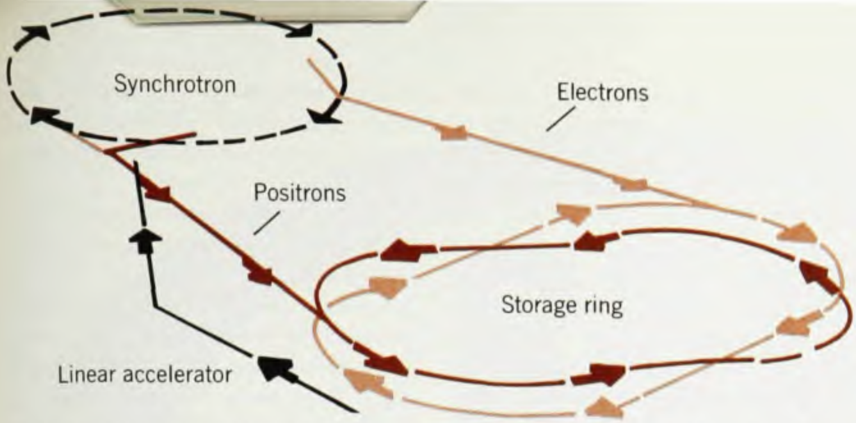

3.5-GEV STORAGE RING AT DESY. Linac produces electron and positron beams in succession. At fork electrons go left, positrons go right; so beam can be properly injected into synchrotron for acceleration. At full energy each beam is stored separately in storage ring. Beams intersect twice at crossing angle of 1.5 deg.

DESY Ring to Store 3.5-GeV Electrons, Positrons in 1973

The 3.5-GeV electron–positron storage ring being built at DESY (Deutsches Elektronen Synchrotron) in Hamburg should be finished at the end of 1973, according to Klaus Steffen, who spoke at a storage-ring conference in Princeton on 26 May.

In sharp contrast to the magnanimous (roughly $25 million) German effort were the two US programs described: The 3.5-GeV colliding-beam experiment at CEA (Cambridge Electron Accelerator), which has now stored electron and positron beams simultaneously, is apparently the main hope for survival of the Cambridge facility; it cost under $2 million. Fabrication of an electron–positron storage ring(s) at SLAC, proposed in successively cheaper and less capable versions, is expected to begin in 1971. (Ironically Stanford was the site of the very first colliding-beam device, a 550-MeV electron–electron device. It was used to confirm the validity of quantum electrodynamics down to distances of 10^{-15}cm.) Burton Richter of SLAC began his talk with: "You've just heard about the Rolls Royce of storage rings. Now I'm going to tell you about the Morris Minor version," which SLAC calls SPEAR-1/2. The Stanford device would cost about $5 million in equipment funds.

The DESY device stacks two elliptical rings, one on top of the other. The positron and electron beams intersect at a crossing angle of 1.5 deg in two separate interaction regions. The chambers consist of 60-meter straight sections and 27-meter-radius circular regions at either end. Three 250-kW rf power supplies per ring will accelerate particles in 12 places, to compensate for synchrotron radiation losses. The rf transmitters, main bending magnets and small quadrupole magnets have been ordered, and a big hole has already been dug.

One of the interaction regions will have a large magnetic detector array installed. The field will be provided by a superconducting coil 1.4 meters across.

Steffen says that he expects the machine will eventually produce 0.9 amps of electrons and positrons at 3 GeV and 0.3 amps at 3.5 GeV. A comparison of status and relative reaction rates (at 2 GeV unless a different energy is given) for each of the electron–positron storage rings is shown in the table.

Willibald K. Jentschke, who will succeed Bernard Gregory as director-general of CERN on 1 Jan. 1971, is presently director of DESY. —GBL

Status of Electron-Positron Storage Rings

Device	*Ratio of Reaction Rate to Reaction Cross Section* ($10^{32}\,cm^{-2}\,sec^{-1}$)	*Status*
SPEAR-1/2	1	operate 1972
Frascati	1/200 (1.5 GeV)	physics
CEA	1/20	testing, physics in 1971
DESY	10	operate 1973
Novosibirsk		
VEPP-3	1/200	operate 1971
VEPP-2	1/2000 (750 MeV)	physics
Orsay		
Coppelia	1	deferred
ACO	1/2000 (550 MeV)	physics

Experimental Relativity

continued from page 41

can say is that over a bandwidth of about 0.1 rad/sec the source is losing 1/100 of a solar mass per year.

By fall Weber expects to automate the experiment. Meanwhile Argonne is building a 4 K machine to house the gravity detectors; the reduction in temperature from 300 K reduces Brownian motion thereby increasing sensitivity by a factor of 75.

At Stanford University William Fairbank and William Hamilton are designing a cylindrical gravity-wave detector that will be magnetically suspended in a Dewar operating at a few millidegrees. The outside of the Dewar is 6 feet in diameter and 8 feet long—almost big enough to hold a cocktail party—helium cocktails, of course. The Stanford experiment would be 100 000 times more sensitive than Weber's room-temperature cylinders.

In Moscow Vladimir Braginski (Moscow State University) and Eugene Popov (Institute for Space Research of the Soviet Academy of Sciences) are repeating the Weber experiment. They have built nine cylinders, all sensitive to about 1600 Hz. Unlike Weber's passive transducer (piezoelectric), the Soviet group will use a capacity transducer, measuring displacement rather than strain. In initial tests Braginski says his transducer had a sensitivity of 3×10^{-14} cm in 1 sec.

The antenna is a cylinder 150 cm long and 60 cm in diameter with a horn-shaped cavity cut into it; the transducer amplifies the small displacement produced by the cylinder on the cavity. A feedback loop allows stability of 10^{-11} meters in 1 sec. Braginski and Popov hope to start experiments this winter with two of the antennas, separated by distances of perhaps 40 km. If they see coincidences, Braginski told us, they will then try experiments with either a telescope or a device resembling a xylophone.

To make a gravity telescope the group would arrange nine identical cylinders in an array (just as in a radio telescope); one could expect to increase sensitivity and get some idea of the source location. The gravity xylophone would consist of antennas that resonate at, say, about 1000 Hz, 1200 Hz, 1600 Hz. If the source were binary neutron stars, as the two parts fall toward each other the frequency of the gravity wave would rapidly change. So the xylophone would first pick up a signal at 1000 Hz, then at 1200, then at 1600. According to calculations by Freeman Dyson one