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The search for the power of 'the force'

$45 million approved for study of subatomic quarks

By **Dan Patrick**

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The power of the force will soon be with IU, thanks to the approval of a $45 million project for the IU physics department. The grant will fund the GlueX/HallD project to finance the refurbishment of a component at the IU Cyclotron Facility and the construction of a on-site manufacturing facility.

Quarks are the smallest known particle in the universe, smaller even than electrons. The quark-binding force, which holds together the parts of the proton and neutron, is quite unique, as it is the strongest known in nature and is not affected by the distance between the quarks unlike other forces in nature. Project Leader and IU Physics Professor Alex Dzierba said this project should shed some light into the force and could even lead to the discovery of a new form of matter.

"The idea is the detector would provide the data about the nuclear force that holds the quarks together," Dzierba said. "We could answer why the force is so strong and why they are always confined within the center of an atom."

The questions surrounding this force have been called one of the 10 most important questions in physics by The New York Times.

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"That force is the strongest force that we know about," Dzierba said. "It's a fundamental question in physics and is one of the most important questions today."

The signing ceremony for the formal approval of the project is scheduled to take place April 19 in Newport News, Va. Dzierba said the amount of money is completely justified for the project, citing how no research can be done without the full detector.

"The project is involved in building a fairly large detector. It's one of those things that it's all or nothing," Dzierba said. "In order to do the physics, we need the full detector, and for that, we'll need the $45 million. The cost has been reviewed by several people, and they looked at the design, and the decision was that the scientific goal justified the cost."

According to an IU press release, the 250-ton superconducting solenoid is currently being refurbished at the IU Cyclotron Facility, and Dzierba said the project is only a few years away from fruition.

"If everything goes well, we could have it finished as early as four years," Dzierba said. "However, it could stretch to as much as five years."

Physics Associate Professor Adam Szczepaniak said the project cannot be completed soon enough because it will allow physicists to reach new heights in the quantum physics field.

"It's an experiment to probe the fundamental force that holds quarks together, which we have never been able to see," he said. "This will give us the opportunity to investigate these properties in a way that we never have been able to before."

While the physicists are excited about the chance to research a major question in their field, this excitement is underscored by the fact that IU is leading the project.

"It's very exciting. This is a project that

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involves about 100 physicists from all over the country, and this project was born here at Indiana," Dzierba said. "The fact that we're leading this project is not only scientifically exciting, but it's also personally exciting to know that we are spearheading such an important project."

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