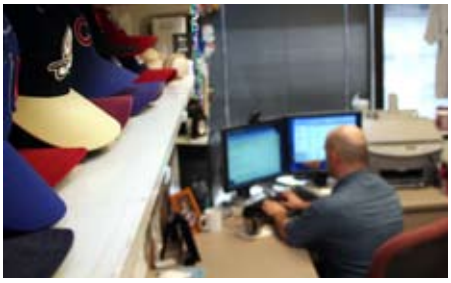
AGGIE PHOTOESSAY

SCIENTISTS KNOW WHAT IS INSIDE AN ATOM. "Electrons orbiting a nucleus," said **Dr. Dave Toback**, associate professor of physics. They even know that inside a nucleus are protons and neutrons. But what's inside an electron, if anything, is a complete mystery. "That's one of the things we're working on," he said. Aggie faculty members in high energy particle physics are active in two such experiments: one west of Chicago and one just outside of Geneva, Switzerland. Using the world's largest particle accelerator at each location, Texas A&M joins researchers around the world in effort to find out how particles, like electrons, are put together. As with atomic energy, information that's discovered could change the field of energy forever. The specifics are still locked inside the secret particles, but as an example, Toback likes to tell the story of an English physicist who, in the 1800s, studied electric current. When asked by a skeptic what good could come from electricity, Toback said the physicist answered that he didn't know the details, but was sure that "one day, sir, you will tax it."

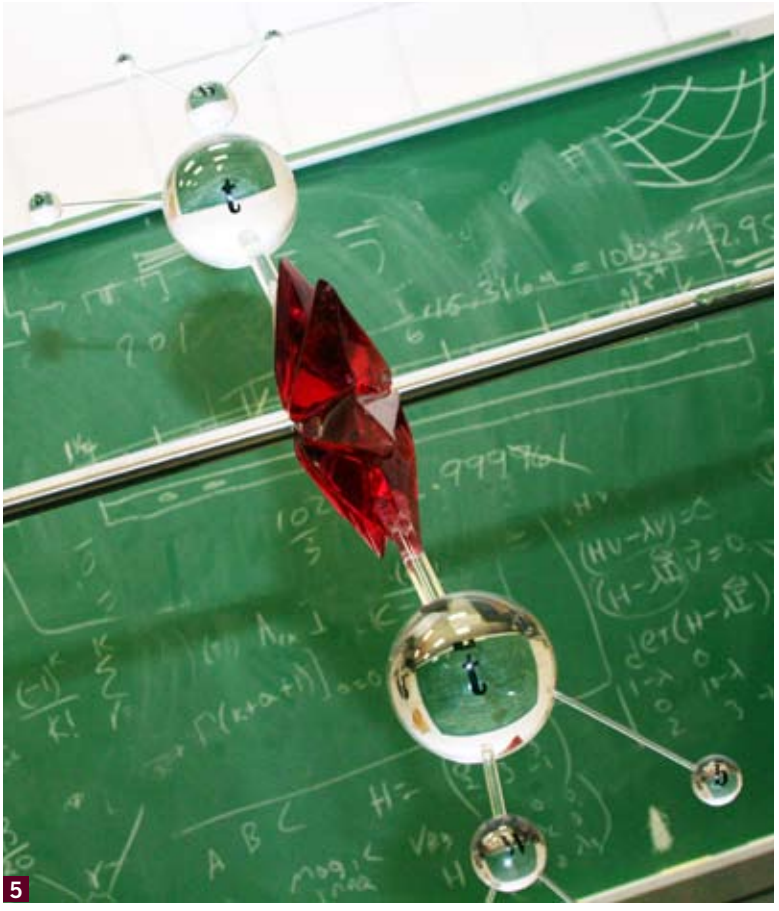
"If we can understand the research, we can use our new understanding to do new and great things," Toback said.

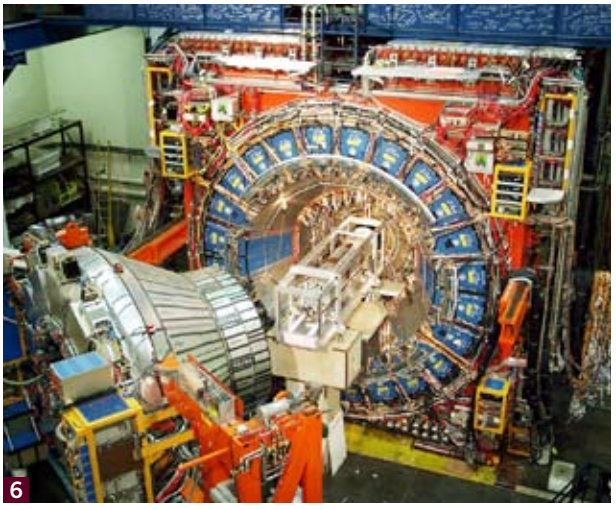


Above: Toback shows some of the electronics used to discover the top quark at Fermilab in the late 1990s.

Toback works with several other Aggie physicists including: Alexei Safonov, Teruki Kamon, Peter McIntyre, Bhaskar Dutta, Dick Arnowitt, and Dimitri Nanopoulos.

Right: Data from both experiments is sent back to Texas A&M where faculty and students work to understand and apply new findings.





CLOCKWISE FROM TOP LEFT:
1: **Vadim Khotilovich '08** shows a read-out board that, as a graduate student, he helped debug, install and maintain.

2: Texas A&M was the lead university in creating the electromagnetic timing system on the detector shown here during installation.

3: Former Texas A&M post doctorate **Max Goncharov** is pictured installing the electromagnetic timing system.

4: **Peter Wagner '07** is shown installing the electromagnetic timing system. Wagner is the only Aggie to win the Universities Research Association Thesis Award.

5. This is a model of what happens when two particles in the particle accelerator crash into one another. The red shows the creation of energy, and the offshoots represent elementary particles called quarks.

6. The detector that surrounds the collision point where all the data is collected is three stories tall.

7. This is an aerial view of the Chicago-based Fermilab where particles travel around a 4-mile loop.

8, 9, 10: As particles make their way around the loop, they are accelerated to high speeds so when they meet there is an enormous energy in the collision. It's this large energy that could produce the new particles that could hold the answer for physicists.