the family to risks of privacy invasion.

Transplanters have been aware of these issues for some time but are just beginning to debate them publicly. Kurtzberg and a pathologist at Duke, Emily Reisner, recently teamed up with Duke medical ethicist Jeremy Sugarman to explore some of the dilemmas in the 13 December *Journal of the American Medical Association*. Kurtzberg says, "It's easy to define what the questions are; much harder to define what the answers should be."

The first question facing clinicians is: How far must you go in obtaining consent for banking cord blood? In the past, many have used the blood without consent, because it has been treated as waste. But transplant surgeons attending the 13 December FDA-NHLBI meeting seem to agree that now they must get the mother's consent before collecting cord blood. Some would go further, saying that a parent must explicitly permit certain tests and future uses of donated blood. In addition, some say that any follow-up tests not given consent at the time of donation must receive a follow-up consent.

Once blood has been collected, banks must decide just how much testing should be done, and what should be done with results that indicate an abnormality. McCullough, Kurtzberg, Rubinstein, and others argue that blood banks should maintain not just standard medical files, but genetic data as well. The reason: Infants have no medical history on which to base risk estimates, yet it would be helpful to know whether a blood unit contains a gene for, say, sickle cell anemia or an immune deficiency. Connected to this is the dilemma of whether the family should be told if a test shows that the child carries a dreaded infection (such as HIV) or an abnormal gene. As a pediatrician, Kurtzberg says, her inclination is to inform the family. However, a 1994 Institute of Medicine review recommends that minors not be tested for abnormal genes unless there is "an effective curative or preventive treatment that must be instituted early in life."

There's wide agreement that the donor's privacy must be protected. One solution would be to strip identifiers from donated blood samples and destroy these personal records. But how would blood banks be able to run follow-up tests or contact donors about test results? Some blood bankers—such as David Harris at the University of Arizona, Tucson—say the risks of transferring a genetic disease from a donor to a recipient are minute, certainly no worse than for normal blood donations. Harris, for one, doesn't want to retain such data. Others, such as the Duke team, argue that "moral and medical responsibilities" demand that names not be "delinked" from data.

Federal officials and ethicists have their work cut out for them as they weigh these arguments and try writing guidelines on storing cord blood and data on the donors. As Sugarman says: "We've been talking in hypotheticals" about the risks of maintaining genetic data banks for many years, but "now we're dealing with reality." And if the demand for cord blood transplants increases, as many expect, clinicians will need answers to these once-hypothetical questions.

–Eliot Marshall

ASTRONOMY

Seeking Out Strange New Worlds

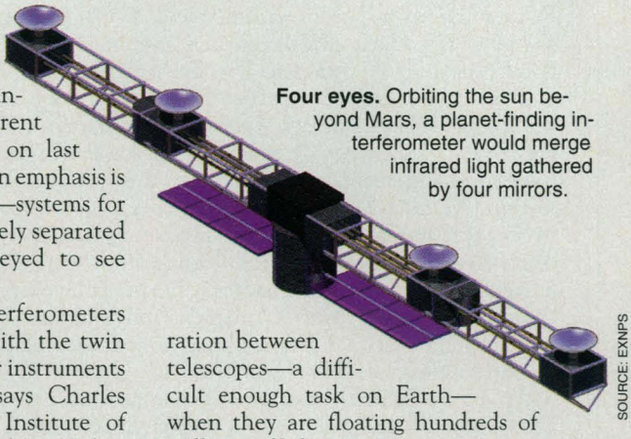
Now that astronomers searching for planets around other stars have detected Jupiter-sized objects, another goal beckons: finding planets more like Earth. That quest is likely to prove even more difficult, however: Indirect clues—regular wobbles in their parent stars—were enough to reveal the giant planets, but recognizing a planet's kinship to Earth would take an image and a spectrum. That doesn't faze National Aeronautics and Space Administration (NASA) Administrator Daniel Goldin, though. He has already organized a planet-search program, called ExNPS, for Exploration of Neighboring Planetary Systems, and last month a "blue-ribbon panel" of prominent astronomers endorsed the quest, which could cost billions of dollars and last 30 years or more.

The panel's report, released quietly during the government shutdown last month, says the discovery of Earth-like planets around nearby stars "would electrify the public imagination and spark a renaissance in science education and science literacy." Led by Nobel Prize–winning physicist Charles Townes of the University of California, Berkeley, the panel also gave its blessing to a plan for pursuing this goal: a version of an ambitious "mission and technology road map" sketched out last summer by three study groups (*Science*, 9 June 1995, p. 1435).

The "road map" approved by the panel reflects an event that overtook the earlier planning: the discovery of a giant planet around a nearby star (*Science*, 20 October 1995, p. 375), followed last month by two more. Detecting alien Jupiters indirectly by observing their parent stars had been the first stop on last summer's map. But now the main emphasis is on developing interferometers—systems for merging the light of several widely separated telescopes—sufficiently sharp-eyed to see extrasolar planets directly.

"First we want to build interferometers at Palomar Observatory and with the twin Keck Telescopes," the 10-meter instruments on Mauna Kea in Hawaii, says Charles Beichman of the California Institute of Technology and the Jet Propulsion Laboratory, one of the contributors to the road map. These instruments, which are already under development with several million dollars in NASA funding, just might be able to see Jupiters around the nearest stars. But in the long run, Beichman says, "if we hope to see Earth-like planets, we'll need an infrared interferometer at 3 or 4 AU [Earth-sun distances] from the sun" to escape the "zodiacal light" of interplanetary dust lit up by the sun. As Beichman sees it, the orbiting interferometer might consist of four telescopes, spaced with a precision of a few angstroms over a distance of perhaps a kilometer.

The panel isn't downplaying the technical challenges, says Caltech's Anneila Sargent, a member of the blue-ribbon panel: "The technical requirements will be developed step-by-step and not overnight." Among the hurdles, the panel notes, is finding a way to maintain the precise separation between telescopes—a difficult enough task on Earth—when they are floating hundreds of millions of kilometers away in space.



Four eyes. Orbiting the sun beyond Mars, a planet-finding interferometer would merge infrared light gathered by four mirrors.

SOURCE: EXNPS

But astronomers argue that the recent planet discoveries leave no alternative to such a system for detecting an alien Earth. Before the discovery, explains planetary expert Tobias Owen of the University of Hawaii, astronomers tended to assume—extrapolating from our own solar system—that Earth-sized planets would likely exist wherever they spotted Jupiter-sized ones. "But these new Jupiter-like planets are so much closer to their sunlike stars than our own Jupiter that we have to conclude that we don't really understand the [planetary] formation process," says Owen. "Hence if we're going to find Earths, we'll really have to *see* them."

–Donald Goldsmith

Donald Goldsmith's book, Einstein's Greatest Blunder: The Cosmological Constant and Other Fudge Factors in the Physics of the Universe, *has just been published by Harvard University Press.*