

products with practical application," says Robert Swanson, president of Genentech. Swanson says the company has another contract with an international pharmaceutical company to attempt development of other hormone products, vaccines and anti-viral products. Genentech is also

considering using recombinant DNA to produce catalytic enzymes for basic industrial processes. But right now they claim bacterial synthesis of human insulin as possibly the most significant advance in diabetes treatment since the use of animal insulin began in 1920. □

Upsilon prime: 10 GeV excited state

To say that a physical system is in an excited state is to say that it has more energy than it had before it got excited. Excited states throw a great deal of light on the physics of matter (quite literally — from a lamp, for example). From the way in which excited states come and go and from what they absorb and emit in doing so (their spectroscopy) comes a knowledge of the structure and behavior of physical systems, be they molecules, atoms, nuclei or subnuclear particles.

The heaviest subnuclear particle ever found, the ψ , is now on the way to becoming the heaviest family or spectroscopic hierarchy of particles. The Deutsches Elektronen-Synchrotron laboratory (DESY) in Hamburg announces that its DORIS storage ring has found an excited state for the ψ , which is being called ψ' .

The original, simple, ψ was discovered last year at the Fermi National Accelerator Laboratory in Batavia, Ill. Its existence was confirmed by DORIS in May of this year. Its mass is 9.46 billion electron-volts (9.46 GeV), about ten times the mass of the proton or slightly more than the mass of a beryllium atom. The ψ' has a mass of 10.02 GeV by the best reduction of data to date. The mass difference, which is equivalent to energy, represents the excitation.

ψ' would thus be the heaviest subatomic particle yet discovered if you accept excited states as new particles, which most particle physicists tend to do. (In atomic physics an excited state of an atom is just the same atom with a little more energy; there are reasons of history and principle for the difference.) So now the answer to the question how massive a particle can be has passed the 10 GeV barrier.

Probably no one expected that it wouldn't, but making one that heavy is nevertheless an achievement. The real

importance of the existence of an excited state for the ψ , as the DESY announcement stresses, is that it goes to prove that the ψ must be made up of at least two subunits, which, as in atoms, are able to move with respect to each other. If not they couldn't take up the energy that makes an excited state. The ψ' is considered to be the same basic structure plus the extra energy.

Theorists have a prescription concerning what those two constituents should be: They should be a quark possessing the quality designated "b", which is glossed by the DESY announcement as "beauty" but in the United States is usually called "bottom," and the antiquark possessing anti-beauty.

Quarks are the unobserved subunits that theory now believes make up the structure of the observed particles. Each quark embodies a particular physical property that is important in the nature and behavior of particles. The names of the qualities can be whimsical, like beauty, and are as arbitrary as any terms in physics. When we say something is electric, for example, we no longer mean it is covered with amber.

ψ was the first particle discovered that is believed to contain beauty (or bottom). Four other varieties of quark are believed present in known particles. The sixth remains to be found. Now that there is an ψ' (and there may yet be other members of the family) studies of the spectroscopy of beauty may begin. The difference in mass between the ψ and the ψ' gives some information about the force between beauty and anti-beauty; a more numerous group would help even more. If ψ' can be observed to decay into ψ , then whatever it emits will also give important information about how beauty is and does and could be a new particle or particles itself. □

NCI Laetrile review inconclusive

Laetrile has not been found effective in test-tube and animal experiments (SN: 8/6/77, p.92), but public pressure for its legalization by the U.S. Food and Drug Administration remains high. Seventeen states currently allow its use in spite of FDA prohibition of its interstate commerce, and 70,000 Americans are currently estimated to be using Laetrile. Con-

sequently, the National Cancer Institute, in spite of its usual stance of only clinically testing drugs already shown effective in animals, is considering running a clinical trial to see whether or not Laetrile is effective against human cancer.

Before the NCI undertakes such an unorthodox mission, though, it wants a better idea of what evidence already exists for

Laetrile's clinical effectiveness. Last January, the NCI requested that the nation's Laetrile suppliers submit evidence of any beneficial effects from the substance. The NCI has now analyzed the material submitted and reports its findings in the Sept. 7 NEW ENGLAND JOURNAL OF MEDICINE.

First the NCI sent letters to 385,000 physicians, 70,000 other health professionals and various pro-Laetrile groups requesting information about any cancer patients who purportedly had improved as a result of taking Laetrile. Although the NCI had hoped to receive 200 to 300 case histories to analyze, it got only 93, and of these only 67 had sufficient details to be scrutinized.

These 67 cases were then presented to a panel of 12 cancer specialists, along with an equal number of conventionally treated cases selected from the institute's files. The panel members were then asked to evaluate each patient's treatment progress, without knowing what treatment the patients had received. This way the NCI hoped to avoid charges of an anti-Laetrile bias.

Six of the 67 Laetrile patients were found by the judges to show complete disappearance of all evidence of cancer or shrinkage of tumors by 50 percent or more. The cancers involved were of the lung, lymph nodes, chest, abdomen and the gastrointestinal tract. Three more Laetrile patients were judged to have shown a longer survival than would normally have been expected for their form of cancer, although their cases were considered non-evaluable in terms of a measurable tumor response because Laetrile was used when no definite sign of disease was present. The cancers were of the testes, ovaries and lymph nodes.

For the remaining 58 cases presented to the panel, a total of 59 courses of Laetrile treatment were evaluated. (One patient was treated at two different times with Laetrile, and each course of treatment was evaluated separately.) Eleven of these treatment courses were judged to have insufficient data for evaluation, 32 as non-evaluable (either because the patient did not have cancer at the time Laetrile was given or because anticancer drugs were given along with Laetrile), nine as showing stable disease and seven as showing progressive disease.

"This retrospective analysis illustrates the difficulty of drawing inferences about the therapeutic efficacy [of Laetrile] in the absence of properly randomized trials," the NCI concludes. Nonetheless, results of the analysis will be presented on September 25 to a committee (composed of NCI physicians and scientists) that advises on the development of anticancer drugs. This committee will decide whether to recommend a clinical trial of Laetrile. The final decision will be made by NCI Director Arthur C. Upton, after consulting with FDA Commissioner Donald Kennedy and other authorities. □