# Langer speaks at MIT

**By Brent Ardaugh**

Nearly 650 students, postdocs, and professors gathered inside MIT's Kresge Auditorium on October 1 to attend the 25th annual Whitehead Institute Symposium. The theme of the event was Regeneration in Biology and Medicine and featured experts who discussed factors that permit cell regeneration and the potential their discoveries hold in developing new medical therapies. The symposium began with opening remarks from MIT Biology Professor Rudolf Jaenisch and was followed by presentations from nine other world-renowned researchers including MIT tissue engineer, Dr. Robert Langer.

Cell regeneration and tissue engineering refer to the natural processes cells use to regain normal functions following disease, injury, or trauma. Knowledge of cell regeneration is applied in tissue engineering to provide insight on ways scientists can leverage the natural capabilities of cells to construct tissues in laboratories.

Cells are the basic living, structural and functional units of the human body, and they are similar to the tiles that provide the aesthetic construction of a given floor. If you pretend each cell is a tile, you can visualize an entire floor as being a tissue or a collection of similar cells. Further, you can think of an organ as being a collection of tissues that work together to perform a specific function. Examples of human organs include the brain, heart, skin, and lungs.

Since the human body is composed of trillions cells, it is important that a large amount of research is dedicated to understanding how cells work and ways to restore them if they become injured. Severe burns, spinal cord injuries, and facial trauma include a few examples where knowledge and application of cell regeneration and tissue engineering can improve lives by providing more effective, less invasive medical treatments.

Photo courtesy of Justin Knight

Dr. Robert Langer discussed tissue engineering at the 2007 Whitehead Institute Symposium.

Dr. Langer is one of 13 Institute Professors at MIT and a 2006 recipient of the National Medal of Science, an award presented by the President of the United States for outstanding scientific achievements. At the symposium, Langer spoke about his recent discoveries that have earned special distinction among the scientific community: the development of self-tying, shape-memory sutures and successful techniques for engineering tissues in the laboratory setting.

After Langer began his presentation, audience members reached for their pens and notebooks when he demonstrated how self-tying, shape-memory sutures can be applied to make existing surgical operations less invasive. Amazingly, these sutures are programmed to tie themselves the moment they reach normal human body temperature (98.6° F). This process is equivalent to dropping a shoelace into a cup of water and watching it tie a perfect knot. Surgeons can one day use these sutures to repair the lungs, liver, stomach, or as Langer noted, "Any normally non-accessible part of the body."

After discussing ways to improve surgical operations, Langer talked about how tissues are made in his lab. To make a tissue, Langer "seeds" a polymer scaffold with living animal cells (e.g., cardiac muscle cells) and bathes the scaffold in a nutrient-rich solution. By mimicking the internal conditions of the body through nutrients, mixing, and scaffold structure, Langer is often able to promote an environment where cells can proliferate into their corresponding tissue (e.g., cardiac muscle tissue).

Using these techniques, Langer has successfully engineered nasal cartilage and cardiac muscle tissue. When asked about the other types of tissues constructed in his lab, he stated, "Livers, intestines, spinal cords, and bone," with "vocal cords and islets" on the way.