

## It's all in the knees

Engineering a cure for arthritis

FOR TAMMY HAUT DONAHUE, engineering is a great weapon in the battle against osteoarthritis, the most common form of degenerative joint disease. "It's a condition that's mechanically induced," she explains. "As mechanical engineers, we're ideally suited to understand the process."

Haut Donahue's research is centered on preventing the disease rather than treating it. She is examining how injury to the meniscus, a fibrous cartilage in the knee, may cause osteoarthritis. The meniscus acts as a buffer in the knee joint and is susceptible to injury. She hypothesizes that if scientists can prevent degenerative changes in the meniscus, they may be able to slow or halt the progression of osteoarthritis.

The knee undergoes severe mechanical loading while walking or running, which induces a biochemical reaction in the meniscus. "It's a close relationship," Haut Donahue explains. "So close that one relies on the other. That is, mechanical loading keeps the cells of the meniscus healthy. It's the very nature of the tissue. We know if we take away loading, the tissue degrades."

The aim of Haut Donahue's research is to understand how the mechanical loading produces a biochemical response. "It's a critical function to understand because the biochemical response produces healthy tissue, which can withstand greater mechanical loading. It's a cycle."

Haut Donahue is also pursuing an alternative approach to the removal of damaged tissue. "Rather than having a surgeon go in and take torn tissue out, we want to repair it. We want to take a biopsy, bring it to the lab, apply the right mechanical loading to it, and thereby grow new tissue from

the ground up." The process is called tissue engineering. "In order to design the new tissue, we have to understand very clearly how the original tissue functions," she says.

It is possible that compression of the cells alone could induce the redevelopment of new, healthy cells. Alternately, fluid flow resulting from compression, or a combination of compression and flow could be required. "We're looking for the right signal," she says.



The research has attracted a \$240,000, three-year grant from the Whitaker Foundation "My goal is to protect the cartilage and interrupt osteoarthritis before it starts," she adds. "Then you won't have the arthritis problem in the first place."

## The growth of Enterprise

Students solving industry's problems



THE HALLMARK OF A MICHIGAN TECH EDUCATION is preparation for the workplace. With the university's fast-growing Enterprise Program, students receive a career foundation that is second to none.

Nobody does it like we do," says Mary Raber, director of Enterprise. Teams of students from different disciplines manage real-world projects for industry partners. The students run the enterprises like companies, addressing such every day challenges as budgets, deadlines, and delivery of a product or solution.

Now in its sixth year, the Enterprise Program comprises nearly 600 students on 23 different Enterprise Teams, including Blue Marble Security, Husky Game Development and Sustainable Solutions. Learn more at [www.enterprise.mtu.edu](http://www.enterprise.mtu.edu).

- The **Aqua Terra Tech Enterprise** hosted three groups of Michigan high school students and teachers, who explored possibilities for starting their own apprentice enterprises.
- A new **Service and Leadership Enterprise** was formed. Its first project is to design a low-cost, energy-efficient dwelling on the Pine Ridge Lakota Reservation in South Dakota.
- The **International Business Ventures Enterprise** formed a partnership with the Universidad del Turabo in Puerto Rico.