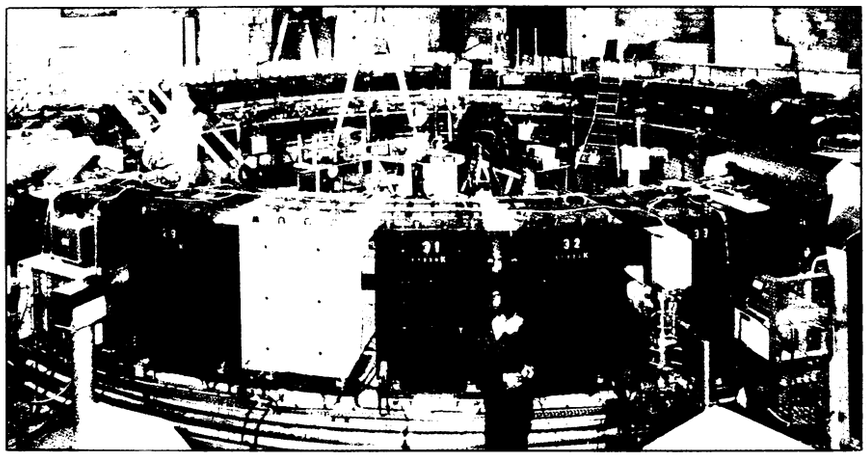

CERN Courier

The 14-meter storage ring used 40 magnets to measure the muon's magnetic moment.

should be equal to 2. (The unit is Bohr magnetons, which relate the magnetic moment directly to other important properties of subatomic particles, but have a complicated relationship to the units used for measuring macroscopic magnetic fields.) Corrections due to the more detailed and involved theory add a certain amount, the so-called anomalous part of the g factor, to this value of 2. It is this anomalous part, or rather half of it, given by the formula $(g-2)/2$, that is the object of measurement. The current CERN experiment makes this number, usually designated a, to be $0.001165922 \pm 0.000000009$, which, says the CERN COURIER, "could hardly be closer to the predicted value of $0.001165921 \pm 0.000000010$."

Most of this amount is due to detailed corrections to the muon's electromagnetic behavior (the so-called radiative corrections), but for two small pieces of it the effects of two other kinds of force, the weak and the strong subatomic interactions, have to be added in. The strong interaction contribution comes from the existence of "virtual hadron states"—the possibility of particles like protons and neutrons appearing out of the vacuum when the necessary amounts of energy are stored in the force fields present. This strong interaction correction amounts to 0.0000000667. The weak interaction contribution is about 0.000000002.

To such fine-pointed calculation corresponds a sharp experiment. Because the muon is a tiny magnet, its spin axis will precess (wobble) in a magnetic field just as the spin axis of a top precesses in the earth's gravitational field. For this experiment a storage ring 14 meters in diameter was constructed. Pions were led into the storage ring. The pions decay to muons, which go around the ring in a magnetic field of 1.47 Teslas. Eventually the muons decay into electrons and neutrinos. Variations in the rate of electron production depend on how the muons' spin axes are precessing, and so from the electron counts the anomalous magnetic moment can be determined. □

Spotting invaders: Which cells decide?

The body's defense against invaders enlists an army of cells. Only one type of cell produces the antibodies that immobilize invaders, but other cells assist in the action. Researchers are asking which cells call the shots in the complex defense strategy. New evidence indicates that even the macrophage cells, formerly thought to simply grab molecules and present them to more discerning cells, have a say in which foreign molecules are recognized and attacked.

Instructions for recognizing invaders are coded into a cell's DNA. Biologists have identified specific genes that control the immune response to certain foreign molecules. Normally all the cells in the immune system would contain the same genes, and thus would agree on which molecules should be attacked. However, in laboratory experiments investigators can mix cells from animals carrying different genes. Then the experimenters can observe the outcome of dissension in the ranks of the immune system.

Alan S. Rosenthal, Marcello A. Barcinsky and J. Thomas Blake of the National Institute of Allergy and Infectious Diseases have examined the responses of cells isolated from two different strains of guinea pigs. Although the immune systems of both groups respond to the foreign protein pork insulin, Barcinski and Rosenthal showed previously that part of the response is based on different criteria. Cells from one type of guinea pig recognize the protein as foreign on the basis of three amino acids on one of insulin's two chains, the A chain. Cells from the other guinea pig strain react to amino acids in a region of insulin's other polypeptide chain, the B chain.

Now Rosenthal and co-workers report in the May 12 NATURE that macrophages appear to be involved in recognition. The researchers mixed macrophage cells isolated from one strain of guinea pig with another cell type from the offspring of a mating between one guinea pig of each strain. These offspring cells, T cells, contain genes for both criteria of recognition, so they should respond to either site on the insulin chain. In the presence of a recognized invader, T cells proliferate and help another group of cells make antibodies.

In Rosenthal's experiments the key site for the response was identified by comparing the reactions to insulin from different species (pigs, cows and sheep) that have different amino acids in the crucial A chain area, but do not differ in the B chain.

When the researchers mixed T cells that could respond to either site with macrophage cells that could respond to only one insulin site, the area recognized depended on the genes of the macrophage. Therefore, at least some of the recognition instructions come from the macrophage cells.

Although they cannot exclude the possibility that the genes involved in recognizing invaders also function in the T cells, the researchers suggest that macrophages have a fundamental role in selecting what chemical groups will be identified as foreign. Rosenthal proposes that the genetically different guinea pig macrophages either chemically modify the insulin molecule to different forms, which the appropriate T cells can recognize, or that each type of macrophage has a class of receptors on its surface that orients the insulin in a particular way, so that T cells can recognize the crucial area. □

Common death trends in early tribes

Certain groups of humans, both in North America and the Sudan between A.D. 700 and 1450, shared not only the same lifestyles (agricultural) but apparently the same death patterns as well. University of Colorado anthropologist Steven Clarke reports that a survey of data on 1,724 skeletons from five seperate populations reveals a high mortality rate among all groups between the ages of 2 and 6 (after the weaning period) and between 20 and 30.

In the May HUMAN BIOLOGY, Clarke analyzes data from previously reported studies on the five groups: Two Meinarti populations from Sudanese Nubia (A.D. 1050-1150 and A.D. 1150-1300); two groups from Dickson Mound in Illinois (A.D. 700-1000 and A.D. 1000-1350), and a Point of Pines (Arizona) population (A.D. 1000-1450).

In constructing paleodemographic life tables from the data, he found a mean mortality rate in the 20 to 30 age bracket of 24.3 percent, ranging from 13.2 to 35.6 percent among the groups. "Another trend, which is more intriguing," he says,