A Jewish Approach to Technology in Medicine

Daniel Eisenberg, MD

Medical milestone or privacy invasion? A tiny computer chip approved yesterday for implantation in a patient's arm can speed vital information about a patient's medical history to doctors and hospitals. But critics warn that it could open new ways to imperil the confidentiality of medical records.[1]

Many observant Jews do not operate lights, computers, mobile phones, or other electrical appliances from sundown on Friday until three stars appear in the night sky on Saturday. They abstain from these activities because, over the last century, rabbinic authorities have compared electricity use to various forms of work prohibited on the Sabbath by the Bible and post-biblical rabbinic literature, including lighting a fire and building. The difficulty of interpreting the Bible's original intent and applying it to modern technology has rendered electricity use on the Sabbath one of the more contentious topics in Jewish law.[2]

Between 1811 and 1817, an anti-technology social movement spread rapidly through England. Dubbed the Luddites, after Ned Ludd, a possibly mythical English worker who had supposedly destroyed weaving machinery in the late 1700s, the movement advocated destroying the laborsaving machines created by the industrial revolution. In particular, they attacked wool and cotton mills. Following a tradition of destroying new machines, particularly in the textile industry, their goal was to fend off the new technologies that were threatening the established way that tradesmen practiced their crafts. They believed that these modern machines would decrease employment opportunities and lower wages because they could be operated by cheaper, unskilled laborers, instead of skilled textile workers. The movement became so disruptive that "machine breaking" was made a capital crime in England, and seventeen men were executed as a result of industrial sabotage in 1813. Many others were exiled to Australia. Pitched battles were fought between the British army and the Luddites. At one point, there were more British troops fighting against the Luddites in England than against Napoleon Bonaparte on the Iberian Peninsula. While the movement had an underlying economic motivation, the term Luddite has come to mean one who opposes industrialization, technology and technological advances.[3]

From cloned sheep to implantable chips in human beings, technology advances at a dizzying pace, bringing with it new ethical problems each day. Are we moving too fast through uncharted territory? Is there a grain of truth to the Luddite position? How do we judge the morality of new procedures and new technologies?

While technology brings opportunity, it also brings change that is not always comfortable. It displaces workers, alters society, and changes the basic fabric of our everyday life. Advances in travel over the past century have led to the displacement

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1 "Implantable chip OK'd for medical use" by Diedra Henderson (*AP*), October 15, 2004.

2 Uri Friedman, "People of the E-Book? Observant Jews Struggle with Sabbath in a Digital Age", *The Atlantic Wire*, December 21, 2010: http://www.theatlantic.com/technology/archive/2010/12/people-of-the-e-book-observant-jews-struggle-with-sabbath-in-a-digital-age/68289/#.

3 See Sale, K., *Rebels Against the Future: the Luddites and Their War on the Industrial Revolution: Lessons for the Computer Age*, Perseus Publishing, 1995.

of whole communities and the dispersion of families, with families no longer living as single units, and family members potentially living thousands of miles apart. Advances in communication have created a world that is much smaller, with information available around the globe in moments. But, the same technology has also deprived us of our privacy, with ubiquitous pagers, cell phones, and email making us always accessible. The technology that plays such a pivotal role in our everyday life has not just changed our society and our way of life, but has had a marked impact on our religious practice.

For instance, scientific advances have impacted our celebration of Shabbat, our practice of *kashrut*, our prayer, and have raised fundamental questions about reproduction and, with the development of genetic manipulation, even the definition of who is human. While many modern technological conveniences have made hot food on Shabbat easier to prepare, the ubiquitous presence of motion detectors on our alarm systems and lights, as well as electric eyes on doors, has made the avoidance of *melachah* more challenging.[4] Even the most basic Shabbat comfort, reading a book, has been complicated by the slow transition of print media to the internet and digital devices, with e-books expected to slowly replace books and magazines in the coming decades.[5] Innovations in food preparation have allowed the production of a huge variety of mass-produced kosher products and the Internet has placed information regarding the kosher status of products at our fingertips. However, the complex nature of modern food production has raised a multitude of *halachic* questions as to the true nature and origin of food ingredients which may come from anywhere in the world and may be derived from synthetic, animal, or plant materials.[6] While the time for prayer was once a simple issue of watching the sun rise and set, modern modes of transportation have raised the question of when to pray during air travel or in outer space and when to end a fast when one can travel thousands of miles in hours.

Technology is morally neutral, but must be applied properly

How does the Jewish tradition approach technology, particularly when it impacts on the practice of *mitzvot*? Judaism approaches scientific advance as an amoral process, that is, devoid of intrinsic moral character. It has no philosophical objection to the use of technology for constructive purposes. As a rule, Judaism does not invoke objections such as tampering with nature in areas of scientific endeavor unless the application of the technology has ethical shortcomings. Nevertheless, some technical advances raise purely technical questions while others appear to have intrinsically moral components. For instance, the permissibility of using an electrical appliance timer on Shabbat is a technical question related to the function of the timer with respect to the categories of forbidden Shabbat labors. But, the timer itself poses no intrinsic moral question. That is, no one would ask whether electrical appliance timers are "moral."

However, technologies such as cloning appear to raise questions beyond mere technicalities of Jewish law. There are certainly *halachic* questions that are raised by all forms of modern reproductive technologies and technical *halachic* hurdles that must be overcome to permit in vitro fertilization and cloning. But, as we shall discuss, the more fundamental question that such a procedure raises is whether it is "moral" to perform it in the first place.

Man's role in creation

[4] There are 39 main categories of activities that are forbidden to be performed on Shabbat. An action that falls under the rubric of one of these categories is called a *melachah*.

[5] See note 2 *supra*.

[6] Take for example, glycerin, a syrupy sweet liquid that is found in many food and pharmaceutical products. Glycerin is a polyol that may be derived from natural sources, either animal or vegetable, and can also be produced synthetically. This is a very kosher sensitive ingredient because there is no discernable difference between the animal, vegetable or synthetic versions. Glycerin requires reliable kosher certification. (www.star-k.org/kashrus/kk-palate-secretingredient.htm)

To understand the traditional Jewish approach to technology, we must first assess the Torah's view of the role of humanity in the world. What is our place in the greater creation? The beginning of the Torah describes the creation of man and woman, telling us that "God blessed them and God said to them: 'Be fruitful and multiply, fill the earth and subdue it; rule over the fish of the sea, the bird of the sky, and every living thing that moves on the earth.'"[7] Man was created with a mission – to rule over the world and to subdue it. Traditionally, this has been interpreted to mean that we are charged to understand our world in order to master our environment. We are commanded to build bridges and to move mountains in order to improve our quality of life. There are even specific passages in the Torah that command us to heal, giving us a mandate to pursue technology that will heal the sick.[8]

The world is a gift from God to man for him to mold and shape, but most importantly, to improve. Man is instructed to emulate God. When the Torah states: "And God created man in His image, and in the image of God He created him" it teaches us that man was fashioned to be a creator, just as God is a creator.[9]

We take this mandate to create very seriously. It is a mistaken form of religiosity to believe that man should not try to innovate. While one may posit that it is not the role of man to improve his lot by manipulating his surroundings, mainstream Judaism does not support such an assertion. For instance, some have asserted from a theological perspective that it is their belief that God alone should decide who conceives and who does not and that if their genetic material is meant to be passed along to another individual, it will happen in the natural manner. A credible response would be that God certainly does decide who will conceive, but what is the basis for asserting that allowing man to perfect in vitro fertilization (IVF) is not one of the ways that He utilizes to provide couples with a family? While one is free to assert that one will only have children if one can do so in the usual way, one certainly should not presume to apply such a concept to others who wish to have families.[10] Despite differing rulings as to the practical permissibility of IVF, there is no intrinsic *halachic* objection to IVF or genetic engineering procedures for treatment of infertility. For the major decisors of Jewish law who permit IVF, there is no issue of circumventing God's will.[11] If there is no inherent biblical or rabbinic prohibition in performing an act that will benefit people, then we fully support it.

Does the Torah limit the application of technology?

If the Torah has no opinion on the use of technology to improve the world, what of apparent Biblical prohibitions barring technical improvements of plants and animals?[12] The Torah appears to prohibit changing of the "natural" order of things via grafting of trees and crossbreeding of animals. These prohibitions would appear to limit modern scientific attempts to improve the food supply via insertion of genes from other species, to treat and heal disease by having virus vectors deliver healthy genes into the genome of defective cells via generic engineering, and to create chimeras (animals composed of tissues of

[7] Genesis 1:28.
[8] Exodus 21:18-19 and Deuteronomy 22:1-2.
[9] Rabbi Chaim of Volozhin, *Sefer Nefesh HaChaim*, *Sha'ar Alef.*

[10] There is no obligation to undergo in vitro fertilization, but those who do so usually desire to have children if at all possible, regardless of whether they are required to do so.
[11] Not all *poskim* permit in vitro fertilization, but not because of a fear of circumventing God's will. Rather there are technical *halachic* issues involved with IVF which they find to be problematic. Most of the objections involve the prohibition of "wasting seed" and a lack of perceived strict oversight of the procedure. Additionally, there is disagreement whether the genetic father has fulfilled his obligation of procreation. For several reasons, Rabbi Waldenberg forbids IVF (*Tzitz Eliezer* 15:45). On the other hand, Rabbi Nebenzahl (*Assia* 34, *Tishrei* 5743), Rabbi Ovadia Yosef (*Yabbia Omer* Vol. 8, *Even Ha'Ezer* 21), and Rabbi Eliashiv allow IVF under certain circumstances (such as when other options have been exhausted and there is strict supervision of the process). See *English Nishmat Avraham*, Vol. 3, p.15 (*Even He'Ezer* 1:6).
[12] Leviticus 19:19: "You shall keep my statutes. You shall not let your cattle mate with another species; you shall not sow your field with mingled seed; neither shall a garment mingled of linen and woolen come upon you."

combined genetic composition) in general.[13] The creation of chimeras appears to present a particular problem as such technology represents the merging of distinct species.

To fully evaluate this difficulty, it is important to distinguish between the practical question of whether the Torah is teaching that certain technology is intrinsically problematic, or whether it limits what applications are permissible. While there is virtual unanimity of opinion regarding the permissibility of using technology, there are differences regarding what outcomes are problematic. We can see these differences through the approaches of Rabbi Shabtai Rappaport and Lord Rabbi Immanuel Jakobovits to some modern technological issues.

In an article entitled "Genetic Engineering: Technology, Creation, and Interference," Rabbi Rappaport deals with the issue of manipulating human genes to improve health and cure disease by replacing certain mutant genes with normal copies, thereby removing recessively inherited diseases.[14] He asks:

> When man takes upon himself to become a creator, does he not transgress his limitation and expose the whole world to untold dangers? Should not an organism created by God be viewed as an entity rather than a composition of genes that can be manipulated? Because our understanding of the organism as an entity is lacking, manipulating genes may create unpredictable monsters that could cause great harm to humanity and to the environment.

Rabbi Rappaport first deals with the technical questions. He points out that Nachmanides (Ramban) considers grafting and cross-breeding to be prohibited by the Torah because "[t]he person who breeds two dissimilar organisms together adulterates the creation; it is as if he was stating that God did not consummate His task, and he is helping the creation by adding a new species."[15] It would appear that such an approach precludes the merging of genetic material from different species via genetic engineering. But, Rabbi Rappaport explains that a closer look proves otherwise. Despite the theoretical explanation of Nachmanides, the accepted *halachic* ruling of Rabbi Avraham Yishayahu Karelitz (Chazon Ish) is that "artificial insemination to generate a hybrid is indeed permitted because the prohibition to 'let your cattle gender with a diverse kind' applies only to sexual contact between living animals."[16] The apparent contradiction between the Ramban and the Chazon Ish is resolved by explaining that while man may not use nature to create a new species (i.e. crossbreeding), he may use his own technology to alter species.

Rabbi Rappaport concludes the first part of his argument by asserting that genetic manipulation is as permissible as artificial insemination.[17] He argues that the "*halachic* viewpoint is that the more advanced the technology, the more reason there is to permit it. Any consideration of an organism being an unchangeable entity has no basis in *halacha*".

He then turns to the ethics of utilizing the new technology of genetic engineering. Regarding the question of whether we must worry about the unforeseen consequences of "meddling" in creation, he admits that there is risk, but that if one functions within the parameters of the Torah, one

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13 A chimera is a single animal or plant with genetically distinct cells or tissues from at least two different species. See Loike, J.D. and Tendler, M.D., "Ethical Dilemmas in Stem Cell Research: Human-Animal Chimeras", *Tradition*, 40:20-50, 2007. Also see Steinberg A, Loike JD, "Human cloning", In: M Halperin, D Fink, and S Glick editors. *Jewish Medical Ethics* Vol 1. Jerusalem: The Schlesinger Institute; 2004. p. 192-209.

14 Rabbi Shabtai A. Rappaport, *ASSIA – Jewish Medical Ethics*, Vol. III, No. 1, January 1997, pp. 3-4

15 *Ramban al Hatorah*, Leviticus 19:19

16 *Chazon Ish Kilayim* 2:16

17 For a discussion of the permissibility of artificial insemination from the husband (AIH), see *English Nishmat Avraham*, Vol. 3, pp.7-12 (*Even He'Ezer* 1:6).

need not fear unintended outcomes.[18] Rabbi Rappaport is adamant that:

> Any new technology should be approached with care and practiced under protected conditions. However, we should not fear unforeseeable risks. God watches over the world and over man. It is man's duty to obey His orders regarding safety.

In the end, Rabbi Rappaport takes a very pro-technology stance, insisting that "[m]an should never believe any deficiency or malady to be unchangeable, but he should try to remedy it under the explicit license of God". Rabbi Rappaport not only sees no problem with technology itself, but advances a broad view of the permissibility of its practical application.

On the other hand, Rabbi Immanuel Jakobovits, former Chief Rabbi of Great Britain and considered to be the "father" of Jewish medical ethics, makes a sharper distinction between the technology itself and the intended application. Rabbi Jakobovits raises no objection to any technological advance that can promote health, but he draws a very firm line on "improving" nature and any acts which undermine the moral foundations of creation. In describing the Jewish attitude toward genetic engineering in 1970, he states:

> "Spare-part surgery" and "genetic engineering" may open a wonderful chapter in the history of healing. But without prior agreement on restraints, and the strictest limitations, such mechanization of human life may also herald irretrievable disaster resulting from man's encroachment upon nature's preserves, from assessing human beings by incubators, and from replacing the matchless dignity of the human personality by test tubes, syringes and the soulless artificiality of computerized numbers.[19]

In 1981, reflecting on the recent birth of the first "test tube" baby born via IVF, Rabbi Jakobovits returned to the topic of technology radically changing nature and again pinpointed his objection to the use of technology to "improve" nature and undermine the moral fabric of society. He pointed out the divergent responses of the two Israeli Chief Rabbis to the birth of the first "test-tube baby" in England in July of 1978 utilizing the new technology of in vitro fertilization. While the *Sephardi* Chief Rabbi, Ovadia Yosef, had given qualified approval, the Ashkenazi Chief Rabbi, Shlomo Goren, "viewed the procedure as morally repugnant because it undermined the entire basis of family life and marital relations".[20]

At that time, genetic engineering was a fairly new concept and little had been written on the topic in *halachic* literature. Rabbi Jakobovits wrote:

> To my knowledge, no rabbinic rulings on genetic engineering in its wider implications have so far been given and published. However, from a study of the relevant sources and precedents in rabbinic writings, it would appear to me that the following considerations and conclusions may be tentatively stated:

[18] For instance, while the Torah commands the building of a parapet around a roof (Deuteronomy 22:8) that would protect the average man from falling and requires the taking of all reasonable precautions in general (Maimonides, Laws of Murder, ch. 11, par. 3-5), it does not forbid the building of the house, nor climbing on a protected roof, despite the fact there remains a risk of falling.

[19] Jakobovits, I., *Jewish Medical Ethics*, Bloch Publishing Co., NY, 1975, p. 266.

[20] Jakobovits, I., "Some Modern Responsa on Genetic Engineering", *ASSIA – Jewish Medical Ethics*, Vol. I, No. 1, May 1988, pp. 10-11, reprinted in M Halperin, D Fink, and S Glick editors. *Jewish Medical Ethics* Vol 1. Jerusalem: The Schlesinger Institute; 2004. p. 171-173. Nevertheless, Rabbi Goren did assert that IVF is halachically unobjectionable. See Rosner, F., Test Tube Babies, Host Mothers and Genetic Engineering in Judaism, *Tradition*, 19(2), Summer 1981, Rabbinical Council of America. See also, Halperin, M., "In-Vitro Fertilization (IVF), Insemination and Egg-Donation", *ASSIA – Jewish Medical Ethics*, Vol. I, No. 1, May 1988, pp. 25-30.

> …The line between what is morally permissible and morally repugnant, it seems to me, would have to be drawn between "correcting" and "improving" nature, i.e. between therapeutic and eugenic objectives.

Rabbi Jakobovits makes a clear distinction between the manipulation of nature that is aimed at healing illness or defects (which is clearly permitted and possibly mandated by the Torah) and "improving" on God's creation:

> The Creator has conferred on man the right, indeed the duty, to "interfere" with the norms of nature for the preservation of human life and health. Thus man may resort to artificial irrigation and fertilization to avert the scourge of famine as he may apply medical or surgical skills to repair or avoid the ravages of disease. There is in principle no difference in kind between such recourse to medicine or surgery and the application of human ingenuity to the prevention, cure or treatment of disease through "genetic engineering."
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> But no such Divine sanction exists to warrant man's attempt to improve the designs of Providence by artificially breeding a "superior" species of man. (The breeding of animals or plants to improve human nutrition may be in an entirely different category, since this could be subsumed under the permitted heading of aiding man in the struggle against hunger and disease.) Eugenic considerations are perfectly legitimate in the choice of marital partner affecting the normal generation of human life, but they do not justify the manipulation of human life and its constituents in contravention of the natural order as predetermined in the scheme of creation.

It becomes clear from the juxtaposition of the approaches of these two scholars that while technology itself is morally neutral, there are differences of opinion with respect to how far we may go in applying that technology to altering the creation.

With power comes responsibility

To better understand Rabbi Jakobovits's approach, it is important to recognize that the mandate to manipulate the environment discussed above comes with a sense of responsibility. Man is given a twofold mandate. While he is instructed "to subdue" the earth and to "rule over" the rest of creation, he is also placed in the Garden of Eden "to work it and protect it".[21] While he was granted permission to exploit and utilize all of the world's natural resources,[22] he is still clearly barred from acts of indiscriminate destruction and waste.[23] Man is enjoined to protect the world and not harm it. In Kohelet Rabba, a *midrashic* commentary on the Bible, there is a very touching story which resonates to this day. [24] The *Midrash* writes:

> At the time that God created Adam, the first man, he lifted him up and showed him all of the trees of the Garden of Eden. And He said to him: 'See My creations, how beautiful and praiseworthy they are. And I have created all of it for your sake. Contemplate this and be watchful that you do not damage or destroy My world. For if you damage it, there will be no one else to repair it after you.'

Would the world be better off without the intervention of people?

There are those, like the Luddites, and proponents of the back-to-the-land movement, who have taken a more negative view of man's

[21] Genesis 2:15.
[22] Genesis 1:28.
[23] Deuteronomy 20:19-20, *Sefer HaChinuch*, Mitzvah 529
[24] *Kohelet Rabba* 7:28.

manipulation of his environment.[25] They claim that the world would be better off in a more "natural" state. This is exactly the argument made by the Roman general Turnus Rufus, in his debates with Rabbi Akiva.[26] He asked Rabbi Akiva why Jews circumcise their sons. Do Jews believe that they can improve upon God's creation of man? Rabbi Akiva placed grain and bread before the general and asked him which one he would prefer to eat. The general made the obvious choice and took the bread, which clearly represented man's improvement on nature. Just as baking bread is an act of improving wheat, so is circumcision an act of improving man. The moral of the story is that our mandate is to improve the world. Judaism does not consider the world to be complete without the input of man. We are God's partners in creation in all aspects of the world, including technology.

The role of man in perfecting the world extends beyond just physical change. We are commanded to improve the spiritual state of the world as well. Again we turn to Turnus Rufus and Rabbi Akiva.[27] The general asked Rabbi Akiva, if God loves the poor people so much, why does He not support them Himself? Rabbi Akiva answered that God wishes to allow human beings to be partners in the spiritual creation of the world and thereby earn merit for themselves by giving charity.

Despite the argument of Rabbi Akiva, one might think that the Torah itself limits the development of technology. For instance, Eve was told that all women will have pain at childbirth. Does this punishment preclude the use of epidural injections of pain medication to relieve birth pangs? While some nineteenth century Christian theologians condemned the use of chloroform for relieving the pain of childbirth, the curse of pain in childbirth is approached by Judaism more as a challenge for us to overcome than a requirement to withstand pain that can be alleviated. Judaism supports the development of pain relief methods, and Jewish law permits epidural injections of pain medication to relieve labor pains.

While man is cursed with the introduction of death soon after creation, he is nevertheless commanded to triumph over death, and strive for life.[28] While philosophically, God is the source of all illness, He nevertheless commands us to heal.[29]

The mixed blessing of technology

Despite the great promise of technology, we must keep in mind the repercussions of technology on our fellow man. We must recognize that the long-term benefits of technology have always outweighed the long-term harm, yet we should also acknowledge that innovation may bring short-term economic strife to groups of people displaced by the new technology. While automated toll machines may be efficient, until the human toll-taker finds another job, he will remain unemployed. We must be prepared to deal with the short-range fallout from scientific advances before the benefits accrue.

We must also use technology for noble purposes. Let us take a deeper look at the Jewish approach to technology as it appears in the beginning of the Torah. The creation story introduces a world of vast untapped resources, awaiting the creation of man to unlock their potential.[30] With the advent of man comes the immediate explosion of technology as man begins to farm and raise livestock.[31] By the eighth generation, man had developed nomadic shepherding, invented musical instruments, and

[25] http://cr.middlebury.edu/es/altenergylife/definition.htm: "Back-to-the-landers chose to be at nature's mercy and to live with the inconveniences that this may entail. By using solar or wind power and other environmentally benign forms of energy, for example, they were trading convenience for a life that fit their moral values".

[26] Midrash Tanchuma, *Tazriah* 19.

[27] *Bava Batra* 10a.

[28] Exodus 21:18-19, Leviticus 18:5.

[29] See Eisenberg DA, "The mandate to heal", aish.com, December 15, 2002 (http://www.aish.com/ci/be/48881967.html).

[30] Genesis 2:5: "now any tree of the field was not yet on the earth and any herb of the field had not yet sprouted, for God had not sent rain upon the earth and there was no man to work the soil." Rashi explains: "And what is the reason that He had not sent rain? Because 'there was no man to work the soil,' and there was none who could recognize the goodness of rains. When Adam came and realized that rains are a necessity for the world, he prayed for them and they came down, and the trees and types of vegetation sprouted."

[31] Genesis 4:2. Cain was a shepherd and Abel was a farmer.

fashioned metal tools.[32] But Rashi, the eleventh century Torah commentator, explains that Jabal, "the father of those who dwell in a tent," built houses of idol worship, Jubal invented the harp and flute "to play music for idolatry, and Tubal-Cain invented tools of copper and iron to be used as weapons by murderers.[33] We see that soon after the introduction of technology, the world became corrupt and would be destroyed by a flood.[34]

This progression of events is not meant to be a warning regarding the evils of technology. It is meant as a warning regarding corruption in the application of scientific progress. The flood is not a consequence of the new technology – it is a response to the corruption of mankind. The Torah describes that the world had become corrupt and full of robbery and violence. It was the degeneration of man's interaction with his fellow man that led to the destruction of the world.

It is the immoral application of technology that is "off limits" to us. The development of technology has always been welcomed by Judaism because technology is ethically neutral. Questions of ethics are questions of applied technology. When Cain brings a sacrifice from inferior produce and his sacrifice is rejected, he is warned that man has free will to do with his gifts as he sees fit. God's only requirement is that man use his gifts wisely and appropriately.[35] Man's job is to decide when it is moral to use the new procedure and when restraint should be applied. Our greatest challenge is applying the fruits of our God-given inquisitive nature in an ethical way. Every new breakthrough offers both hope and danger. Nuclear power can fuel our need for energy, but has the potential for destruction in the form of bombs. Radiation can diagnose disease, but can also destroy cities.

Practical Applications: Is medicine different?

Medicine is no different. Daily advances in biotechnology offer hope for so many. People live longer than ever before, and vaccinations and antibiotics have turned infectious disease into an inconvenience, rather than a scourge. Smallpox has been eradicated. Measles, mumps, whooping cough, and polio are virtually memories. We have mastered the world and subdued disease, and Judaism applauds each medical breakthrough.

But not all medical technology is quite so unambiguously good. Let us reexamine the example of in vitro fertilization with preimplantation diagnosis to prevent genetic diseases.[36] After several cell divisions, a few cells may safely be removed for genetic screening. For a married couple, each carrying a gene mutation for Tay Sachs disease, pre-implantation diagnosis and implantation of only embryos without Tay-Sachs disease may be the only *halachically* acceptable way to have children born without a tragic fatal disease.[37]

Implanting only "healthy" embryos may be ethical when avoiding a tragedy such as Tay Sachs. But what of using the same technology to choose the sex of our children? Shall we implant only boys? Only girls? Shall we examine every embryo for a myriad of genetic flaws, including low intelligence (or average intelligence), poor eyesight, bowed knees, or brown eyes? The human genome project has sequenced the entire human genome and it has become clear that on average everyone are carriers of between five and 50 recessive gene mutations, many of which have the potential to cause disease in the next generation of

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[32] Genesis 4:20-22: "And Adah bore Jabal; he was the father of those who dwell in a tent and with livestock. (Rashi explains: "He (Jabal) was the first of those who graze animal in deserts, and he would dwell in tents, a month here and a month there, because of pasture for his flock.") The name of his brother was Jubal; he was the first of all who handle the harp and flute. And Zillah, too--she bore Tubal-Cain, sharpener of any shaper of copper and iron."

[33] *Midrash Bereshit Rabba* 23:3.

[34] Genesis 6:5.

[35] Genesis 4:7, "Is it not true that if you do good, you will be forgiven? But if you not do good, at the entrance the sin crouches; its longing is toward you, yet you will rule over it".

[36] See "Stem Cell Research in Jewish Law": http://www.jlaw.com/Articles/stemcellres.html.

[37] It is important to recognize that the carrier a recessive mutation does not manifest the recessive disease. Only the offspring of a couple who each carry a gene mutation for the same recessively inherited disease and who each pass down a copy of the mutated gene to the offspring will manifest the recessive disease.

offspring. Will the perceived need to test for the presence of these rare mutations create an excuse to "design" our children according to our own specifications, or will we resist the urge to utilize preimplantation diagnosis and genetic engineering for frivolous purposes?

The *poskim*[38] have enunciated the rule that all technology, including assisted reproduction, must be used within certain ethical parameters. IVF is almost never appropriate except for a married couple, using only the couple's egg and sperm. With respect to choosing the characteristics of offspring, the same issues apply. The use of reproductive technologies is permitted so long as they do not contravene any other *mitzvot*. For example, Rabbi Shlomo Zalman Auerbach rules that artificial insemination is permitted even if a couple already has fulfilled the mitzvah of procreation with a boy and girl. However, they may not choose the sex of the baby by separating out the sperm containing the X or Y chromosome since they will be actively destroying the unused remainder. This is true even if by making such a selection, an additional mitzvah will be observed, such as a childless couple choosing a boy so that there might be a *Pidyon Haben*.[39] On the other hand, if the mother is a carrier of an X-linked disease, Rabbi Auerbach permits artificial insemination with female sex selection if the couple so desires.[40] We see from these rulings that it is not the intrinsic nature of the technology that determines *halachic* acceptability, but the rubric of positive and negative *mitzvot* that will either be fulfilled or violated.

Additionally, we must take into account the human suffering which technology may bring. While we usually associate more accurate information with increased and better choices, this is not always the case. Knowledge is only power when we can act upon the information that we are provided. What if the information only engenders fear without offering hope? For instance, we may now test people for the genes that cause multiple deadly diseases. But, if the disease for which one tests positive is not curable and if the test only represents a propensity for the disease, what positive information has the test provided? It may be better to postpone testing until technology has advanced to enable some practical remedy.

The power of restraint

We see that the Jewish view of technology is no different than its view of any other aspect of life. While we can perform almost miraculous technological feats, we look to the Torah for answers as to if and when we should perform these acts. In a world which has endless potential, we must decide how to channel our discoveries ethically, when to perform medical miracles, and when to restrain ourselves from applying the awesome power in our hands because it is simply not appropriate. We must use technology to subdue the world, but not to harm each other.

As the book of Ecclesiastes states: "Everything has a season, and there is a time for everything under the heaven".[41] Jews have traditionally turned to the Torah and our rabbis for guidance in determining the appropriate time to act and the appropriate time for restraint.

[38] A *posek* is a decisor of Jewish law.

[39] *Pidyon Haben* is the ritual redemption of a firstborn son performed 30 days after birth.

[40] Abraham, A. S. (2004). *Nishmat Avraham* (Vol. 3: *Evan Ha'Ezer* and *Choshen Mishpat*). Brooklyn, NY: Mesorah Publications. pp. 4-5.

[41] Ecclesiastes 3:1.