



Scott Barnett Emerald

Nobel prize winning physicist Burton Richter lectured on campus yesterday about modern high energy physics.

## Speaker

Continued from Page 1A

center Jim Brau said the center would help unify researchers' efforts.

"This whole field is getting very hot now," Richter said to an audience of more than 100.

One of the most important issues facing high energy physicists is improving the atomic model that Richter and his partner won the Nobel Prize for discovering, he said.

Richter said he became a high energy physicist when the science community was "just beginning to understand the structure of the particle world."

Before Richter's discovery, scientists believed that all atoms were composed exclusively of three sub-atomic particles called quarks.

"It was a very unsatisfactory picture because the three didn't

seem related at all," Richter said.

In 1974, Richter discovered a fourth quark and made a series of further discoveries that transformed atomic theory and became known as the November Revolution.

"It's nice to be leading a revolution," Richter said. However, he said, the current atomic model still needs improvement.

"We are at a point in particle physics that we have a wonderful theory but we know it's not complete. But we don't know how to complete it."

Another vein of high energy physics research is analyzing the origins and the future of the universe.

"When people talk about the big-bang, they talk about a fire cracker going off," Richter said. "It's not like that at all. It's more like the rising of yeast and dough. You have to get out of your mind that the universe start-

ed at a point. It's an extended thing, which had a single density that started to expand."

Richter also compared the big-bang to a ball of rubber being stretched in three dimensions.

In another recent discovery about the universe, physicists have found that the universe is expanding at an increasing rate by analyzing the red shift of type 1-A supernovas, Richter said.

However, Richter expressed doubt about the discovery because it relies on the uniform light quality of type 1-A supernovas, which are originally binary stars.

Richter said high energy physicists are soliciting NASA for a telescopic satellite to further investigate the universe.

"When we have ten times more data than we have now, maybe we could answer our questions," he said.

## Scientists complete chromosome map

By Jeff Donn

Associated Press Writer

For the first time, scientists have mapped virtually an entire human chromosome, one of the chains of molecules that bear the genetic recipe for human life.

The achievement announced Wednesday is an important step for the \$3 billion Human Genome Project, which is attempting to detail the tens of thousands of genes that carry instructions for everything in a human — from brain function to hair color to foot size.

"This is the first time that we've had a complete chapter in the human instruction book, and that's pretty amazing," said Francis Collins, who chairs the international project from the National Institutes of Health.

"I think this is probably the most important scientific effort that mankind has ever mounted. That includes splitting the atom and going to the moon," he said.

In laying out the chemical instructions for life, scientists believe they are in the early stages of revolutionizing the study of human development and medicine.

Already, researchers have begun testing several biological therapies that replace faulty genes or correct their misfirings to make cells work correctly. Such therapies, if they can be made reliable, would bring a more precise way

to treat diseases without the sometimes debilitating side effects of conventional drugs.

A draft of the entire genome was expected to be done next spring, but the milestone announced Wednesday may hasten its completion. The study's details appear in the journal Nature.

The human genetic pattern, or genome, is a biological map laying out the sequence of 3 billion pairs of chemicals that make up the DNA in each cell. All human DNA is contained within 23 pairs of chromosomes.

What the scientists have done is lay out the order of about 545 of the estimated 700 genes on chromosome 22, which has about 1.1 percent of the genes in the human body.

About 55 percent of the genes were new to researchers during the study; 45 percent already had been discovered during the Human Genome Project.

The chromosome 22 group, which includes British, American, Japanese, Canadian and Swedish scientists, could find only 97 percent of the chromosome's genetic material. Scientists said technological limits prevented them from analyzing the remaining 3 percent, which could have as many as 200 genes.

While five government-supported centers and many university labs have already identified

about a third of the whole genome, the map of chromosome 22 is the most complete part so far.

"One down, the others to go," said Ian Dunham, a biochemist with the Sanger Centre in Cambridge, England, and lead author of the Nature report. "It's a great relief to have it finished."

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