adapted to work in the energy range that creates the upsilon masses, so it was turned to a study of them.

It had been assumed from their first discovery that the upsilons contained bottom quarks, namely that they were so-called "bottomonium," a series of structures built of a bottom quark and a bottom antiquark, each one with slightly more energy than the one below it in the series. That, however, had to be proved.

John Yoh of Columbia University, representing a collaboration of physicists from Columbia, the State University of New York at Stony Brook, the Max Planck Institute in Munich and Louisiana State University using the CUSB detector at CESR, reported evidence that the upsilons are structurally similar and related to each other. That was done by making upsilons in some quantity and studying how they decay radioactively. Evidence for a hierarchical relation among the upsilons is that the more massive upsilons do sometimes decay into less massive ones. This strengthens the belief that the upsilons are bottomonium.

Bottomonium is fascinating but it is still not the best way to study bottom quarks. Properties of the bottom quark in bottomonium are masked or partially canceled by the presence of its antiquark in the structure. To study bottom well requires what in the trade is called bare bottom or naked beauty, some particle in which a bottom quark is bound to another flavor and can manifest itself better. Edward H. Thorndike of the University of Rochester reported how that was accomplished by a collaboration from Vanderbilt University, Syracuse University, Rutgers University, the University of Rochester, Harvard University and Cornell University using the CLEO detector at CESR.

It started with a difference between the most massive upsilon, upsilon triple prime, and the others. The less massive upsilons have a signature that indicates that they will decay rather reluctantly. The signature of the upsilon triple prime indicates a readiness to decay. That indicated to the physicists that there was a "threshold" between the upsilon double prime and the upsilon triple prime, the mass value of something into which the upsilon triple prime could be expected to readily decay.

Observation was able to show that the upsilon triple prime falls apart into basically a bottom quark and a bottom antiquark. These partner with quarks from the surroundings, forming the so-called B mesons. The B mesons further decay, and in the final decay process yield a large number of the sort of particle theory expects bottom or beauty quarks to decay into. So Thorndike says, "We can conclude that naked beauty exists."

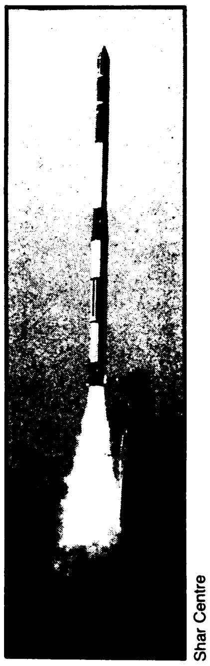
All of this is being taken rather smugly as a fine example of the way in which nature confirms theory. "The big surprise is that there are actually no surprises," says Thorndike. □

India joins the space-launch club

Not quite 23 years after the Soviet Union's momentous launching of Sputnik 1, 15 countries have had satellites of their own in space (Australia, Canada, China, Czechoslovakia, France, Great Britain, India, Indonesia, Italy, Japan, the Netherlands, Spain, West Germany, the United States and the USSR). Far fewer, however, have actually been able to put them there. For years, the United States and USSR launched everything that went into orbit, forming an exclusive club that was subsequently joined only by China, France (which is also the primary builder of the Ariane rocket for the European Space Agency), Great Britain and Japan — until last week. The newest member is India, which on July 18 sent a tiny test satellite into orbit aboard a four-stage, solid-propellant rocket launched from Sriharikota on the country's southeastern coast.

The 35-kilogram satellite, designed merely to report on the flight environment and the shape of its own elliptical orbit, was India's third. The previous two were launched by the Soviet Union, whose space links with the subcontinent also include the possibility of training some Indians as cosmonauts. The new rocket (whose maiden flight last August ended in failure) is not from Soviet designs, however, according to Indian officials, but evolved from India's own sounding-rocket research, which has been going on since the 1960s. (Japan's first orbital launching, by comparison, used a rocket based on a U.S. design, although a Japanese-designed rocket has since matched the feat.)

Satish Dhawan, chairman of India's policy-making Space Commission, also said on the day of the launching that the new rocket gives the country the capability of developing intermediate-range ballistic missiles, since "any country which can place a satellite in orbit can develop an IRBM." A four-stage rocket, depending for success on a series of properly executed firings, might be an unlikely choice for an IRBM, but last Friday's launching could be seen as relevant to an appropriate guidance system. In addition, officials report that Indian researchers are at work on liquid-propellant technology.



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The Indian Space Research Organization, meanwhile, is planning to launch a scientific satellite with the new rocket next year. A remote-sensing satellite for earth-resources studies is in the works for 1984 or 1985, although its projected 500-kilogram weight is about 10 times the payload capacity of at least the present version of the rocket. This could well mean that it will be orbited by a different vehicle entirely, such as ESA's Ariane, Indian officials acknowledge. It is possible, in fact, that an Ariane will launch India's next satellite before either of the above probes has flown. An Indian experimental communications satellite called Apple is due to ride an Ariane officially scheduled for November, although the recent failure of Ariane's second test flight may have delayed the flight into 1981. India's new rocket is thus not an automatic entree to orbit, at least for the time being, but the launch capability does put the country in exclusive company. □

Human tests of bacteria-produced insulin

It's another step forward in the attempt to harness bacteria to fulfill human needs. Eli Lilly and Co. has announced what it believes to be the first testing in humans of a product of the rapidly expanding recombinant DNA technology (SN: 3/29/80, p. 203). At a plant in England the pharmaceutical company has begun testing bacterially produced human insulin on eight nondiabetic healthy subjects. The first results of the tests, which began July 14, show bacterially made insulin to be approximately as effective in lowering blood sugar as naturally produced insulin. One subject who received 9.6 units of the insulin had a 36 percent drop in blood sugar. The bacterial product had already been shown effective in laboratory animals.

Facilities to produce insulin with bacterial techniques are already under construction both in Indianapolis, Lilly's U.S. headquarters, and near Liverpool, England. Lilly expects insulin production at the plants, which will cost more than $40 million, to begin in 1982, although "considerable" scientific work, including tests on diabetics, and government approvals must be gained before the insulin can be made commercially available.

The bacterially produced, or "biosynthetic," insulin is identical to that made by the human body (SN: 9/16/78, p. 195). The researchers expect that biosynthetic insulin will reduce the incidence of allergic reactions — a small proportion of diabetics are allergic to the insulin currently available from animal pancreas glands. In addition, the bacterially produced material would answer the concern that animal pancreas glands will be in short supply in about 20 years. □