractal-like form, with loops of various sizes, the best possible network for resisting that type of damage, or might a different loop-filled structure be better? And is the hierarchical structure the optimum for any other criterion? Marcelo Magnasco (the Rockefeller University, New York) and colleagues sought to find out. Using a mathematical model that assigns each vein segment a cost proportional to its capacity raised to a power γ, they looked for the



networks with a given total cost that suffered the least average strain under two sets of circumstances. First, they looked at damage to a randomly chosen vein segment. Second, they considered the case of a fluctuating load, in which the amount of fluid to be delivered to each part of the network varied in time and space. (Real leaves do sometimes need to handle fluctuating loads. So, more obviously, do most human-built networks.) They found that for low values of γ (results for $\gamma = 0.1$ are shown in the figure), both cases yielded hierarchical networks of loops, qualitatively similar to real leaves. (E. Katifori, G. J. Szöllősi, M. O. Magnasco, *Phys. Rev. Lett.* **104**, 048704, 2010.) —JLM

A carbon halo. In most nuclei the protons and neutrons form a roughly spherical core of approximately uniform density. But along the edges—the so-called drip lines—of the chart of nuclides a handful of light nuclei have more nucleons than can be accommodated in the nuclear core. The excess, usually one or two neutrons, form a dilute distribution called a halo that extends far beyond the core. At the RIKEN Nishina Center for Accelerator-Based Science, a Japanese team has studied the reaction of heavy carbon nuclei with hydrogen and identified the extremely neutron-rich carbon-22, with its 6 protons and 16 neutrons, as a halo nucleus, the heaviest one yet found. Nuclear radii generally scale as the cube root of the total number of protons and neutrons, yet based on their cross-section data, the researchers calculated the radius of ^{22}C to be twice that of the much more common isotope ^{12}C; indeed, at 5.4 fm it exceeds the radius of lead-208. The halo of ^{22}C comprises two valence neutrons; determining their distribution and other aspects of the halo structure will require experiments with different target nuclei and different beam energies. (K. Tanaka et al., *Phys. Rev. Lett.* **104**, 062701, 2010.) —RJF ■