effect.) By scanning the SEND beam across the sample, Tao obtained a sequence of diffraction patterns. The brightest spots in each pattern corresponded to the undistorted lattice. Whenever the beam passed over a region of charge-ordered phase, additional faint spots appeared.

Figure 2 shows the maps Tao constructed from the intensity distributions of the charge-ordered spots. The regions of charge-ordered phase are indeed nanoscale. And they proliferate and spread as the CMR transition temperature of 253 K is approached from either direction. At their greatest extent, the charge-ordered phase occupies 22% of the sample volume.

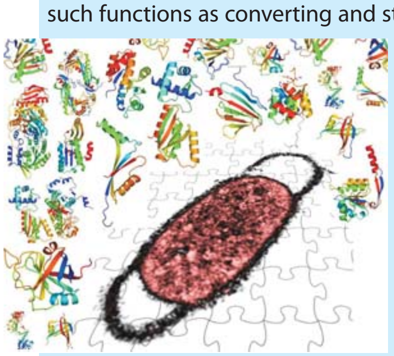
Doping is inherently inhomogeneous: An x value of 0.5 doesn't imply that every Mn ion is surrounded by exactly four Ca ions and four La ions. Given that Ca ions promote the charge-ordered phase, could local overdoping account for the maps in figure 2? Tao repeated the scans over her sample. Each run yielded the same overall behavior but with a different distribution of regions. Immobile dopants would have yielded the same distribution.

physics update

These items, with supplementary material, first appeared at http://www.physicstoday.org.

Element 114 verified. In the 10 years since researchers at the Joint Institute for Nuclear Research in Dubna, Russia, first reported producing the superheavy element 114 (see PHYSICS TODAY, April 1999, page 21), some tens of other sightings of the element (as well as elements 115, 116, and 118) have been documented—but all by the same group. Now a team at Lawrence Berkeley National Laboratory, led by Heino Nitsche and Ken Gregorich, has confirmed the results. Such independent verification is important, particularly given evidence of fabricated results for other superheavy elements (see PHYSICS TODAY, September 2002, page 15), but it is complicated by experimental challenges, including picobarn (10^{-40} m^2) reaction cross sections and radioactive targets. Working with the lab's 88-inch cyclotron, the Berkeley team followed a process similar to that used at Dubna: They aimed an accelerated beam of calcium-48 ions at a target containing plutonium-242. The reaction products passed through a gas-filled mass spectrometer, which separated out the nuclei of interest, to a detector that yielded energy and timing information not only for the products but also for any alpha particles or fission fragments they emitted. Amid the data the researchers collected over their eight days of running the experiment, they found two correlated chains of decays that they identified as starting with ^{286}114 and ^{287}114. Although the lifetimes (tenths of seconds), decay modes, and decay energies agree with the Dubna results, the cross sections measured by the Berkeley team are lower. That discrepancy, say the researchers, could be due to statistical fluctuations or to some of the element-114 nuclei overshooting the detector. (L. Stavsetra et al., *Phys. Rev. Lett.* **103**, 132502, 2009.) —RJF

Shaping a cell's metabolic network. In a single cell, thousands of simultaneously occurring biochemical reactions carry out such functions as converting and storing energy and regulating nutrient levels; together, those processes make up the cell's metabolic network. Computational biology involves, among other things, the linking of metabolic pathways to form a metabolic network model, a promising tool for preclinical drug studies and other medical research. However, such computational models do not traditionally include the function-determining structural details of a network's macromolecules; for example, an enzyme's ability to catalyze reactions and regulate the cell's response to external stimuli is determined by its three-dimensional configuration. Now, an international team led by Adam Godzik at the Burnham Institute for Medical Research in California has taken a rare step and introduced atomic-level protein structural data to the metabolic network model of an ancient thermophilic bacterium, *Thermotoga maritima*, shown in the optical microscope image. The image also shows schematics of proteins in their 3D configurations, which, when they were expressed in the reconstructed metabolic network, helped the research team solve the puzzle of how proteins evolve when their cell networks grow larger. It turns out that only 37% of *T. maritima*'s proteins are essential to the formation of its metabolic network; those "core-essential" proteins adopt the bulk—61%—of the bacterium's relatively few unique 3D configurations. The finding suggests that the core-essential proteins evolved their structure to perform additional functions in distinct pathways. (Y. Zhang et al., *Science* **325**, 1544, 2009.) —JNAM



An exoplanet as dense as Earth. Of the more than 350 planets that have been observed to date orbiting alien suns, only a handful have known densities. (For more on exoplanets, see PHYSICS TODAY, May 2009, page 46.) Now an international team led by Didier Queloz (Geneva Observatory, Switzerland) has introduced the newest member of that club, Corot-7b, the only exoplanet to have a measured density comparable to that of Earth. The result suggests that Corot-7b, like Earth, has a rocky composition. The planet and its host star Corot-7 were named after the *Convection, Rotation, and Planetary Transits* satellite, which in 2008 observed a star whose intensity periodically dimmed once every 20.4 hours—the result of a planet partially eclipsing the star. The small degree of dimming and the known size of the star established that Corot-7b has a radius about twice that of Earth's. To obtain the mass of the planet, Queloz and colleagues turned to the High Accuracy Radial Velocity Planet Searcher, a spectrograph that could precisely measure the sinusoidally modulating Doppler shifts in the light emitted by Corot-7 as it is gravitationally tugged to and fro by the small planet orbiting it. The greater the amplitude of oscillation, the greater the planet's mass. Obtaining the result required the Queloz team to filter out obscuring noise due to sunspot-like activity on the star. As a bonus, the residual signal included a component with a 3.69-day period. Queloz and colleagues attribute that to a previously unknown second planet, about eight times as massive as Earth. (D. Queloz et al., *Astron. Astrophys.*, in press, doi:10.1051/0004-6361/200913096.) —SKB

Earth's energy balance since 1950. Combining the powerful notion that energy is conserved with observational data on surface temperature, ocean heat content, and radiative fluxes, researchers have determined our planet's energy budget for the past half century—without recourse to any climate models. En-