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On Synthetic Life

by

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On Friday, December 10, 1999, the *Philadelphia Inquirer* had as its headline: "Recipe for Life? Scientists Close in on Essential Genes" (pp. A1, 16). It was based on an article "Global Transposon Mutagenesis and a Minimal Mycoplasma Genome" in *Science* (Dec. 10, 1999). The *Inquirer* piece specifically described the work and findings of an ethics committee known as the "*Minimal Genome Project*" which convened to address the proposed experiment described in the journal. The group was comprised of 20 people: ethicists, lawyers, philosophers, scientists, sociologists and theologians who were tasked to get out in front of science and discern the ethical implications, political correctness, environmental prohibitions and theological issues involved in creating new life forms. This experiment would be the next step down the road from reengineering organisms that already exist, such as genetically engineered crops, animals and vaccines. Before going any further however, it is important to note that these proposed "*new life forms*" or "*synthetic life*" would not be created "*ex nihilo*", (only God can do that), but out of already existing material grown in laboratory conditions.

The project was sponsored by J. Craig Venter of Celera Genomics in Rockville, MD. Venter, part scientist, part entrepreneur and part showman, is best known at the moment for his challenge to the National Institute of Health (NIH) for a quicker method of decoding of the human genome (Wade, N., May 19, 1999). Venter knows the importance of public relations and anticipated the questions and fears that such an experiment would generate. Some of the protesters at the 1999 World Trade

Organization (WTO) conference in Seattle give evidence to the specter of Frankenstein already present in the minds of many people regarding genetic engineering. Venter and the ethics committee were very much aware of these concerns. The project would also provide another opportunity to garner headlines, such as the one atop this essay, that would promote Venter's parent biotech company, the Institute for Genomic Research (TIGR). Venter knows that for technology to succeed, public acceptance is paramount (Pool, R., 1997).

To give ethics and public relations a jump on this developing technology, Venter engaged Dr. Arthur Caplan, director of the Center for Bioethics at the University of Pennsylvania. He gave Caplan an unrestricted grant to provide a published paper as to whether or not the creation of new, free living life forms would violate fundamental moral precepts or ethical boundaries. The scientists from Venter's company explained that their initial step would be to break down the parasite *Mycoplasma genitalium*, the smallest known genome with 470 genes, by knocking out genes to determine which ones were necessary for life. Thus far scientists think the number to be between 265-350 genes, but more work is necessary. Once this knockout of non-essential genes is completed the scientists will attempt to synthesize or string the necessary genes together one by one with the hope that they will reach the tipping point where one gene would turn non-living chemicals into life itself.

Along with the ethical, environmental and social concerns was the issue of religion. Are we "playing God?" Do we have a right to tamper with creation (nature)? Could this experiment and technology bolster a radical Darwinistic reductionism as Venter himself dramatically alluded to, with the statement "*If this experiment works it will put you guys (religion) out of business*", while staring directly at me. Could this synthetic life pose a threat or question the moral status of the human person? Venter here echoed the thoughts of many biologists who see an unbroken evolutionary continuum from the first single-cell organisms to people. Dr. Clyde A. Hutchinson, a microbiologist at the University of North Carolina in Chapel Hill, who is also working on the TIGR *Minimal Genome Project* and the lead author of the *Science* article, was quite honest when he met with the group in stating his belief that life can be explained from a reductionist point of view (Wade, N., Dec. 14, 1999). I quickly shot back at Venter's quip that evolution itself was not a problem for Roman Catholics but reductionism is. As a matter of fact, I said, "Pope John Paul II himself recognizes evolution to be a viable theory. What Catholic belief does hold, however, is that God created '*ex nihilo*' (from nothing) the matter of the universe and designed the environment conducive to building higher orders of organization of chemicals of which organisms are composed with the

pinnacle of creation being humankind. For us life is not just DNA." I believe that it is in just such an exchange that the real debate between science and religion is unveiled to be cultural in nature. The question then of "What is Life?" must be defined in several ways according to the context of the question. Nevertheless the prevailing regard for what we determine to be life does have far-reaching social consequences.

These religious issues and moral questions were left to the theologians to wrestle with. A rabbi, three Protestants, and me representing the Catholic input, formed a subcommittee to discuss these concerns. What follows is my report to the committee. Our combined thoughts will appear in a separately published article. Although our conclusions were the same, our approaches were different. Nevertheless, the exercise helped us to deepen our appreciation for life and the complexity that the new world of biogenetics is presenting the 21st century. Far from eliminating religion, the questions proposed and our subcommittee response will show that religion must and will remain a major player in the field for the good of the human race.

The following is the presentation I made for the Catholic point of view.

A Holistic Starting Point

For Roman Catholics, any discussion of the ethical implications in the creation of so-called synthetic life¹ forms can only take place within the context of a holistic worldview that places humans at its central point of reference (Congregation for the Doctrine of the Faith, 1987, #2). With this in mind, the question of what constitutes a life would give a false start to the present discussion and dead-end it in a quagmire of values relative to the various disciplines and philosophies seeking hegemony in the formation of public opinion. The debate would, in fact, be akin to the conundrum of "*whence personhood*" that lies at the heart of the abortion controversy (Shannon, T.A., Wolter, A.B., 1990, p. 623). For Catholics, the biological moment of fertilization is deemed constitutive of human life (Pontifical Academy for Life, 1997, pp. 662-63). Yet, it is clearly recognized that this could be deemed as reductionistically naïve as any positivist definition since, of itself, it fails to consider the rich panoply of experience and relationship that are constitutive of the human person. We, therefore, are left with speculation that has to have its common grounding in scientific knowledge and religious wisdom both of which have legitimacy only insofar as they serve and promote what is good for humanity. It is only when there is a sense of sacredness, and I do not mean in the "*doctrinally religious sense*," of the awesome and ultimate stature of man in an

anthropocally-structured world that we can begin to choose technologies for human well being (Klein, J., 1997, pp. 3-4). This sense of sacredness speaks to the post-Enlightenment mentality of a generation respectful of technology but increasingly skeptical that it holds all the answers. To this end, in reaction to reductionism, a growing number of scientists called theoretical biologists have developed a more holistic approach to the question of "What is life?" "*Holists believe that the whole is greater than the sum of its parts; even if you know all the properties of each part, you will still not understand the whole because something is missing.*" They further believe that life is not just a commodity but has an intrinsic value, having worth in and of themselves (i.e., organisms), like works of art (Blakeslee, S., 1997, p. C8).

Subhuman Life

As a part of this question of the ethical implications of creating synthetic life, the study and treatment of subhuman life is extremely valuable to the present discussion. Man's dominion over creation has always been a strong precept of the Judeo-Christian tradition (*Gen. 1:26*). This trajectory "defines humans as co-creators or participants with God in the continual unfolding of the process and patterns of creation . . . All material reality is simply plastic to be used, dominated and ultimately shaped by human freedom" (Walter, J.J., 1997, p. 46-47). Nevertheless, because of the interconnectedness of the ecosystem, the Church promotes respect for all levels of life since it envelopes and serves the human person (O'Connor, 1997). The Church therefore recommends that we should refrain from arbitrary alterations of other animal species and challenges science to be socially responsible with goals that are worthy and aimed only at helping people (Sgreccia, E., 1997). With this base, it would seem that technologies that theoretically move beyond the natural to the artificial would not in themselves be prohibited as long as they guard against any detriment to human well being. As a matter of fact, the Church approvingly notes the advances brought about by biotechnology for the human good, in food production, husbandry, and the potential for immunization through genetically engineered vegetables that will save the lives of millions of people (Thavis, J., 1999).

Some of the criteria for this evaluation have already begun by reflecting on "*Diamond v. Chakrabarty*" which discussed the patentability of genetically engineered oil-eating bacterium "which was not nature's handiwork, but his (*Chakrabarty's*) own" and was thus judged eligible for U.S. Patent Rights according to the Court (Krueger, K.C., 1981, p. 162). In response to the case's ethical implications the United States Catholic

Conference, The National Council of Churches, and the Synagogue Council of America jointly issued a tacit approval for genetically engineered life forms with strong caveats:

New forms of life may have dramatic potential for improving human life, whether by curing disease, correcting genetic deficiencies, or swallowing oil slicks. They may, however, have unforeseen ramifications, and at times the cure may be worse than the original problem. . . . We may not be able to recall a new life form . . . life forms reproduce and grow on their own and then would be harder to curtail. . . . Therefore, when the products are new life forms, shouldn't there be a broader criteria than profit for determining their use and distribution? Given our responsibilities to God and our fellow human beings, do we have the right to let experimentation and ownership of new life forms move ahead without public regulation? (Kelly, T., Randall, C., Mendelbaum, B., 1980, pp. 98-99).

The report, therefore, urged an examination of the entire spectrum of the issues involved by individuals and groups who represent the public in the long-term interest of all humanity. To proceed with less input, if and when this technology becomes available, could lead to crimes against humanity. Therefore, a regulatory committee group is necessary for an ongoing dialogue in search of the "good" for humanity.

A Caveat

Perhaps these reflections can be best summed up by Pope John Paul II, when on October 29, 1983, he stated: "First prevent any damage, then seek and pursue the good," (John Paul II, 1983, p. 388). This also seems to be the principle criteria of both secular and religious thinkers in the National Bioethics Advisory Commission's recommendation for a five-year ban on cloning (Childress, J.F., 1997).

Since it is impossible to consider organisms in isolation, biotechnology can affect the well being of humanity now and in the future generations (Pool, R., 1997). Therefore, those actions which would threaten or change the nature of our humanity must be avoided (Seibert, M.A., 1991). Pope John Paul II reminds us that there is an order to the universe which we have an obligation to preserve (John Paul II, 1989). "The safety of our complex ecosystem demands that we keep our technological genius under control. We must say no to the Faustian bargain" (Pool, R., 1997, p. 258). In October, 1999, the members of the Pontifical Academy for life presented two volumes of documents on ethics

and genetic technology. Speaking for the group, Bishop Elio Sgreccia, vice president of the Academy said, "We give a prudent 'yes' to genetic engineering. We cannot agree with the position of some groups that say it is against the will of God to meddle with the genetic makeup of plants and animals. . . though the risks should be carefully followed through openness, analysis and controls" (Thavis, J., 1999, p. 7).

The main factor then seems to be whether we will be able to handle the risks that synthetic life may pose. The first and obvious factor regarding the production of synthetic life is whether we will be able to handle any physical risks it may pose. A second and perhaps more important concern is the psychological effect that its proposal and possible subsequent production will have on humankind's self-understanding. Extreme vigilance must be taken here lest, by stealth or confusion, life's definition becomes diminished, lending credence to a radical post-modernist perspective making all life equal or relative and thereby deny the unique worth of the human variety. This would be the ultimate crime against the Creator.

Choose Life

Technology, in a marvelous way, has advanced the cause of the human good in providing medicines, therapies, food, communication, information, etc. . . that provide for better health, longer life, and leisure that allow for a better quality of life, recreation, study and time for higher pursuits that have ennobled humankind. No doubt biotechnology guided by ethics has the power to help billions of people all over the earth (Lewis, P., 1997). For example, genetically engineered bacteria today produce virtually all insulin for diabetics while genetically altered crops have enhanced yield and plant survivability that will enable the feeding of the world's six billion people. Synthetic life can, if it is ever possible to create it as such, be another positive step to enhance the human evolutionary process to know and dominate matter. We are the ultimate moral determinant of synthetic life: how we use it, limit its risks, and how it affects our overall respect for the mystery of human life and destiny. Before us we have a blessing and a curse. In itself the creation of synthetic life is ethically neutral. For us, however, the precept that we must follow comes from Moses when he tells the Israelites, "Choose Life!" (Deut. 30:19).

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