Spectroscopic Survey Telescope and the Supercollider

By Bill Hobby

By the end of this decade Texas will be the home of two incredible new scientific machines that will advance human knowledge in very different ways, both seeking to get a little closer to the moment time began.

A new kind of telescope, gathering information more efficiently than any before it, will stare into the universe from a mountain-top in West Texas.

Below the prairie just south of Dallas, the most powerful particle accelerator in the world will ram together the elementary particles of which the world is made at incredible speeds.

Both machines will be looking back to when the time after the Big Bang was measured in 1/100ths of a second.

Each machine is a significant scientific breakthrough in its own way.

The telescope is the first of a new breed designed to gather light instead of look at stars. You can't take a picture of Saturn's rings or Halley's Comet through this telescope. You can't point this telescope up and down. It moves around in a circle, at a constant elevation of 65 degrees.

The fixed angle is one of the reasons this telescope costs about one-tenth of what a telescope of traditional design costs. This arrangement avoids the expensive engineering needed to handle the varying stresses of gravity on the mirrors and the telescope tube.

The other reason that this telescope is so cost-efficient is that it relies on 85 mirrors, each a meter (about 39 inches) in diameter, focussed by computers. A conventional telescope would have to have a single 340-inch mirror to gather the same amount of light.

That conventional telescope would cost over $100 million. This telescope will cost less than $10 million. That's smart science.

Today's astronomy isn't about looking through a telescope at Venus. It's about gathering and analyzing light. Light analysis (spectroscopy) tells astronomers what a star is made of, how hot and how heavy it is, and which way and how fast it is spinning.

The most valuable commodity in astronomy is time on a telescope. This new design will use that time more efficiently than does a conventional telescope. It will measure the distances to hundreds of galaxies every night. Observations will be coordinated by computer. The telescope will examine each target object as it goes by, analyze the light, and forward the observations to the appropriate astronomers--who will be doing a lot more of their sleeping at night than they now do.

The unique design came from astronomers at Penn State University, which is a partner with the University of Texas in this scientific venture.
Six hundred miles to the East, under some of the richest farmland in Texas, physicists from all over the world will be using the most powerful machine in the world, the Superconducting Super Collider (SSC) to ram protons together at incomprehensible speeds.

The SSC will accelerate these cores of hydrogen atoms up to an energy of 20 trillion electron volts, more energy than anyone has ever put into a particle of matter. The protons will collide every 1/1,000th of a second. These collisions will produce smaller, more fundamental particles than have ever been detected.

The technological advances that can be expected from these new discoveries can scarcely be imagined. The electronic world as we know it came from advances in knowledge made on much smaller machines early in this century.

The SSC is a roughly circular tunnel 54 miles in circumference. It will be from 50 to 250 feet below ground. Aside from a road over the top of the tunnel and buildings to house the engineers and scientists, the Ellis County countryside will be largely undisturbed.

The SSC was put in Texas because Texas had the foresight and the courage to put together a package better than all the other states who competed mightily for it.

In 1987, the legislature created the Texas National Research Laboratory Commission to bring the SSC here. Bonds totalling $1,000,000,000 were authorized. Voters approved the second $500,000,000 by 62%--the highest percentage of any proposal on the ballot.

The SSC is currently estimated to cost $8.2 billion. The construction will bring about 15,000 jobs (9,390 direct, 5,700 indirect) to the area.

Texas will become a world center for the study of high-energy particle physics when the SSC, to be staffed by 500 to 1,000 scientists, goes into operation.

The protons swirling beneath of Ellis County may seem infinitesimal, and the galaxies swirling high over Jeff Davis County impossibly remote. But they hold secrets of knowledge that will make possible a better world.

Written in 1991.