enough to detect this level of doping on the ladders.

Everyone is now hoping for some independent confirmation of the Aoyama Gakuin–Tokyo–NTT result. Preliminary supporting data is starting to surface. Shin-ichi Uchida of the University of Tokyo told us about his group's measurement of the optical conductivity on a single crystal of $Sr_{14-x}Ca_xCu_{24}O_{41}$. With this type of measurement, the group is able to distinguish between the contributions from the chains and those from the ladders. They find evidence that there are holes on the ladders and that their number increases as the doping level increases up to $x = 11$. (In the experiment by Akimitsu and coworkers, superconductivity sets in at $x = 13.6$.) So far, Uchida reports, his group does not see any sign of superconductivity at pressures up to 2 GPa.

Yoshio Kitaoka's group at Osaka University has done some nuclear magnetic resonance studies on these compounds with the monster-sized unit cell. His group finds that at low temperatures, the copper peaks split into several peaks, suggesting that the local electrical field is different at different sites, perhaps because of the holes. But there may also be other explanations for the observed splitting.

None of the evidence for superconductivity in a ladder compound has yet enticed all observers onto the bandwagon. They are, however, watching closely from the side of the road.

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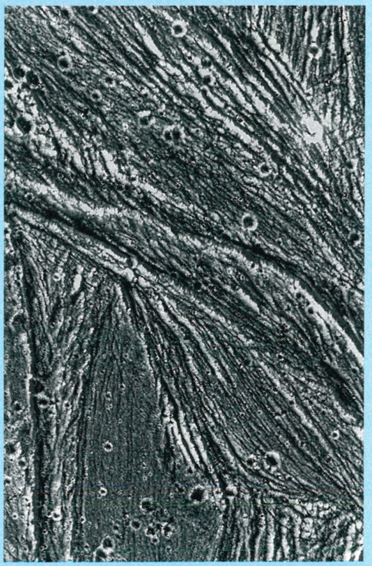
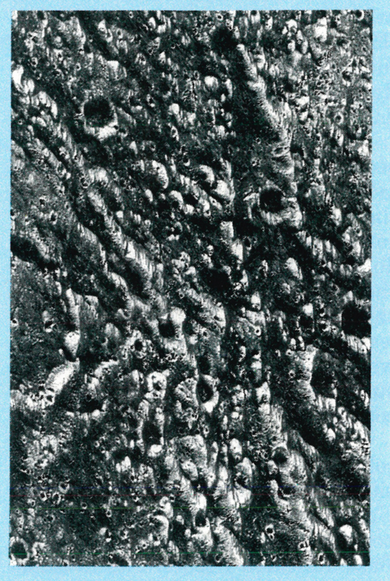
Galileo Reveals the Light and Dark Sides of Ganymede

Following the excitement generated by the Galileo spacecraft's first Ganymede flyby on 27 June, researchers are hoping that data from the 6 September encore performance—which skimmed within 262 km of that Jovian moon—will help them understand why Ganymede is more tectonically and magnetically active than expected. The data trickling back to Earth during the next two months is expected to include the best images yet obtained (some stereoscopic) of Jupiter's and the Solar System's largest moon.

The photo on the left, taken during the 27 June flyby from a distance of 7448 km, shows some of Ganymede's complex terrain. The 55 km × 35 km portion of the Uruk Sulcus region, located at latitude 10° north and longitude 168° west exhibits networks of parallel grooves and ridges that are thought to result when tectonic activity causes extension of the region. Such features are characteristic of Ganymede's high-albedo "light terrain," which covers about half the moon's surface. Because such terrain is relatively smooth and not densely cratered, it is thought to be relatively young—that is, it may have been resurfaced in the "middle ages" of the Solar System by water "lavas" pouring over the icy crust and by subsequent tectonic activity. In this sense, such terrain resembles the next moon in toward Jupiter, Europa, whose surface seems younger and may still be active.

The photo on the right, taken from a distance of 7563 km, shows a 46 km × 64 km region of Galileo Regio, a region of "dark terrain" located at latitude 18° north and longitude 147° west. Dark terrain on Ganymede is characterized by a high density of craters, with little evidence of resurfacing (characteristics that show it to resemble the ancient surface of Callisto, the next moon out from Jupiter), and by furrows—





long, shallow troughs like those running from lower right to upper left in the photo. The furrows usually form parallel trenches and are thought to result from the collapse and relaxation of large, ringed impact structures or from large-scale tectonic activity. The crossing of the furrows near the center of the image indicates that tectonic activity has played a significant role in shaping even this ancient surface.

In addition to obtaining more detailed images, researchers very much want to see whether measurements made by the spacecraft's magnetometer and plasma wave spectrometer confirm the existence of both an ionosphere and a magnetic field, as indicated during the first flyby. The mechanism by which Ganymede could generate its own magnetic field remains mysterious. If the moon is as cold and dead as many thought before the 27 June flyby, the field could be a remanent field in a cold, solid iron core. If the source of the field is a dynamo in a molten-iron core—as on Earth, Mercury and presumably Io—Ganymede must have some unexpected energy source to drive convection in the core. Alternatively, sufficiently vigorous convection in a thin layer of salty water under the moon's icy crust could also generate a magnetic field—a mechanism postulated as the source of the magnetic fields of Uranus and Neptune. Again, however, such a mechanism would require an energy source powerful enough to drive convection with velocities on the order of a few centimeters per second. Positing such energy sources has become a cottage industry as researchers await the latest data from Galileo.

Ray Ladbury ■