DISCURS DE JAMES D. WATSON

Viewpoint: All for the Good – Why Genetic Engineering Must Soldier On

There is lots of zip in DNA-based biology today. With each passing year it incorporates an ever-increasing fraction of the life sciences, ranging from single-cell organisms, like bacteria and yeast, to the complexities of the human brain. All this wonderful biological frenzy was unimaginable when I first entered the world of genetics. In 1948, biology was an all-too-descriptive discipline near the bottom of science's totem pole, with physics at its top. By then Einstein's turn-of-the-century ideas about the interconversion of matter and energy had been transformed into the powers of the atom. If not held in check, the weapons they made possible might well destroy the very fabric of civilized human life. So physicists of the late 1940s were simultaneously revered for making atoms relevant to society and feared for what their toys could do if they were to fall into the hands of evil.

Such ambivalent feelings are now widely held toward biology. The double-helical structure of DNA, initially admired for its intellectual simplicity, today represents to many a double-edged sword that can be used for evil as well as good. No sooner had scientists at Stanford University in 1973 begun rearranging DNA molecules in test tubes (and, equally important, reinserting the novel DNA segments back into living cells) than critics began likening these "recombinant" DNA procedures to the physicist's power to break apart atoms. Might not some of the test-tube-rearranged DNA molecules impart to their host cells disease-causing capacities that, like nuclear weapons, are capable of seriously disrupting human civilization? Soon there were cries from both scientists and nonscientists that such research might best be ruled by stringent regulations, if not laws. As a result, several years were to pass before the full power of recombinant- DNA technology got into the hands of working scientists, who by then were itching to explore previously unattainable secrets of life. Happily, the proposals to control recombinant-DNA research through legislation never got close to enactment. And when anti-DNA doomsday scenarios failed to materialize, even the modestly restrictive governmental regulations began to wither away. In retrospect, recombinant-DNA may rank as the safest revolutionary technology ever developed. To my knowledge, not one fatality, much less illness, has been caused by a genetically manipulated organism.

The moral I draw from this painful episode is this: Never postpone experiments that have clearly defined future benefits for fear of dangers that can't be quantified. Though at first it may sound uncaring, we can react rationally only to real (as opposed to hypothetical) risks. Yet for several years we postponed important experiments on the genetic basis of cancer, for example, because we took much too seriously spurious arguments that the genes at the root of human cancer might themselves be dangerous to work with.

Though most forms of DNA manipulation are now effectively unregulated, one important potential goal remains blocked. Experiments aimed at learning how to insert functional genetic material into human germ cells —sperm and eggs— remain off limits to most of the world's scientists. No governmental body wants to take responsibility for initiating steps that might help redirect the course of future human evolution. These decisions reflect widespread concerns that we, as humans, may not have the wisdom to modify the most precious of all human treasures — our chromosomal "instruction books." Dare we be entrusted with improving upon the results of the several million years of Darwinian natural selection? Are human germ cells Rubicons that geneticists may never cross?

Unlike many of my peers, I'm reluctant to accept such reasoning, again using the argument that you should never put off doing something useful for fear of evil that may never arrive. The first germ-line gene manipulations are unlikely to be attempted for frivolous reasons. Nor does the state of today's science provide the knowledge that would be needed to generate "superpersons" whose far-ranging talents would make those who are genetically unmodified feel redundant and unwanted. Such creations will remain denizens of science fiction, not the real world, far into the future. When they are finally attempted, germ-line genetic manipulations will probably be done to change a death sentence into a life verdict by creating children who are resistant to a deadly virus, for example, much the way we can already protect plants from viruses by inserting antiviral DNA segments into their genomes.

If appropriate go-ahead signals come, the first resulting gene-bettered children will in no sense threaten human civilization. They will be seen as special only by those in their immediate circles, and are likely to pass as unnoticed in later life as the now grownup "test-tube baby" Louise Brown does today. If they grow up healthily gene-bettered, more such children will follow, and they and those whose lives are enriched by their existence

will rejoice that science has again improved human life. If, however, the added genetic material fails to work, better procedures must be developed before more couples commit their psyches toward such inherently unsettling pathways to producing healthy children.

Moving forward will not be for the faint of heart. But if the next century witnesses failure, let it be because our science is not yet up to the job, not because we don’t have the courage to make less random the sometimes most unfair courses of human evolution.