M. is the chief executive officer of a major investment company and is currently considering the purchase of a medium-sized biomedical company which specializes in molecular genetics and is considered by experts to be on the cutting edge of genetic manipulation. M. has never studied molecular biology, and this area is new to him.

According to a report, the company is on the verge of a major breakthrough. Several years ago the genes associated with dozens of genetic diseases were identified, such as fragile X syndrome, a known cause of hereditary mental retardation carried by females and affecting males. The biomedical company is perfecting a process to remove the faulty genes from cells taken from a blastula (an early embryonic form produced by cleavage of a fertilized ovum) produced as a result of in-vitro fertilization. These genes are replaced, and a culture of the resulting cells is micro-injected into the cavity of an intact blastula. These cells populate all the tissues of the developing embryo, which can be implanted in the mother’s womb, resulting in a healthy baby.

The report, accompanied by a well-argued cost analysis and prediction, was written by experts in science and technology. Besides being a shrewd businessman, M. possesses a keen sense for ethics. The project seems to have the potential for tremendous medical benefit. He knows of clans that were closely intermarried and whose children suffered from retardation. This process could remove, once and for all, the curse from these families.

The hereditary disease cystic fibrosis develops during early childhood and affects the exocrine glands, in turn affecting the pancreas, the respiratory system, and sweat glands. The disease is characterized by the production of abnormally viscous mucus by the affected glands, usually resulting in chronic respiratory infections.
and impaired pancreatic function. Introduction of the aforementioned medical process could render the ailment an episode of history. It could remove recessive genetic disorders and with them the concern of being a carrier. On the other hand it allows the doctor to appropriate vast power. God created the world, and perhaps man is not allowed to interfere with its basic structure.

One of the early developments of genetic engineering was the generation of the so-called chimeras, organisms in which DNA from distinct parent species is combined to produce an individual with a double chromosome complement, resulting in a new species. 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.

In Leviticus\(^1\) we read: “You shall keep my statutes. You shall not let your cattle gender with a diverse kind; you shall not sow your field with mingled seed; neither shall a garment mingled of linen and woolen come upon you.” The Jerusalem Talmud\(^2\) interprets “my statutes” as the statues of creation, rather than legal statutes.

Thus the opening sentence “keep my statutes” is the reason given for the prohibitions in this verse. Ramban expounds on this point:

The reason for this prohibition is that God created all species of the world and the plants and animals, and installed in them the power to reproduce so that these species would exist for as long as He wills the world to exist. He thus ordered that they reproduce with their own species only, as He ordered during creation that each species reproduce “after its kind.” The 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. Further, the living power of each

\(^1\) Leviticus 19:19.
\(^2\) Kilaim ch.1.
organism is rooted in heaven, as God said to Job, “Do you know the ordinances of heaven? Can you set the dominion thereof in the earth?” Hence, the person who breeds dissimilar organisms together impairs the ordinances of heaven.

A superficial study of this commentary may indicate that genetic manipulation is contrary to biblical law. A closer look, however, will prove otherwise. Ramban’s reasoning needs to be examined in view of the practical implementation of the halacha regarding the prohibition against crossbreeding dissimilar animals. It is an accepted ruling, as noted by the Chazon Ish, one of the leading Torah authorities of the twentieth century, 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.

How can this ruling be reconciled with Ramban’s commentary? Ramban’s reasoning applies only to God’s creation, to nature itself. God instilled in the animals the power to reproduce by sexual contact and ordered that they should do so only “after their kind.” But He also gave man the power to improve upon creation and develop technologies to attain such improvement. Man is not allowed to use nature to generate new species; doing so is an adulteration of nature. However, this prohibition does not apply to anything man does using his own technologies.

If artificial insemination is considered a human technology which is not governed by the “ordinances of heaven,” then this formula also applies to genetic manipulation. 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.

As to the danger of creating harmful monstrosities, man’s activity does create dangers.

We read: “When you build a new house, you shall make a battlement for your roof, so that you should not bring blood upon your house, if any man fall from there.” The Sages interpreted this verse as a general command to maintain a high level of safety. The

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3. Ibid. 38:33.
6. Ketubbot 41b.
act of building the new house itself is not forbidden; we are only commanded that reasonable safety measures be taken. Does a fence around the roof prevent any danger of falling? Of course not. A person may climb the fence, or lean over it and fall. Still, halacha directs us to build a wall around the roof at least one meter high, which will prevent people from accidentally walking off the roof. Furthermore, it has to be sturdy enough for the average man to lean on it without falling down.⁷

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 above case M. has no reason not to invest in the biomedical project. It might prove extremely beneficial as the eradication of genetic disorders would be a tremendous blessing to mankind. The creation is summed up in the following words: “And God blessed the seventh day, and sanctified it because on it He had rested from all His work which God created and made.”⁸ The actual Hebrew words read “which God created to make.” A well-known Hasidic interpretation of this is “which God created for man to make and improve upon.” Man should never believe any deficiency or malady to be unchangeable, but he should try to remedy it under the explicit license of God.

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⁷. Maimonides, Laws of Murder, ch. 11, par. 3-5.
⁸. Genesis 2:3.