have any of the activity. Thus, the best source of the antileukemia factor appeared to be heparinized plasma.

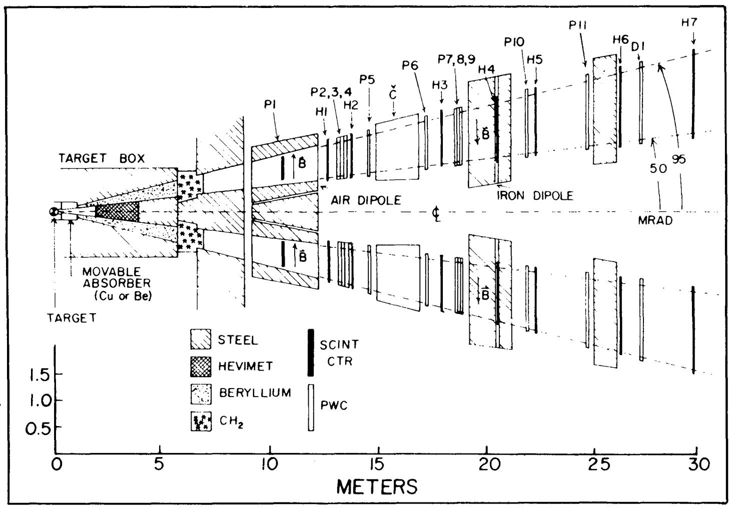
During their experiments, the researchers also observed that heparinized plasma kept overnight at a specific temperature developed a precipitate (a solid separated out from a solution) and that the precipitate contained something with antileukemia activity. Thus, they had reason to suspect that the antileukemia factor might be loosely adsorbed to the precipitate, so they tried to adsorb it onto a calcium phosphate gel. This method of purification, widely used in enzyme isolation, proved successful.

Ever since they isolated the leukemia factor, the scientists have tried to determine what it is. They have reason to believe that it might be one or several complement proteins, and so along with H.J. Müller-Eberhard of the Scripps Research Institute in La Jolla, Calif., they have been screening the gel material for various complement proteins. So far, complement proteins known as C3 and C6 have been detected.

If the factor indeed turns out to be one or several complement proteins, it would strongly suggest that the complement system may be as crucial as some of the other cells and chemicals of the immune system—for example, T cells, macrophages and antibodies—in fighting cancer cells. Several studies have, in fact, shown that complement levels are often depressed in animals and humans with cancer. So giving complement exogenously to cancer patients might help them. However, providing patients with lots of complement through repeated plasma infusions would impose too much of a protein burden on their bodies. Concentrated, purified leukemia factor, in contrast, should provide the same anticancer activity without the danger of a protein overload.

Even if the leukemia factor is not composed of complement proteins, of course, it might still hold therapeutic value for leukemia patients or other kinds of cancer patients. □

Dileptomania: Heavier and heavier



Fermilab/Phys. Rev. Letts.

Paths of muon pairs are traced by arrays of detectors. Each arm contains an identical series.

Dileptomania is a disease first described in print in the CERN COURIER. A malady that strikes particle physicists, its major symptom is an extreme compulsion to search for pairs of leptons (electrons or muons) in the products of various kinds of collisions between particles and particles and particles and targets. The victims tend to regard such leptons as evidence of something important and fascinating, possibly new kinds of particles being created in the collisions. Recently, a variant syndrome, trileptomania (searching for triplets of leptons), has also made its appearance.

The latest seizure of dileptomania is reported from the Fermi National Accelerator Laboratory in Batavia, Ill., and appears to be a particularly heavy one. Sixteen physicists from Columbia University, Fermilab and the State University of New York at Stony Brook (S. W. Herb et al. in the Aug. 1 PHYSICAL REVIEW LETTERS) report that the appearance of unusual numbers of pairs of muons leads them to suspect the existence of something with a mass around 9.5 billion electron-volts. What that something may be is not conjectured. The experimenters call it a "resonance," which may or may not mean a single particle, but 9.5 billion electron-volts is by far the highest mass or energy at which a particle-physics "thing" has yet been found.

Actually dileptomania is a rather clever way to look for things. The leptons come in pairs with opposite electric charges. They are clean evidence, long lived and easy to record, and they tell quite precisely where and when something happened. It is then necessary for expert interpreters of the evidence to try to decide exactly what that something was.

What the data show is, to use a word that physicists often like because it has the vagueness requisite for a situation where they're not sure what they have, a "structure" or as these experimenters put it a "resonance." The experiment consists of bombarding copper and platinum targets with protons of 400 billion electron-volts energy from Fermilab's synchrotron. As the energy available for new creations in the collisions passes 9.5 billion electron-volts, the number of muon-pairs produced takes a sudden upward leap. If a graph of muon-pair number versus available energy is made, the curve at this point resembles the graph of a mechanical resonance. (If a person pushing a swing gradually changes the timing of his thrusts, when he comes to synchrony with the natural period of the swing, the amplitude of the swing will shoot upward; a graph of the amplitude will look similar to the data in this experiment. That is how the word "resonance" got into particle physics in the first place.)

The question is what is responsible for such a resonance? An obvious candidate is the creation of a short-lived particle that gathers up the available energy and then decays into a pair or pairs of muons. If such a particle existed, at 9.5 billion electron-volts, its mass would be in the supercolossal category. Such a large mass also suggests the possibility of a bound state of two or more particles, something that has been seen here and there elsewhere and is coming to be called a baryon molecule or a charmonium molecule. Or the cause could be some nonparticulate enhancement of the energy utilization processes. In fact, with these short-lived resonances, the definition of the word "particle" gets a bit strained. When is a particle not a particle? becomes a relevant question.

The present experimenters publish no interpretation of their findings. According to the history of these things, one can expect that several will be forthcoming shortly, but in the proper intellectual order of business, the next step is an experimental confirmation that the resonance does in fact exist. The present paper was published without even the customary review procedure under a new policy of the editors of the journal. Physicists had been complaining that new results are not published fast enough, so the editors decided that if someone with sufficient reputation vouched for a finding, it would be speeded to print without review. In this case, the guarantor is Edwin L. Goldwasser, assistant director of Fermilab.

The only other facility in the world where a confirming experiment of the same type could be mounted is in the Super Proton Synchrotron at the CERN laboratory in Geneva. Confirmation might also come from a different kind of experiment, collisions of electrons and positrons, but this energy level would probably strain the existing colliding-beam facilities for electrons and positrons and might have to wait for the completion of the PETRA facility at Hamburg. That could take a couple of years yet. □