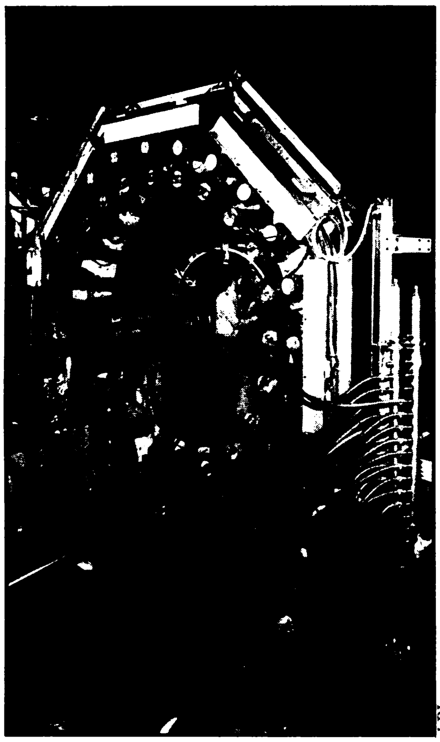

Deep in the heart of this giant detector electrons meet positrons and make psi particles. The psi's decay products are recorded and measured by several layers of different kinds of counters.

Theorists are going frantic trying to assess the significance of the discovery. One suggestion is that the new particles may be the intermediate vector bosons, the particles that embody the weak subatomic force, and that they may support recent theoretical efforts to unify that force and electromagnetism. Another suggestion is that they may be quarks, not the usual old-fashioned kind of quark that has been in particle theory for a decade, but a newer, fourth quark that some theorists find necessary, possessed of a special new quality called "charm."

Quot homines, tot sententiae. Every theorist has his pet idea, says Rudolf Larsen of SLAC, but one has to see a pattern before the significance is clear. Having just two of the particles, he says, is like having only two lines of the spectrum of the hydrogen atom. One wouldn't learn much about the structure of the hydrogen atom from so little.

There are two more weeks of the current experimental run, and the group at SPEAR will go on looking, gradually raising the energy as they go. "It seems we can't scan far without finding one," Larsen says. The SPEAR experiment collides beams of electrons with positrons. Since the total electric charge in that combination is zero, it can produce only neutral particles. If there are charged analogues, SPEAR is likely to find them only if a neutral member of the group decays into a slightly lighter charged version. A complementary experiment at Brookhaven National Laboratory, which participated in the discovery of the psi(3105)—called J by the experimenters at Brookhaven—is more capable of making charged versions and is looking especially for them.

One feels rather like the old-time radio announcer: "Tune in again next week, folks." Never in recent memory has particle physics zipped along with such speed. "It's a real credit to the storage ring," says Larsen. □

NAS launches study on fluorcarbons

Fluorocarbon aerosol propellants and refrigerants are a serious enough threat to the earth's ozone layer that a National Academy of Sciences committee should be convened to do a thorough study of the problem. These are the conclusions of an *ad hoc* NAS panel of atmospheric scientists headed by Donald Hunten of the Kitt Peak National Observatory in Tucson. Hunten told SCIENCE NEWS that it "seems appropriate to give public exposure to the problem for a few months" before expecting any recommendations by the academy, but that he hopes they will take action within a year to recommend a Government ban on the use of fluorocarbon propellants if that is their conclusion based on a growing body of evidence.

Following the group's recommendation, NAS is now organizing a special interdisciplinary panel. Members are being chosen and a report will be issued within a year, a spokesman says.

The *ad hoc* panel included Frank S. Rowland of the University of California at Irvine and Michael B. McElroy of Harvard, both of whom recently published theoretical mechanisms and timetable projections for fluorocarbon breakdown and ozone destruction in the upper atmosphere (SN: 9/21/74, p. 181; 10/5/74, p. 212). The group met in late October and made their recommendation to the academy's governing board Nov. 16.

The Rowland and McElroy teams and others theorize that when inert chlorine-containing fluorocarbons float up past the troposphere (the lower seven miles of atmosphere) into the stratosphere, they are dissociated by ultraviolet light energy and release reactive chlorine atoms. These interact with ozone (O_3) in a chain reaction that changes thousands of ozone molecules into molecular oxygen (O_2). Using computer calculations based on production growth rates, chemical reaction rates and climatic factors, McElroy predicts percentages of ozone depletion ranging from about 3 percent to 30 percent by the year 2000, depending on the growth of the industry and the onset of Government regulation. If growth continues at the 1960-72 rate of 22 percent, and production is not halted for 10 years, 10 percent of the earth's ozone layer could be destroyed, McElroy predicts. Several thousand cases of skin cancer per year could result from the subsequent increased exposure to ultraviolet light.

A subcommittee of the standing NAS Climatic Impact Committee will study the environmental, public health and economic impacts of the continuation or removal of fluorocarbons from the market. Although some direct evidence of ozone depletion does exist now, the subcommittee will pay close attention to upcoming measurements of ozone depletion taken in the stratosphere. The Manufacturing Chemists Association is funding James E. Lovelock, an atmospheric scientist at the University of Reading in England, who plans next year to measure ozone and fluorocarbon breakdown products. The Atomic Energy Commission and the National Oceanic and Atmospheric Administration also are involved in direct measurement. Rockets and balloons carrying laser devices will probably be used.

Although the NAS plans to issue a report within one year, and many would like to see a ban clamped on production of the products now, a long, controversial study seems likely. Rowland and McElroy have both advocated speedy consideration of the problem and the National Resources Defense Council (an environmental public interest law firm) has petitioned the Consumer Product Safety Commission to ban the use of spray cans that use the suspected propellants. But Ray McCarthy, technical products manager of DuPont's Freon products division thinks "two to three years would be a more reasonable estimate" of the time needed to gather sufficient scientific evidence. "We are 100 percent in favor of having the National Academy of Sciences make this study, but we don't want to see the products found guilty without a trial."

McCarthy emphasizes that the ozone depletion models are theoretical and that no one has yet proven environmental damage conclusively. Rowland responded to this statement in a phone interview. "Industry says it is just a hypothesis. But their position is just hypothetical, too. They have the hypothesis that it is safe to release fluorocarbons, but no data to back up their position. We have a hypothesis that it is unsafe, but we do have some scientific data, and are coming up with more." □