GOLEMS IN THE BIOTECH CENTURY

by Byron L. Sherwin

Abstract. The legend of the golem, the creation of life through mystical and magical means, is the most famous postbiblical Jewish legend. After noting recent references to the golem legend in fiction, film, art, and scientific literature, I outline three stages of the development of the legend, including its relationship to the story of Frankenstein. I apply teachings about the golem in classical Jewish religious literature to implications of the legend for ethical issues relating to bioengineering, reproductive biotechnology, robotics, artificial intelligence, artificial life, and corporate ethics. The golem legend emerges as a source of prudent guidance through the minefield of ethical and spiritual problems emerging from current and expected developments in biotechnology.

Keywords: artificial life; biotechnology; cloning; corporations; DNA; Frankenstein; genetically modified food; golem; in vitro; robotics; stem cells

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The most famous and influential postbiblical Jewish legend is the legend of the golem, which tells of the creation of life through mystical and magical means. I believe that we are now living in what could be called the age of the golem. Today's golems take on shapes and forms different from those of golems in ages past, yet they are golems nonetheless. Golems now come in new forms—from that of a large multinational corporation with a GNP larger than that of most countries to a tiny embryonic stem cell or an atom created by recent developments in nanotechnology, from a personal computer to a literary or artistic work, from an ear of genetically modified corn to a large nation-state.

Since the first decades of the twentieth century, the golem has been the subject of novels, plays, poems, short stories, operas, films, and ballets. In

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recent decades, golems also have been featured in television programs, including *The X-Files*; comic books, including *Superman* and *Batman*; and children's games, including Pokemon and Dungeons and Dragons. University-based science projects and computer programs have been named after the golem, as have rock groups and European coffee houses. In Prague, sites identified with the golem are major European tourist attractions. Once familiar only to a small cadre of recondite Jewish scholars, once restricted to the domain of Jewish mystical literature and folklore, the golem has become somewhat of a celebrity—featured in Pulitzer Prize–winning novels such as Michael Chabon's *The Amazing Adventures of Kavalier and Clay* (2000) and as the name of the flagship of the twenty-fifth–century fleet of *Star Trek*'s Federation of Planets. The golem appears in a wide range of contemporary artistic genre; writers such as Isaac B. Singer and artists such as Christian Boltanski have even described the process of the creation of a golem as a metaphor for artistic expression itself. Sociologists of science Harry Collins and Trevor Pinch have depicted science and technology themselves as golems in their books *The Golem: What You Should Know about Science* (1998) and *The Golem at Large: What You Should Know about Technology* ([1998] 2002).

In 1964, one of the founders of cybernetics and computer science, Norbert Wiener, in his book *God and Golem, Inc.*, described the machine as "the modern counterpart of the golem." According to Wiener, the golem legend anticipated the problem of the relationship between humans and machines, which Wiener identified as one of the central challenges confronting contemporary human beings. Soon afterward, Gershom Scholem, the great scholar of Jewish mysticism, described the computer as a contemporary manifestation of the golem. Speaking at the installation of the first computer at the Weizmann Institute in Israel in 1965, Scholem named it "Golem One." In 1982, in a report called *Splicing Life*, a United States presidential commission compared developments in recombinant DNA to the creation of a golem.

With recent developments in bioengineering, reproductive biotechnology, computer science, bionics, robotics, artificial intelligence, artificial life, and related fields, the golem legend is being increasingly understood as a relevant and powerful metaphor for understanding and addressing the nature and the ethical and public policy implications of such developments. Classical and modern Jewish texts relating to the golem may therefore serve as a resource for theologians, philosophers, ethicists, and public policy makers dealing with the implications of these developments. In what follows I identify examples of how and why this is so, issues I discuss in greater detail in my book *Golems Among Us* (Sherwin 2004).

Before offering examples of the ethical implications of the golem legend vis-à-vis contemporary developments, I focus on two related issues: the historical development of the golem legend and the relationship of the golem legend to the story of Frankenstein.

There are three stages in the development of the golem legend. The first stage is in early rabbinic literature that was amplified in subsequent Jewish mystical, magical, and halakhic or Jewish legal texts from about the third to the eighteenth centuries. The golem is usually described as an anthropoid—an artificial creature in human form but devoid of a human soul, speech, and reproductive capabilities. Golems usually are depicted as having been created from inert matter such as dust or clay and animated through manipulations of Hebrew letters called, in Hebrew, *zerufei ha-otiyot,* often including the Tetragrammaton, the four-letter name of God. In this first stage, golems are seemingly created for no practical purpose other than to demonstrate the mystical skills of their creator. In some traditions, creating a golem is described as a profound experience of communion with the divine and participation in the mystery of creation. In this stage, golems remain passive, mute, and obedient. Their existence usually is brief. They are often destroyed soon after they are created.

Beginning in the eighteenth century, and extending into the early twentieth century, a second stage in the development of the legend becomes apparent. Building upon as well as incorporating precedents and texts of the initial stage, a number of new elements enter the golem saga. Initiating this second stage are formulations of the golem legend that coalesce first around the sixteenth-century rabbi Elijah of Helm and later around his contemporary, Rabbi Judah Loew, the Maharal of Prague. These formulations are expanded and embellished in Rabbi Yudel Rosenberg's 1909 book, *Nifla'ot Maharal*, which deftly combines classical texts with the author's own literary fabrications.

Three new features are introduced in this second phase. The first is that the golem is created for practical purposes, such as to be a manual servant or to protect the Jews from hostile attacks by their enemies. This golem is described as having extraordinary physical might. Second, a golem can run amok, not only providing protection but also bringing danger and destruction to the lives and property it was created to protect, including its own creator. Here we have the emergence of the theme, pertinent to our own times, that the very entities we create to help and protect us have the potential to harm and to destroy us—a theme found in much of modern science fiction literature and film. Third, though the golem can become a danger and a menace, it nonetheless always remains under the control of its creator. When it threatens danger or its power runs amok, its creator retains the ability to destroy or deactivate it.

In the third stage, which emerges around the middle of the twentieth century, the golem begins to be depicted in art, literature, and film—mostly by non-Jewish writers, artists, and filmmakers—as an uncontrollable malevolent creature that overpowers its creator and others whom it has been created to serve. No longer the obedient servant, the golem becomes a powerful master, a monster, whose creation portends inevitable tragedy

and destruction. Its destruction, while necessary, often remains elusive. An example of such a golem in contemporary popular culture is the Galactic Golem, the archenemy of Superman and the ally of Superman's nemesis, Lex Luthor.

This third-stage golem seems to be more of a facsimile of Frankenstein's creature than an heir of golems described in modern or premodern Jewish literature. Although some literary scholars claim that the golem legend influenced Mary Shelley's novel *Frankenstein* ([1818] 2003) and its numerous sequels and spinoffs, I find no definitive evidence to defend this view. Instead, it would seem that the story of Frankenstein influenced some recent narrations of the golem legend and both severed it from its Jewish roots and distorted it. The historical relationship between the golem legend and the story of Frankenstein is not simply a footnote in literary history. Rather, the independence of these two epochs from one another, and the radically different views each represents, prove significant in dealing with a wide variety of ethical implications of recent developments in science and technology. These two epoch stories of the golem and Frankenstein deal with similar issues but offer different responses.

The story of Frankenstein has emerged as a popular metaphor for many recent developments in science and technology. For example, genetically modified food is popularly described as Frankenfood. Willard Gaylin's provocative 1972 article in *The New York Times Magazine* stimulated and continues to influence public policy debate on in vitro fertilization and cloning. Describing the creation of "artificial life" and virtual (that is, computer-generated) life forms, physicist Doyne Farmer warned of the "bugaboo of Frankenstein" (quoted in Levy 1992, 333)—that the scientist, intoxicated by the hubris connected with the ability to create life, will proceed unencumbered, without assuming responsibility for the dangerous and potentially catastrophic outcomes of an endeavor that could destroy property and lives.

It is not coincidental that Shelley subtitled *Frankenstein* "The Modern Prometheus." She understood the modern scientist, epitomized by Victor Frankenstein, as a contemporary Prometheus. Like Prometheus, who stole fire from the gods and was punished for doing so, Frankenstein is described as invading the divine realm and appropriating and then misusing a power he has no right to possess.

Frankenstein serves as a paradigm for those who oppose many recent developments in bioengineering and reproductive biotechnology on theological, philosophical, and ethical grounds. Such developments often are characterized by their opponents as unnatural, morally odious, playing God, inevitably destructive and catastrophic, practicing what Shelley calls "the unhallowed arts," acts of hubris, and actions that fail to accept their moral consequences. Such depictions as found in Shelley's novel may also be found in views articulated by the Roman Catholic Church, Protestant Evan-

gelicals, and secular bioethicists such as Leon Kass, former chairperson of the President's Commission on Bioethics.

The golem legend and the story of Frankenstein deal with similar questions, such as the propriety of the creation of life by human beings, the relationship of artificial creatures to their human creator, and the human creator's responsibility for and ability to control the actions of his or her creature, but the legend and the story reveal radically different attitudes toward these and related questions.

The golem legend as developed in the first two stages, that is, in classical and modern Jewish literature, offers an alternative view to that represented by the story of Frankenstein—a view that may be applied to many ethical issues. First, the creation of new life and life forms is not considered unnatural, immoral, or as playing God by classical Jewish sources, especially those about the golem. For example, the Talmudic description of the fourth-century Babylonian rabbi Rava's magical creation of a golem and of Rabbi Hanina and Rabbi Oshaia's magical creation of a calf for food are not prohibited by Jewish law. Rather, they are considered examples of permitted magic or technology.

Second, although the golem legend was not identified with Rabbi Loew until centuries after his death, Loew does address the creation of life forms through mystical means in his writings. In his words, "Everything that God created needs completion (*hashlamah*) and repair (*tikkun*)." In other words, God began but did not complete the work of creation (*ma'aseh bereshit*); the universe created by God is to be made (*bara la-asot*), that is, improved, by human beings under a divine mandate. In extending and improving upon the initial creation, human beings imitate rather than impersonate or play God. Through such actions, human beings do not violate nature but rather extend it. In Loew's words, "Human beings bring to fruition things not previously found in nature; nonetheless, since these are activities that occur in nature, it is as if they had entered the world to be created" (quoted in Sherwin 2000, 120). God arrested the process of creation before its completion, and the human task is to develop the potentials of the raw materials in nature created by God. Similarly, commenting on the magical creation of life recorded in Talmud, tractate *Sanhedrin*, fourteenth-century Talmudic commentator Rabbi Menahem ha-Meiri wrote, "Even if one knew how to create creatures without natural procreation, as is known in the books of nature, he may engage in such activity, since anything natural is permitted and not forbidden."

Third, the golem legend teaches that not only technical skill but also the wisdom to use it is required of creators of golems. We must ask not only whether something can be done but whether it is wise to do it. It is not coincidental that in one spelling the numerology for "golem" (GLM) equals the numerology of "wisdom" (*hokhmah*, that is, 73). Part of such moral wisdom is knowing when to create and when to stop creating, and

refusing to sever moral wisdom from technological knowhow, as many contemporary Prometheans have done.

Fourth, there is the rabbinic adage, "There is the bee which has both honey and a sting. Should we forgo its honey because of the risk of its sting?" In other words, creativity entails risk, but does not—as in *Frankenstein* or in the views of some contemporary philosophers, ethicists, and scientists—entail inevitable catastrophe. And fifth, the golem legend teaches that creators should not bring into the world entities that cannot be controlled. One reason why golems have no reproductive capabilities is so that they cannot freely multiply out of control.

Now, let us see how some of what has already been noted can be applied to some current ethical issues, both by direct application and by analogy.

The golem legend, as articulated in classical Jewish sources, describes how new life and new life forms were created using the technology then available. Consequently, the creation of new life and life forms that help complete and repair creation is not proscribed but permitted, though restricted. For example, the use of bioengineering for the creation of weapons of mass destruction would not be permitted, but beneficial uses of bioengineering aimed at preserving or maintaining health would be permitted, if not required. On a historical and sociological note, the usual gut reaction of the public is to initially respond to new developments in bioengineering and reproductive biotechnology with fear, opposition, and moral revulsion. However, when beneficial results are perceived as emerging from the employment of these technologies, attitudes often change. For example, when recombinant DNA began in the early 1970s, it was largely opposed by the public out of the fear that a bioengineered pathogenic organism might escape from a lab and harm people. When it was demonstrated that bioengineering could produce synthetic insulin and other pharmaceuticals effectively, efficiently, and economically, attitudes began to shift. The case of in vitro fertilization is similar. When the first test-tube baby was born in England in 1978, in vitro was widely condemned as unnatural, immoral, playing God, and so forth. In Illinois in 1978 the state legislature declared in vitro a crime, a form of child abuse. Today, in vitro has become almost routine in human reproduction clinics. Relevant to this discussion is that in both popular magazines such as *TIME* and in less known halakhic journals, the test-tube baby was analogized to a golem.

In contemporary Hebrew *golem* means "cocoon." However, as Professor Moshe Idel of Hebrew University demonstrates in his magisterial work on the golem, in many classical Hebrew texts *golem* denotes an embryo. One may couple this linguistic fact to discussions, particularly in halakhic literature, of the legal status of a golem. While some, including the nineteenth-century Hasidic master Gershon Hanokh Leiner of Radzyn, maintain that a golem has the potential to become a human person in every respect, the dominant halakhic view is that as long as a golem remains a

golem it does not have the status of a human being. Consequently, destroying it is not murder. This view has direct implications not only for abortion but also for embryonic stem cell research. If a human embryo or pre-embryo is a golem, it is not a human person. This approach rejects the claim of various religious and secular bioethicists, including some members of the U.S. President's Commission on Bioethics, who have declared that embryos, even at very early stages, are human persons "like us."

As has been noted, golems are created by means of manipulating letters in the Hebrew alphabet, particularly the Tetragrammaton. The Jewish mystics claimed that cracking the code and learning how to manipulate the letters could penetrate the mysteries of life and could provide one with great powers, including the ability to heal existing life and to create new life. With the publication of the human genome and with other developments in genomics, this abstruse medieval mystical notion has taken on new meaning and relevance. In Jewish mysticism combining and recombining the four letters of God's name can create life, including golems, and can cure disease. Similarly, in genomics, DNA is represented by the four letters GATC, representing the four nucleotides of which DNA is composed. In combining and recombining these four letters, that is, nucleotides, scientists believe, they can create new life forms and new ways of treating and even curing diseases—through the use of bioengineered pharmaceuticals, for example. Furthermore, at some university and government laboratories, such manipulations are being used to try to create organic life from inert matter, which is what the creator of a golem also does. The similarities between creating golems through recombining Hebrew letters and creating organic matter through recombining the letters GATC and what they represent is explored in a brilliant and provocative way by the Dutch novelist Harry Mulisch in his novel *The Procedure* (2001). When one considers similarities between kabbalistic magic and our present and anticipated technologies, the words of Arthur C. Clarke, author of many works of science fiction including *2001: A Space Odyssey* ([1968] 2000), come to mind: "Any sufficiently advanced technology is indistinguishable from magic"—familiar words that are known today as Clarke's third law of prediction.

Immediately after recounting the story of how Rava created a golem, the Talmud tells us of how Rabbi Hanina and Rabbi Oshaia created a calf by mystical and magical means, using letter recombinations according to the medieval commentaries. Here, it would seem, is anticipation of the creation and production of genetically modified food. Commenting on this Talmudic text, Rabbi Menahem ha-Meiri indicates that such activities are permitted and that creating new living entities through asexual reproduction is not unnatural. This observation is relevant because many condemn genetic engineering and cloning on the grounds that it is intrinsically morally odious as well as unnatural because asexual reproductive techniques are used.

According to the Talmud, the reason that these rabbis created the golemic calf was because, being very poor, they had no food for the Sabbath. Similarly, the production of genetically modified food could help address issues of human hunger and vitamin deficiencies among the populations of poor nations. Furthermore, the use of genetically engineered plants that produce their own insect repellent can lead to the reduction of human-disease–causing herbicides that also destroy the soil. And genetically modified food is being designed that has not only added vitamins but various pharmaceuticals as well. There are plans to produce bioengineered plants that break down pollutants and that can be manufactured into biodegradable plastics to replace nonbiodegradable petroleum-based plastics.

Despite the obvious benefits of genetically modified foods, despite the lack of any hard evidence that they pose distinct health risks or hazards, and despite an awareness of certain health hazards of some organically or naturally produced foods, there is strong opposition to genetically modified foods in Africa, Europe, and certain North American circles. There are many economic, political, and cultural reasons for this opposition. Are such objections defensible in cases such as the rejection in 2002 by Zambia of U.S.–grown food offered through the United Nations to help alleviate starvation among its famine-devastated population? The government of Zambia allowed its citizens to perish rather than accept the same genetically modified foods from America that are consumed daily by millions of Americans. Indeed, in the U.S. today, it is estimated that about 60 percent of our food has been genetically modified in some way.

One objection to genetically modified foods is rooted in the assumption that natural is always better. Opponents to what they call Frankenfood often link the claim that natural is better to other claims often made by opponents of genetic engineering. Prince Charles is a vocal advocate for organic foods. He and other opponents of genetically modified foods state that scientists have strayed into realms that belong to God alone. Three claims commonly made by such naturalists are that (1) those who engage in genetic engineering usurp divine prerogatives, (2) genetic engineering is intrinsically harmful and inevitably destructive, and (3) the natural is always superior to the artificial.

From the point of view of classical Jewish teachings about the golem, each of these views is problematic. First, creation of golems is not considered a usurpation of the divine prerogative. Like the golem legend, genetic engineering sees the world as "created to be made," where human beings have a divine mandate to improve upon and edit that which God has created. Second, the Frankenstein myth that sees scientific and technological developments as inevitably catastrophic is not verified historically or experientially. Third, genetically modified food is no less natural than organic food; a genetically modified soybean is still a soybean. Fourth, nature is not always nurturing or benign as naturalists seem to believe. Nature can

also be cruel, destructive, violent, and deadly. The natural world is "red in tooth and claw" (Tennyson), imploding stars, typhoons, and cancer; the natural world is a tough and dangerous neighborhood and not the garden of Eden.

Whatever one's views on genetically modified foods, one poignant factor in the opposition to them is the fear that huge, largely U.S.–based corporations could eventually control the food supply and with it the lives of populations who use their genetically modified seeds, plants, animals, and agricultural techniques. Because genetically modified animals are also used in the production of pharmaceuticals, reliance on these products affects the delivery of health care. Already corporations have placed restrictions on farmers' uses of their patented genetically modified seeds, thereby controlling agricultural production. Penalties for patent violations are harsh and expensive. Indeed, it might be suggested that the 1980 U.S. Supreme Court decision in *Diamond v. Chakrabarty*, which by one vote permitted the patenting of organisms created through bioengineering, opened the door for the explosion of the biotech industry and the eventual patenting of bioengineered plants, animals, human tissue, and more recently even human genes—all under the control and ownership of huge corporations. Consequently, the threat from developments in technology may not be these new developments in themselves but the power of the large corporate entities that produce and control them. This observation leads to the notion of the large corporation as a golem that has the potential to become a Frankenstein monster—out of control, dangerous, and destructive. Already in 1933, U.S. Supreme Court Justice Louis Brandeis (a direct descendant of Rabbi Loew of Prague), in the case of *Lee v. Liggett* described the huge corporation as a Frankenstein monster.

A golem is an artificial person, a person without a soul. In Anglo-American law, beginning with William Blackstone's classic *Commentaries on the Laws of England*, this is precisely how a corporation is defined. I would therefore consider a corporation as a contemporary type of golem and suggest that the resources of classical Jewish mystical and halakhic literature that deal with the nature, status, and implications of creating golems may be applied to corporate ethics, particularly to the legal status of a corporation and its potential and actual misuse and abuse of the power it has been granted by its creators—the governments who charter it and the courts and legislators who regulate its behavior.

In the seventeenth century, Rabbi Zevi Ashkenazi of Amsterdam wrote a fascinating responsum (a decision in Jewish religious case law) on the question of whether a golem may be included in a *minyan*, a quorum for prayer. On the basis of subsequent discussions of this responsum by his son Rabbi Jacob Emden (eighteenth century), and by late nineteenth- and early twentieth-century Hasidic masters such as Leiner of Radzyn, Zadok ha-Kohein of Lublin, and others, I read this responsum as an inquiry into

the question of whether an artificial person can be granted the legal status of a natural person. It is relevant to note that since 1886 U.S. Supreme Court majority decisions have granted corporations a variety of constitutional protections and rights previously reserved for natural persons, obscuring the longstanding distinction between a corporation as an artificial person and human beings as natural persons. Precisely because of the power of huge corporate entities, granting this status and protection afforded to natural persons, especially under the fourteenth amendment, has allowed corporations to exercise their power in such a way that they actually trump the rights of natural persons while simultaneously not being held accountable for the crimes they commit, the same crimes for which natural persons would readily be indicted, tried, and punished. Ashkenazi's view that a golem should not be afforded the legal status and protections of a natural person may be applied to corporate golems. This view is similar to that taken by such U.S. Supreme Court justices as Brandeis, William Rehnquist, and Hugo Black. Restricting the destructive power of large corporations could be accomplished by reverting them to a golemic state and status—as artificial entities (and not even "artificial persons")—rather than extending to them the rights of natural persons as has been done by the Court. Just as a golem that has become destructive or has outlived its purpose may be destroyed, so may corporations.

As noted above, machines, such as robots and computers, are the most prevalent variety of golem in our time. According to a medieval Jewish legend, the first mechanical golem was created by the great eleventh-century poet and philosopher Solomon ibn Gabirol. As we increasingly coexist with and rely upon machines, the challenge to the creator of golems continues to be our daily challenge: how to prevent the golems we have created to help us and to protect us from harming and destroying us; how to prevent the golems we create to serve us from controlling us and becoming our masters.

Finally, there is the question addressed by the responsum of Ashkenazi and other classical Jewish texts on the golem: how to distinguish between the identity of a human being and a golem, especially if, as Leiner claims, golems have the potential of becoming human in every respect. Developments in genetic engineering and especially in transgenics, where animal, plant, and human genes are moved from species to species; developments in bionics, where machines and other devices increasingly become integrated into the human body; developments in reproductive biotechnology in which human cloning and the use of artificial wombs may be in our future; developments in robotics, computer science, and artificial intelligence in which the line between humans and machines becomes progressively obscured—all of these pose visceral questions about issues of human identity, about the nature of life, the nature of nature, and the relationship

of humans to the life forms and machines they can now or will become able to create.

In early rabbinic sources, the first golem was created not by human beings but by God. According to this tradition, God created the first golem, who became the first human: Adam. Will the golems we create evolve into humans as the golem created by God did? or will they develop into Frankenstein monsters who will control and destroy us? Have we human beings already begun to devolve back into the golemic state from which we emerged? According to the Talmudic rabbis, a golem is our ancestor, our past. In our present, we coexist with many types of golems that dwell among us, which we have created. What will the golems of the future be?

I have suggested here that the golem legend has anticipated many of the challenges that we now confront in our biotech century and that the legend, as developed in classical Jewish sources, not only offers us an alternative to the scenario of inevitable catastrophe represented by the story of Frankenstein but also can help us to navigate a safe path through the minefield of social, biological, and mechanical engineering in the midst of which we stand. Though according to most traditions the golem is mute, we now more than ever need to listen to what the golem has to tell us.

NOTE

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