Campus was surprisingly quiet as I made my way to Cook Auditorium on the frigid morning of January 29, 2000, anticipating with every step the heated debates I was sure to witness throughout the day. Most students were evidently still sleeping so early on a Saturday, completely unaware that a controversy large enough to upstage even the Student Life Initiative had made its way to Hanover, New Hampshire. For just a minute, I wondered why I myself was not in bed; but there was simply no way I was going to miss a day-long symposium on the one topic that has intrigued specialists from all fields of medical science: stem cell research. With it’s seemingly limitless potential for medical therapeutics matched by the complex ethical issues that surround it, stem cell research is a topic that will likely continue to cause controversy throughout the beginning of the new millennium. On the 29th of January, eight panelists, including M.D.s, Ph.D.s, and one C.E.O., flew to Dartmouth College to introduce both sides of the stem cell controversy to faculty and students.

The morning session of the symposium focussed on the biological background and therapeutic benefits of stem cells. Daniel Marshak, Ph.D., of Osiris Therapeutics, Inc. and Associate Professor of Oncology and of Molecular Biology and Genetics at the Johns Hopkins University School of Medicine began the morning by defining stem cells as rare progenitors of various tissues with extensive self-renewal capability and the ability to differentiate into multiple cell lineages. Essentially, stem cells are cells that, when given the right biological signals, have the ability to become any other type of cell. It is important to keep in mind when discussing stem cells that the capabilities of different stem cell populations vary. Multipotent cells are able to differentiate into more than one tissue type; pluripotent cells can develop into nearly all tissue types; and totipotent cells, potentially the most beneficial stem cells, can differentiate into every type of tissue in the human body. Dr. Marshak explained that the range of potencies is a result of the source of the stem cells. The inner cell mass of pre-implantation embryos and three to eight week old fetus gonadal rings both offer pluripotent and totipotent stem cells. Adult tissue sources, which include bone marrow and connective tissue, offer stem cells—at no ethical cost—that have not been shown to be totipotent. Rather, the adult stem cells, termed hemopoietic stem cells in bone marrow and mesenchymal stem cells in connective tissue, have been made to differentiate into only a limited number of cell and tissue types. However, the adult stem cells are still therapeutic. For example, hemopoietic stem cells are capable of rescuing cancer patients by differentiating into new immune system cells, replacing those which had been destroyed by chemotherapy or radiation; mesenchymal stem cells can be injected into bone gaps after removal of osteosarcomas to fill in the areas of missing bone.

Still, the adult derived stem cells do not offer the same potential therapies as totipotent fetal or embryonic stem cells, which were discussed next by Robert Goldstein, M.D., Ph.D., Chief Scientific Officer of the Juvenile Diabetes Foundation International. Dr. Goldstein believes that stem cell research should be pursued “because it offers unparalleled opportunities for curing disease.” Dr. Goldstein said that people would be surprised to find that though many effective treatments have been developed, fewer than ten diseases have actually been cured in the last fifty...
years. One such uncured disease is Type I Diabetes, in which an autoimmune response targets and kills the insulin secreting Beta cells of the islets of Langerhans in the pancreas. One treatment for this disease is an islet transplantation to supply more of the destroyed cells. While this treatment works for a while, the autoimmune response remains active, and toxic immunosuppression is needed to prevent graft rejection. Also, there is a low supply of islet cells for transplantation. Stem cells, asserts Dr. Goldstein, would offer an unlimited supply of islet cells. Furthermore, these cells could be engineered to resist graft rejection and the autoimmune response and then be implanted to secrete insulin, effectively curing this disease. Stem cell treatments could also replace bone marrow transplants in the treatment of childhood leukemia and immunodeficiency diseases. As a final, striking example, Dr. Goldstein stated that stem cells could also be used to repair damaged heart muscle, possibly removing heart disease as the number one killer in the United States.

Next to take the center podium was Michael West, Ph.D., Chief Executive Officer at Advanced Cell Technology, Inc.. He spoke further on the applications of stem cells. Dr. West brought up the point that beginning in the next few years and continuing for the next few decades the baby-boomer generation is going to overburden the health care system in the United States, unless we find new tools to deal with aging. “Stem cells and cloning are the screwdriver and pliers of these new tools.” At Advanced Cell Technology, Inc., scientists are already exploring the possibility of cloning embryos as a source for stem cells. Interestingly, Dr. West's description of the process his company is investigating—though simply an explanation of the biological manipulation of cell genetics—brought the first emotional response from the symposium crowd, who heretofore had been listening calmly to what amounted to a very interesting biology lesson. When Dr. West revealed that Advanced Cell Technology, Inc. uses animal oocytes to house human chromosomes in nuclear transfer procedures, an audible astonishment spread through the crowd. Specifically, this technique involves taking unfertilized animal oocytes (from cows for example) and removing all of the genetic material within. Once the oocyte is emptied of the animal genome, scientists inject a complete set of human chromosomes into the oocyte. A short, electrical pulse initiates the cell division process, and the oocyte has the potential to develop into a human embryo. Though the oocytes have not been allowed to progress beyond a few divisions, Dr. West hopes that someday this technique will be used to produce populations of embryos from which stem cells may be harvested and used in some of the medical treatments already mentioned. It should be noted that Dr. West assured the consternated crowd that this technique does not create animal/human hybrids, even though the oocyte is not human. He contends that the few remaining animal proteins in the oocyte disappear within the first few divisions, and the resulting cell population is completely human.

Judy Stern, Ph.D., Associate Professor of Obstetrics & Gynecology and Pathology at Dartmouth-Hitchcock Medical Center, also brought up the idea of using embryo populations as sources of stem cells. However, instead of creating new embryos from nuclear transfer, Dr. Stern mentioned the possibility of using unwanted embryos from in vitro fertilization (IVF). In most IVF procedures, eggs harvested from the mother are combined with sperm donated from the father, and multiple embryos are developed. Some of the resulting embryos are then placed back into the mother's womb to gestate normally. A choice must then be made as to what to do with the leftover embryos that were not implanted. Sometimes they are discarded, but often they are frozen for future implantation. These frozen embryos may be a source for embryonic stem cells, if the donating couple later decide that they no longer want to use them for implantation. Of course, both this and Dr. West's technique of creating embryos for stem cell harvesting are very controversial ideas, and they provide a basis for the ethical arguments that occupied the afternoon session of the stem cell symposium.

Starting off the afternoon ethics discussion was Richard Doerflinger, Associate Director for Policy Development and Secretariat for Pro-Life Activities for the National Conference of Catholic Bishops. Mr. Doerflinger began by pointing out that National Institutes of Health (NIH) funding
for stem cell research involves using the tax money of millions of non-supporters, who should not be forced to support something they find morally wrong. Furthermore, Mr. Doerflinger finds the idea that the NIH is funding only stem cell research and not the more ethically problematic derivation of stem cells ludicrous. Most of the NIH guidelines for receiving funding are concerned with defining appropriate methods for acquiring stem cells. Mr. Doerflinger continued by addressing the idea of a pre-embryo stage from which stem cells could be taken without destroying an actual embryo. It turns out, he asserts, that the existence of a pre-embryo stage is something in which few embryologists believe anymore; thus most specialists agree that an embryo must be destroyed to harvest stem cells. Finally, Mr. Doerflinger confronted the issue of whether or not a cloned embryo was a real embryo. Speaking biologically, he said, cloned animals are indistinguishable from naturally birthed animals. Indeed, he persisted, defining an embryo as person or not is difficult. There is nothing objective in anyone that designates them as a person; scientists pick and choose what to call people to allow for killing.

While Mr. Doerflinger raised some interesting points, there is no doubt that the next speaker, Kevin Fitzgerald, J.S., Ph.D., from the Department of Medical Humanities at Loyola University Medical Center, was the more eloquent and more convincing of the two anti-stem cell panelists. Dr. Fitzgerald pulled a fast one on the audience when he asked us all to close our eyes and picture a human being. After a few moments, he invited us all to open our eyes again and asked how many people pictured a blind person or a deaf person. No one raised their hands, prompting Dr. Fitzgerald to ask if these people were not human. Can we take their stem cells? While the audience sat in speculative silence, Dr. Fitzgerald pointed out that our history is full of instances in which the status of humanity was removed from groups of people so that they would not have to be respected; slavery was a specific example he gave. Once again the audience was quiet, unable to deny the truth contained in the words of Dr. Fitzgerald, who plunged forward with his argument. “Are prisoners and comatose patients spare?” he asked. “Then why are embryos?” Dr. Fitzgerald began his closing remarks by pointing out that scientists cannot step back and look at the big picture—what's good for everyone—because scientists want to see their work succeed at any cost. But this approach towards success invariably causes others to lose. In a story Dr. Fitzgerald told the audience, he was once at a Special Olympics foot race in which one of the participants fell. Rather than continuing on towards the finish line, all of the other runners stopped, turned around, and helped the fallen runner get up. All of the Olympiads then proceeded to cross the finish line together. In our race against disease, Dr. Fitzgerald asks, do we want definite winners quickly, or can everyone cross the finish line together? While the latter may take longer to accomplish, it allows embryos to remain a part of our human family, and it ensures everyone a place in the winner’s circle.

The last two ethics speakers had a difficult act to follow, and frankly, they barely held their own. Norman Fost, M.D., M.P.H., Professor of Pediatrics and Director of the Program in Medical Ethics at the University of Wisconsin, claimed that stem cell research rescues part of an embryo about to be discarded. Furthermore, the potential to become a person doesn't confer the status of being a person, he claims. Hamburgers have the potential to become a person, said Dr. Fost. During her pregnancy, his wife ate nothing but hamburger; and yet, their son was created. But hamburgers are not considered people. Stem cells cannot develop into humans without being manipulated, so that makes them no different than any other cell line; embryos are not people, he decided, but they should be treated with respect. Agreeing with Dr. Fost, Eric Meslin, Ph.D., Executive Director of the National Bioethics Advisory Commission, wrapped up the afternoon with support for stem cell research. This research, he claimed, would enhance scientific progress in the United States and ensure that we continue to lead the science world.

Anyone in attendance that day is sure to say that the stem cell symposium was a very thought provoking event. I myself went in fully supporting the idea of stem cell research but left with some serious doubts, thanks to Dr. Fitzgerald. With so many well spoken and extremely well educated participants present, it was easy to understand all sides of the stem cell controversy. As for those heated debates I was looking forward to, I left disappointed on that score. There was nothing but lively and mutually respectful discussion among the eight panelists that day—a testament to their intelligence and confidence in their respective positions.