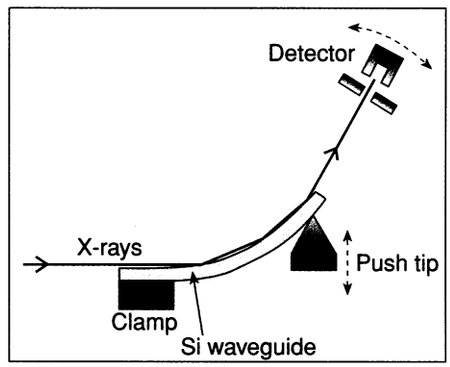
PHYSICS

Curve Throws X-rays for a Loop

High-energy x-rays are a great way to probe matter, but it's hard to control a beam of them, since they shoot straight through ordinary lenses without bending. Now, researchers have developed the most efficient way yet to bend a powerful x-ray beam. Inspired by the famous "whispering gallery" just under the dome of St. Paul's Cathedral in London, Jene Golovchenko and Chien Liu of Harvard University drastically bent a beam of short-wavelength, high-energy x-rays by making it follow a curving wall of polished silicon. Other physicists say the device, described in the 5 August issue of *Physical Review Letters*, might someday become a crucial component of an x-ray laser.

Scientists already have ways of manhandling an x-ray beam: bouncing it off a "grazing incidence" mirror at a very shallow angle, like skipping a stone on water, or channeling it through thin layers of artificial crystals. But these techniques only deflect the beam by a few degrees. The Harvard researchers have had better luck by imitating the acoustics of St. Paul's, where a beam of sound waves—a whisper, for instance—travels around the circular gallery by bouncing repeatedly along the curved walls, so that it is clearly audible to someone listening close to the wall at the far side of the dome.

The same principle can work for radiation. Earlier this year, a group led by A.V. Vinogradov at the Lebedev Physics Institute in Russia reported constructing a whispering gallery that bends lower energy x-rays, with wavelengths of about 70 angstroms. But higher energy x-rays take even more finesse to control, because they are more likely to penetrate a surface instead of skip off it.



SOURCE: C. LIU, J.A. GOLOVCHENKO/PRL

Kissing the wall. An 18-millimeter-long silicon barrier deflects high-energy x-rays.

To make their high-energy whispering gallery, Golovchenko and Liu polished an 18-millimeter-long silicon wafer, which they bent into an arc. When they fired a beam of 0.7 angstrom x-rays at a shallow angle toward one end of the arc, the photons grazed the wafer's surface. Almost all were reflected and then hit the wafer again, farther down the curve. The process was repeated down the length of the wafer, with the beam bouncing nearly 100 times against the wall. At the end of the line, the rays had been deflected by 13 degrees.

"This is the shortest wavelength example of a whispering gallery by far," says Malcolm Howells, a physicist at California's Lawrence Berkeley National Laboratory. It will take some work to translate the proof-of-principle into a useful piece of equipment, however. "At the moment, it's more a lab curiosity than anything else," says Donald Bilderback, a physicist at Cornell University. "But, as with all new ideas, until you wrestle with it, you don't know what will come from it."

Howells, for example, envisions building a racetrack-shaped whispering gallery to trap x-rays in a future x-ray laser. "You could return the x-rays and feed some back into the laser," he says. "Nobody's actually done that, but I foresee the possibility of a laser resonator."

–Charles Seife

GENOMICS

Drug Firms Back Move to Link Databases

Because the world's major biological databases are constructed differently, it is virtually impossible to devise search programs to tap into them all effectively. A user has to hop from one to the other using each database's search engine to retrieve information that comes in a variety of different formats. That may soon change, however. A group of leading pharmaceutical companies last week put their considerable weight behind the development of common standards for the interface between biological databases, based on an approach popular in the computer industry. But bioinformatics specialists who run some key databases used by academic researchers say they are not enamored of the interface standards chosen, although they may now be forced to adopt them.

The strategy was agreed to at a meeting in Philadelphia, attended by representatives of pharmaceutical giants such as Smith Kline Beecham, Glaxo Wellcome, and Zeneca, together with a number of software companies and representatives of databases, including the European Bioinformatics Institute (EBI) in Cambridge, U.K., and the Genome Data Base at Johns Hopkins University. The participants unanimously agreed on a fast-track plan to bring life sciences databases under standards drawn up by the world's largest software consortium, the Object Management Group (OMG). "The pharmaceutical industry is fed up by the lack of standards between biological databases," says the EBI's head of services, Graham Cameron.

The OMG was set up 8 years ago to tackle the problem of incompatible databases. The OMG's approach, dubbed the Common Object Request Broker Architecture (CORBA), does not impose an external set of rules for the contents of databases to which everyone must adhere. Instead, CORBA defines interfaces that allow different databases to communicate with each other no matter what their format. Software companies then use these interfaces to devise programs that allow researchers to access data in otherwise incompatible locations. "The idea behind CORBA is that database managers will never entirely agree on common formats for data entry in databases," says Eric Neumann of the biological software company NetGenics.

The EBI has already championed the CORBA approach, winning funds from the European Union to study its application to biological databases in collaboration with other European partners. The Philadelphia meeting, chaired by Cameron, agreed to work toward getting the OMG to establish a life sciences "task force" by the end of the year to hammer out the details of applying CORBA to life sciences databases. Seven task forces in various business areas already exist.

Cameron is concerned, however, that biologists may not back a move to CORBA in the belief that other standards may ultimately be more useful for life scientists. "The plan is by no means a done deal," he says. Researchers at the National Center for Biotechnology Information (NCBI) in Bethesda, Maryland, for example, are not convinced that CORBA will provide the best solution for biologists. "CORBA is one among many technologies," says head of applications development, Jim Ostell. "There's no real reason why a number of other standards couldn't be applied, but given the critical mass of interest in CORBA it's a reasonable choice," he adds. NCBI will be looking at CORBA alongside other potential technologies for linking databases.

Supporters of CORBA will ultimately have to convince skeptics to use the standards, but they are optimistic. "The best outcome would be standards to which software developers and database managers adhere. It could do us all a great deal of good," says Cameron.

–Nigel Williams