NIH-DOE advisory committee that would keep Lipman attuned to the needs of the genome community.

Lipman and Wooley, who took over after Galas left for Darwin Molecular Corp. in Seattle, have spent the past several weeks trying to craft a joint statement that would clarify the situation, only to have those efforts disintegrate into yet more bickering. Lipman's boss, Donald Lindberg, head of NLM, complained: "Both Collins and I are sick and tired of problems with DOE. We don't seem to be making any headway."

As *Science* went to press, DOE was still hoping for an interagency agreement and on 13 October sent NCBI yet another proposal. One sticking point is that DOE wants Lipman to endorse its new database—something he and his bosses have so far declined to do. At this stage, NIH seems disinclined to pursue any joint agreement. Having failed to find a political solution, says Lipman, the issue now is to figure out technically how best to interact with the new player.

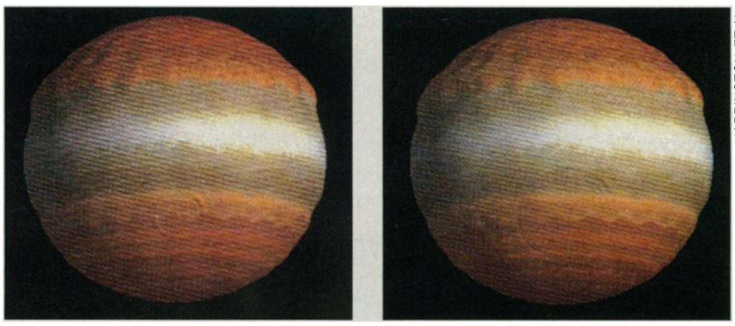
Both Lipman and Wooley vow they will share data. And each is intent on creating the better product. Lipman promises a cleaned up version, called GenBank Select, in which redundancies and errors are reduced and all coding DNA sequences have proteins associated with them. DOE will continue on its path toward a "federated information infrastructure" that will "enable data to flow electronically from producers to databases to users." Meanwhile, both agencies are vying for the affections of the few big sequencing labs—DOE can boast Hood's, while NCBI is claiming Robert Waterston at Washington University. As in any divorce, it will be some time before the community can decide who came out ahead.

–Leslie Roberts

PLANETARY SCIENCE

Jupiter Hits May Be Palpable After All

When astronomers first predicted earlier this year that a shattered comet would smack into Jupiter next July, they thought it might produce a spectacle rivaling the Earth impact that may have wiped out the dinosaurs. But when they started getting better views of Comet Shoemaker-Levy 9, estimates of the size of the largest fragments dwindled from as much as 10 kilometers in diameter to less than 1 kilometer, and many researchers began to fear a dud (*Science*, 30 July p. 552). Now, however, prospects are brightening again: Rather than dwindling out of sight, the impacts look like they will be both observable and scientifically productive.



HARRINGTON ET AL.

Ripple effect. A computer simulation traces pressure variations in Jupiter's atmosphere 5 and 10 hours after the impact of a 2-kilometer comet fragment.

Continued analysis of Space Telescope images and of slight differences in the fragments' orbits suggest that the largest of them are probably at least a couple of kilometers in diameter. "I think there is pretty good evidence the largest ones are not below 2 to 2.5 kilometers," says Harold Weaver of the Space Telescope Science Institute. Objects that large would put on a nice show for any observer, whether using a spacecraft or a ground-based telescope. And researchers are realizing that even if the impacts themselves don't generate the expected fireworks, they will probably trigger detectable events—from the damping of Jovian radio emissions to ripples in the Jovian atmosphere—with scientific payoffs.

The earlier diminished expectations for Shoemaker-Levy came from analysis of images made last July by the Hubble Space Telescope. Weaver and others electronically peeled away obscuring dust and debris in search of the solid fragments, but they couldn't convince themselves that the bright core of each fragment was anything but a particularly dense blob of dust. But with more time to reflect, Weaver now feels that the single, exceptionally bright pixel at the center of the brightest dust coma is an actual comet fragment measuring at least 2.5 kilometers across. If so, and if Shuttle astronauts can correct Hubble's myopic vision during the repair mission this December, the sharper images from the repaired telescope should put Weaver's size estimate on a solid footing.

The length of the train of Shoemaker-Levy fragments also suggests that they will pack a wallop. The pieces formed and began spreading apart in July of last year, when the intact comet passed within 37,000 kilometers of Jupiter's cloud tops, too close to survive the strain imposed by the massive planet's gravity. After the breakup, each of the 21 or more pieces followed a slightly different path depending on its initial distance from Jupiter, which could vary by no more than the diameter of the intact comet. The current length of the fragment train thus gives a clue to the size of the parent body—and hence of its 21 fragments.

Researchers James Scotti and Jay Melosh of the University of Arizona have modeled the breakup of Shoemaker-Levy under different assumptions of its original size and compared the resulting fragment trains with observations. The best fit was with a parent comet 2.3 kilometers in diameter, which would yield fragments averaging 0.74 kilometer in size. A group at the Jet Propulsion Laboratory—Zdenek Sekanina, Donald Yeomans, and Paul Chodas—considers this smallish estimate to be a lower bound because it does not include some factors that could make for a larger parent comet, such as possible breakup before closest approach to Jupiter. Taking such factors into account, the JPL group envisions an intact comet of perhaps 10 kilometers, which would yield 20 or so major fragments ranging from 5 kilometers down to sub-kilometer size.

Even if the smaller estimates are on target, the impacts should still make a scientific splash. Joseph Harrington, Timothy Dowling, and their colleagues at the Massachusetts Institute of Technology have run a model simulating the waves each impact should trigger in Jupiter's bottomless sea of gas. Even a 1-kilometer impacter should create waves strong enough for observers to track at visual or infrared wavelengths, says Dowling. Knowing the speed at which waves move through Jupiter's atmosphere—"arguably the most fundamental unknown quantity in Jovian atmospheric dynamics"—would provide insight into its structure. An accurate number, he adds, could let researchers "throw away half the models of the Great Red Spot."

Whatever the size of the fragments themselves, the dust and debris sweeping along with them may provide a valuable probe of another region of Jupiter—its magnetosphere, the vast envelope of charged particles trapped by the planet's magnetic field. Space physicists Alexander Dessler and Bill R. Sandel of the University of Arizona think the comet's debris and the gas it gives off should play havoc with trapped plasma and radiation, and with the radio waves they emit. By temporarily quenching the trapped radiation belt, for example, the cometary debris may reveal details of magnetospheric behavior to earthbound observers. One way or another, it seems, the show next July should be worth tuning in.

–Richard A. Kerr