inhibitors is not enough, since the "foreign" structures cannot pass through the cytoplasmic membranes of bacteria in large enough amounts to be lethal. The scientists thus used a surprise-attack approach: They linked the inhibitors to protein fragments recognized by several bacterial transport mechanisms, enabling them to be taken into the unsuspecting cells. Once inside, the fragments are degraded and the inhibitors are released, killing the bacteria.

Another study, also reported in NATURE, attempts to optimize the effectiveness of azidothymidine (AZT), the only drug thus far approved in the United States for the treatment of AIDS (SN: 3/28/87, p.198). Scientists at the Wellcome Research Laboratories in Kent, England, cloned the gene for reverse transcriptase, the enzyme necessary for replication of the AIDS virus and the target for AZT. Mutations induced in the gene at selected sites can eliminate activity of the enzyme, say the scientists, who are now inserting the mutant genes back into viruses to see whether such mutations will affect virus growth. *– D.D. Edwards*

U.S., Soviets to study Antarctic ozone

In an agreement announced last week, U.S. and Soviet scientists plan to collaborate in an investigation of the seasonal thinning of Antarctic ozone.

The agreement calls for the United States to provide 50 packages of ozone-monitoring equipment and balloons, which the Soviets will fly above their Molodezhnaya station on the Indian Ocean side of Antarctica. The Soviets will exchange data from these flights with the United States, which will, in turn, supply the Soviets with daily ozone profiles measured by satellites.

"We will have much more information – just the basic observations of the distribution of ozone over Antarctica as a function of space and time – than we've ever had before," says James Peterson of the National Oceanic and Atmospheric Administration's Air Resources Lab in Boulder, Colo., who was the senior U.S. official involved in the negotiations.

Currently, one British and two American stations in Antarctica take balloon soundings of the ozone levels. By combining the verticle profiles from balloons with spatial information from satellites, scientists can obtain a detailed, three-dimensional picture of the ozone distribution, says Peterson.

Scientists are concerned about the stratospheric ozone depletions, which appear over Antarctica in September (SN: 5/23/87, p.326) and over the North Pole in February (SN: 10/4/86, p.215), because the ozone layer is needed to filter out harmful ultraviolet radiation from the sun. Some fear that these holes signal a worldwide drop in ozone levels, possibly caused by chlorofluorocarbons, a class of chemicals used chiefly in refrigerants and aerosols.

The two superpowers also discussed plans for a scientific meeting next year in the Soviet Union concerning computer modeling of ozone and other trace gases. *– R. Monastersky*

Lasers light the way for computer links

Even the most efficient and swift supermarket shoppers will get bogged down in their task if they have to stand in long, slow-moving checkout lines. Scientists are facing a similar kind of bottleneck in their race to make faster, higher-capacity computers. While the speeds of the electronic devices that do the actual computing have skyrocketed, the whole enterprise is rapidly being bogged down by the electrical wires that transmit information between these ultrafast devices. Not only are these electrical "interconnects" cumbersome and relatively slow, but over half the power consumed by processors goes into shuttling electrons along them.

Consequently, computer designers have had their eyes on laser diodes as replacements for the electrical links between computer devices, chips and boards. By sending light through fibers, waveguides or free space, these lasers promise to transmit more information faster and in less space, with less power and greater reliability than their electrical counterparts. As evidenced by recently reported work on one kind of laser diode, researchers are now within reach of redeeming that promise.

One of the technical problems involved in making optical interconnects has been to develop solid-state laser diodes that require a low input current. (The input current "pumps" electrons in the laser material up to an excited state, and when electrons fall from this state to a lower energy, laser light is emitted.) A low input current translates to low power consumption and less generated heat (heat can adversely affect the operation and reliability of a laser). All of these reductions are essential if scientists are ever to put hundreds and thousands of these laser devices on single chips.

Most researchers have been aiming for a "threshold current" of 1 milliampere (mA) – for laser diode scientists, this current level has been the psychological equivalent of the 4-minute mile, says Amnon Yariv at Caltech in Pasadena. While scientists have had little trouble making lasers with 10-mA-threshold currents, obtaining lower currents has been tough going. Researchers at the University of Illinois at Urbana-Champaign had achieved the lowest-threshold current with one laboratory device operating at 1.5 mA.

Now Yariv and his colleagues say they have crossed the 1-mA milestone with a gallium arsenide laser that has a threshold current of 0.95 mA. Yariv, Caltech's Pamela L. Derry and Kam Y. Lau, Nadav Bar-Chaim, Kevin Lee and Jan Rosenberg of ORTEL Corp. in Alhambra, Calif., report on their laser in the June 22 APPLIED PHYSICS LETTERS.

Yariv's group is one of a few working on quantum well lasers, so called because the region doing the lasing is very narrow – in Yariv's laser the active region is about 100 angstroms wide and the entire laser device is about the size of a grain of sand. The narrowness of the active region quantizes, or makes discrete, some of the energy levels of the semiconductor material from which the laser is made. This leads to a much more efficient production of light.

Yariv says the main contribution of his group's paper is to demonstrate that putting even moderately reflective coatings on the facets of a laser has a much more pronounced effect on improving the threshold current of a quantum well laser than of conventional solid state lasers. "If you put coatings on an ordinary laser, you will only improve the threshold by a factor of 10 or 15 percent," he notes. "But [with the quantum well laser], the improvement is 300 to 400 percent."

Yariv says his group passed below the 1-mA mark on its first try with a laser that was made out of materials of mediocre quality. With better materials and higher-reflectivity coatings, Yariv expects to reach a threshold current of 0.1 mA. At this low level, he says, it becomes feasible to use lasers in computer circuits. And, he adds, it opens the door for many other applications such as reliable instrumentation in cars powered by small batteries.

Some other researchers, however, do not share Yariv's enthusiasm. They do feel that his group has done excellent work in making the laser and that, from the standpoint of applications, the lower-threshold current is important. But they don't believe that Yariv's paper constitutes a fundamental advance in laser physics. Yariv's discussion of reflection coatings, says John Epler at Xerox Palo Alto (Calif.) Research Center, merely "points out the obvious. All the important elements of his argument have already been considered .... The real figure of merit for a device is its threshold current without reflection coatings."

Yariv disagrees, contending that his critics don't fully comprehend the physics of this laser. "We're talking about a generic development here which should make it possible with a given laser to reduce its threshold current by probably more than a factor of 10," he says. "... This is a major breakthrough." *– S. Weisburd*