

churches, for instance, the ministers and members of the boards of trustees are male, but women raise the money and effectively determine how it is spent. Power in those churches is wielded by “the Mothers,” a group of older women who dress distinctively in white on Sundays and constitute the heart and soul of the church. As C. Eric Lincoln of Duke Divinity School has written, “woe be it to the minister” who does not have the Mothers on his side.

Within American Christianity, Woodward contends, “the altar and the pulpit represent the last bastions of male presence”—and, within the liberal mainline Protestant denominations, those strongholds are rapidly giving way. Although males still outnumber females by three to one in the mainline clergy, seminary statistics “suggest that the future belongs to women,” Woodward writes. Among Presbyterians, United Methodists, and Episcopalians, male seminarians outnumber

female ones, “but not by much.” Feminist theology is widely taught in the seminaries. Studies suggest that, because of the different attitude toward authority and its exercise that women who enter the seminary have, the ministry is being transformed into a “profession without authority,” one bent on eliminating the distance between clergy and laity. Woodward, however, believes that “congregations . . . require the exercise of authority and demand that some distance be observed between those who stand in the pulpit and those who sit in the pews.”

As the masculine presence in the church diminishes, he writes, “the dialectical relationship of masculine and feminine”—from which, according to Catholic theologian Walter Ong, the church gets “much of its dynamism and energy”—is weakened. That “may be one reason why mainline denominations are in such dire straits” today.

SCIENCE, TECHNOLOGY & ENVIRONMENT

Dynamic Duo Confronts Refrigerator Menace

“The Einstein-Szilard Refrigerators” by Gene Dannen, in *Scientific American* (Jan. 1997), 415 Madison Ave., New York, N.Y. 10017-1111.

In July 1939, Albert Einstein and Hungarian-born physicist Leo Szilard met to ponder the news that scientists had produced a fission reaction in uranium. As a result, Einstein wrote his famous letter to President Franklin D. Roosevelt warning that Nazi Germany might be able to develop nuclear weapons. That, notes Dannen, an independent scholar, was not the first time Einstein and Szilard had collaborated for the benefit of mankind. A decade earlier, they had worked to avert the danger posed by mechanical home refrigerators.

Einstein, who by the mid-1920s was the world’s most renowned physicist, became interested in the problem when he read of an entire family that had been killed by toxic gases leaking from their refrigerator.

Refrigerators then, as now, used mechanical compressor motors to compress a refrigerant gas, which then liquefies as excess heat is discharged. When the liquid is allowed to expand again, it cools and can absorb heat from an interior chamber.

But the early refrigerants were toxic, and leaks were inevitable in systems with moving parts. The two physicists’ solution: a cooling system that did not involve mechanical motion and so did not require moving parts.

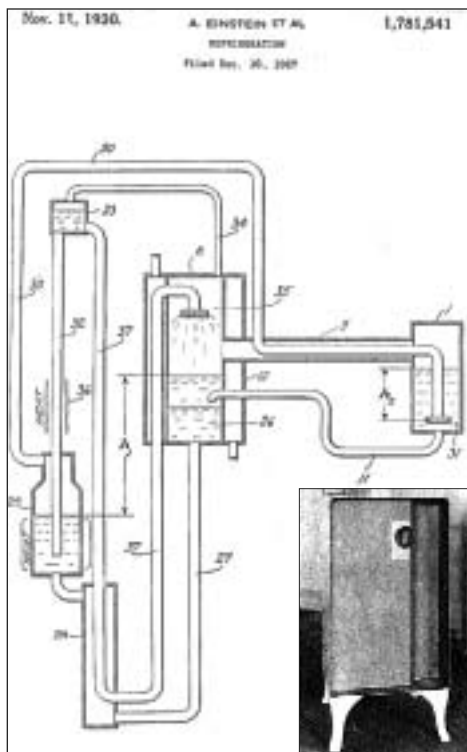
Swedish inventors had designed a so-called absorption refrigerator—in which heat from a natural gas flame, rather than the push of a piston, drives the cooling cycle—and the Swedish firm AB Electrolux was marketing it. Szilard and Einstein devised an improvement—and came up with a host of other designs. In early 1926, Szilard began filing patent applications, and by the fall, he and Einstein had decided on the three most promising designs. One, based on absorption, was very similar to the Electrolux machine; a second was based on the principle of diffusion. Electrolux, seeking mostly to safeguard its own pending patent applications, bought both those designs but never developed either one.

The physicists' third design turned out to be their "most revolutionary, and most successful, invention": an electromagnetic pump. In it, Dannen explains, "a traveling

electromagnetic field caused a liquid metal to move. The metallic fluid, in turn, was used as a piston to compress a refrigerant." Although less efficient than standard compressors and very noisy, the pump would not leak or fail. In July 1931, an Einstein-Szilard refrigerator went into continuous operation at a Berlin manufacturer's research institute.

But the growing worldwide depression and improvements in conventional refrigerators truncated the experimental refrigerator's career. In 1930, Americans demonstrated a new nontoxic refrigerant called Freon, which soon became the global standard. Two years later, the Berlin firm, hit hard by the depression, killed the refrigerator project.

Although the two physicists never produced a product that reached the consumer market, Dannen writes, the Einstein-Szilard pump eventually proved its value: "The built-in safety of its design later found a more critical task in cooling breeder reactors."



The physicists sold an absorption design, but their best refrigerator (inset) relied on electromagnetism.

An Apostle of Science

Richard Dawkins, a professor of "the Public Understanding of Science" at Oxford University, says he is often confronted by the assertion that science is a form of religion. It isn't, he writes in the *Humanist* (Jan.-Feb. 1997).

Science is not religion and it doesn't just come down to faith. Although it has many of religion's virtues, it has none of its vices. Science is based upon verifiable evidence. Religious faith not only lacks evidence, its independence from evidence is its pride and joy, shouted from the rooftops. Why else would Christians wax critical of doubting Thomas? The other apostles are held up to us as exemplars of virtue because faith was enough for them. Doubting Thomas, on the other hand, required evidence. Perhaps he should be the patron saint of scientists.

One reason I receive the comment about science being a religion is because I believe in the fact of evolution. I even believe in it with passionate conviction. To some, this may superficially look like faith. But the evidence that makes me believe in evolution is not only overwhelmingly strong; it is freely available to anyone who takes the trouble to read up on it. Anyone can study the same evidence that I have and presumably come to the same conclusion. But if you have a belief that is based solely on faith, I can't examine your reasons. You can retreat behind the private wall of faith where I can't reach you.