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/ THE FIRST WORD

SEARCHING THE LITERATURE

Frankenstein's monster and Faustian bargains lurk everywhere in the shadowy subtext of biotechnology debates. Images drawn from literature—or popular conceptions drawn from movies drawn from literature—help shape expectations or give substance to formless fears. We have heard a prominent West Coast microbiologist (decked in cowboy shirt and string tie) casually toss the first dozen lines of Goethe's *Faust*, in German, into a conversation about scientific ambition, where it detonated like a hand grenade. We have heard David Padwa invoke Faust and Frankenstein in a single breath. We have heard countless casual allusions to monsters, deals with the devil, "meddling with nature," and "things man was not meant to know"—not to mention, on one late-night radio call-in program, a fear of "quasi-human space environoids" produced by genetic engineering.

Now, no one we know would make a Faustian bargain, a Frankensteinian monster, or an environoid even if they could. But we did begin to wonder if there was any literary substance to the popular catch-phrases.

Since this is summer, the season for reading on beaches, we seized on this opportunity to get horizontal and re-read some books about the pitfalls of knowing, striving, and creation—among them *Frankenstein*, *Faust*, and a collection of stories, from the Prague ghetto, about the Golem. We were looking for insight into the popular debate. What we found was a tissue of popular misconceptions. So, to set the record straight, draw some new morals, and possibly furnish our readers with ammunition for cocktail-party skirmishes or a winning game of Trivial Pursuit:

- Like many of today's technophobic horror stories, *Frankenstein, Or, The New Prometheus* began as half-digested science. As Mary Shelley wrote in her 1831 "Author's Introduction," she got her ideas from listening to Lord Byron and her husband, Percy Bysshe Shelley, while they "talked of the experiments of Dr. [Erasmus] Darwin (I speak not of what the doctor really did or said that he did, but, as more to my purpose, of what was then spoken of as having been done by him), who preserved a piece of vermicelli in a glass case till by some extraordinary means it began to move with voluntary motion." *Moral*: Science is short; rumor is long.

- To produce a tragic effect, Shelley resorted to the most irresponsible and neurasthenic protagonist (one cannot call him a hero) in the nerve-sick annals of Romantic literature. Viktor Frankenstein faints and flees at the sight—and later at the thought—of his own experiment; this somewhat distresses his handiwork. *Moral*: Consider physical containment first.

- Nowhere in *Frankenstein* does Shelley say that the creature was cobbled up out of grave-scrappings. *Moral*: Rumor may be long; Hollywood is longer.

- Faust's deal with the devil had much more to do with sensuality than with science. To get the sage's soul, Mephistopheles diverts him from inquiry and steeps him in sex, wealth, and worldly power. *Moral*: A deal with the devil may be good for business, but it won't help you get tenure.

- The Golem, though man-created and possibly the inspiration for *Frankenstein*, is a protector, not a destroyer. When the Golem (first name, Joseph) does cause trouble, it is the fault not of an evil nature but of faulty programming—for a golem unfailingly carries out its orders, no matter how ill-considered. Thus, scientists at the Weizmann Institute named their prototype electronic brain Golem I. *Moral*: Be sure your intentions are good and your sequences are well defined. Or, garbage in, garbage out.

There is a serious lesson here: Never underestimate the researcher's responsibility, the need for forethought, or the power of even an empty image. Now, biotechnology has so far outstripped—in its caution, responsibility, and foresight—even the classiest of these classics. The real challenge, then, of this "literature of over-reaching" is to credit the natural fear of the new and unknown, while never permitting empty catch-words or allusions to stand in place of substantial discourse.

—Douglas McCormick

To supplement coverage of Japanese developments, BIO/TECHNOLOGY has an editorial liaison with the editorial staff of Japan Chemical Daily, Ltd. and Japan Chemical Week.