

REFLECTIONS

MAGICAL THINKING

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Isaac Asimov, for whom this magazine was named and who was my predecessor as writer of this column, was a totally rational man with no belief whatever in matters supernatural. That didn't stop him from writing the occasional fantasy story or from editing a long series of anthologies with such titles as *Devils*, *Ghosts*, *Spells*, and *Magical Wishes*. But those were done for his private intellectual amusement, not out of any belief in such phenomena.

I'm pretty much like Isaac in that respect. Long ago, when I lived in New York and was having some repairs done to my house, the craftsman who was refinishing the floor in my library turned to my wife and said, "Your husband isn't a religious man, is he?" "Why do you say that?" she asked, startled. He pointed to two shelves of books. "Here are the books on religion. And here"—one shelf below—"are the books on witchcraft." It was a shrewd observation. I practice no religion. But, like Isaac before me, I have a great deal of curiosity about the farther shores of our imaginations. And, just as I have written about things I don't believe in (sorcery, time travel, faster-than-light spaceships), I've made a considerable study of what I consider to be the fantastic element in human thought processes over the centuries: the all but universal willingness to believe in that which is inherently unbelievable.

You've seen the result of these studies in several columns here. In one, I dealt with the magical and medical spells of the Anglo-Saxon physicians of a thousand years ago ("Leechdoms, Wortcunning, and Starcraft"), in another I looked at the mystical imagery of the Kabbalah ("The Sixth Palace"), and, most recently, I discussed spells used by the sorcerers of Egypt about the time of Christ ("The Software of Magic"). And, as I wander through the vast accumulation of books I have acquired over the decades, I keep coming upon other volumes that indicate my interest in esoteric lore of all sorts. The case in point today is Lynn Thorndike's magisterial *A History of Magic and Experimental Science*. This is eight splendid volumes that provide an inexhaustible storehouse of dazzling information about all things supernatural and, as the title of the book indicates, an examination of the link between magic and science that makes all of this so interesting even to a cold-eyed skeptic like me.

Thorndike was a New Englander, born in 1882, who did his doctoral thesis on "The Place of Magic in the Intellectual History of Europe," upon which he erected the encyclopedic set of books that the Columbia University Press published between 1923 and 1958. (He taught medieval history at Columbia until 1950, just two years before I arrived at that university as an undergraduate.) He defines "magic" in the first paragraph of the first volume as "including all occult arts and sciences, superstitions, and folklore," and states his great theme at once: "My idea is that magic and experimental science have been connected in their development, that magicians were perhaps the first to experiment, and that the history of both magic and experimental science can be better understood by studying them together." Here Thorndike begins to impinge on the concept underlying Arthur C. Clarke's famous aphorism, "Any sufficiently advanced technology is indistinguishable from magic." This carries with it the hidden converse that magic is a sort of technology, attempting as it does to attain control over phenomena through the use of formulas and implements that can be employed in predictable ways.

Though he was a medievalist, who originally intended to limit his survey to the

twelfth and thirteenth centuries, Thorndike found that in investigating the magical practices of medieval Europe it was necessary to extend his research back to the earliest Christian writers, and from them to those of Imperial Rome, and briefly to examine magical practice in Egypt, Babylonia, and ancient China. But his formal point of departure is Roman, the encyclopedic *Natural History* of Pliny the Elder, which appeared about 77 A.D., during the reign of the Emperor Titus. Pliny deals with the whole realm of knowledge, setting forth a huge body of information and misinformation under such categories as Aquatic Animals, Exotic Trees, the Nature of Metals, and Medicine. He notes that the best way to attain knowledge is through experiment: "There is no end to experimenting with everything, so that even poisons are forced to cure us." And, since magic was a significant subset of knowledge in Pliny's time, he devotes considerable space to the "science" of magic. "No one should wonder," he says, "that its authority has been very great, since alone of the arts it has embraced and united itself with the three other subjects which make the greatest appeal to the human mind," which are, he says, medicine, religion, and the arts of divination.

Quickly he dismisses many of the claims of the practitioners of magic as fantastic, absurd, exaggerated, or false. For that he gains a prominent place in the history of science. But, despite his embrace of what we think of as the scientific method, Pliny was very much a man of his times, and he offers a favorable view of many magical practices and recipes: the use of amulets, incantations, herbs, and astrological calculations, for example, and potions made from such things as owls' toes, the eyes of river crabs, and the ashes of the head of a mad dog. In the service of science one must test everything with an open mind, says Pliny; and if he seems excessively credulous to us, we must still praise him for the extent and rigor of his investigations.

From Pliny Thorndike moves on to the great Roman physician, Galen, as much of a scientist as Rome ever produced, though a great deal of his medical theory was, we now know, based on the wildest fantasy. (All natural objects, he believed, are composed of four qualities, hot, cold, dry, and moist; one cures a moist disease with a dry medicine, a cold one with a hot one, etc.) Though magic and the occult figured largely in Galen's medical practices, so, too, did close observation of anatomy and physiology, and he scorned certain rival physicians as "liars or wizards or I don't know what to say," attacking one medical man who used mouse dung to excess as "superstitious" and "a sorcerer." It is a theme that runs through all of Thorndike's book: the uneasy conjunction of magic and experimental science that marks every step in the long process of our acquisition of useful knowledge.

We proceed onward through early Christian scientific beliefs, Arabic science and Arabic occultism, and early medieval thought. By the third volume we have reached Roger Bacon, the thirteenth-century friar often thought of as the first modern scientist, though Thorndike is careful to point out that Bacon's scientific thinking, like that of his contemporaries, is a not entirely scientific mixture of theology, astrology, and experimental observation. (But the essential feature, from our point of view, is the experimental observation. Thorndike quotes such repeated phrases from the writings of another medieval scientist-monk, Albertus Magnus, whose studies of natural history were the most accurate since those of Aristotle sixteen centuries earlier, as "I have tested this" and "I have not explained this" and "We pass over what the Ancients have written on this topic, because their statements do not agree with experience." Those sentences mark the birth of the true scientific method.)

In Thorndike's next volume we meet the first alchemists—their experiments in turning lead into gold produced no gold but they were experiments nonetheless, and led to the advent of real chemistry. And Thorndike brings us such men as the fifteenth-century astrologer Conrad Heingarten of Zurich, whose work opened the way for Copernicus, Johannes Kepler, and Tycho Brahe, through whose studies of the

heavens was attained our first real understanding of the workings of the cosmos. And onward he goes into the Age of Exploration, where many old myths needed to be discarded when punctured by the cruel needle of reality. But still we find widespread belief in demons and witches, and magic still held sway even among such men as Copernicus, who dabbled in strange medical ideas and advocated such remedies as unicorn horn and the bone from the heart of a stag, and the pioneering anatomist Vesalius, who risked his life to see what was actually inside the human body but also believed that the stars exercised influence over events in our world by means of hidden powers and forces. We still had a distance to travel before moving from the world of magic to the world of science. As Thorndike tells us in his fifth volume:

“Magic was a systematized and ordered marvel-believing and marvel-working, a consistent body of error, attained through sense perception, introspection, reflection, and dreaming, influenced by faith, emotion, appetite, and pleasure, marked by unwarranted association of ideas, without adequate means of correcting error and without proper standards of measurement. The last deficiency was due to the fact that mechanical invention had not proceeded far enough. Imagination, irresponsible conjecture, and loose logic therefore filled the gap of mystery. Before such inventions, sculpture and painting were more exact and interesting pursuits than physics and chemistry. In magic the desire to attain ends and satisfy human cravings not primarily intellectual was dominant; in science the urge is to measure and know.”

A consistent body of error. What a lovely phrase! Magic was, in its way, the science of the impossible: a carefully worked out and internally consistent body of knowledge that happened to have been built on totally false premises. Yet within it was the urge “to measure and know,” which brought us, ultimately, to a reality-based science that is constantly in need of modification and correction but which, at least, is grounded in observation and repeatable results.

That is the direction in which things are going, volume after massive volume, a journey down the centuries with the border between magic and science becoming indistinct as one evolves into the other. And when we reach the eighth and last volume we come to the true scientific era that human ingenuity had erected on this great pyramid of fanciful and often absurd pseudo-knowledge that we label “magic.” That volume is the one dealing with the seventeenth century, the century of Kepler and Galileo and Isaac Newton and Robert Boyle and Christian Huygens and René Descartes. There is plenty of nonsense and fantasy intertwined with truth in the work of these people; but they were striving constantly toward knowledge of the real world, and their work is the essential underpinning of everything we know today.

Thorndike’s book is an extraordinary treasurehouse of human thought in all its folly and grandeur—and one of the most remarkable works of scholarship ever to be produced by a single writer, worthy of being ranked with Gibbon’s *Decline and Fall of the Roman Empire*, George Sarton’s *Introduction to the History of Science*, and Alfred Kroeber’s *Anthropology*. Thorndike’s *Magic and Experimental Science* is out of print now, but copies are available through various book dealers at about five hundred dollars per set. Better yet, the whole vast thing has been archived on the Internet, volume after volume of it, and with a couple of clicks you can have access to it all without cost. True twenty-first century magic!