



My Wizard

Frank Wilczek

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Don Herbert, TV's "Mr. Wizard," died on 12 June 2007. This column is dedicated to Mr. Wizard, with admiration and gratitude.

When I read last summer of the passing of Don Herbert, for a moment I became a little boy again, with my mind focused on a tiny black-and-white television screen, eager to see new wonders revealed by Mr. Wizard—wonders all the more wonderful because they were hiding in plain sight, right at home.

Everyday magic

The original *Watch Mr. Wizard* series ran from 1951 until 1965 for a total of 547 episodes. Surely I watched hundreds of them in the late 1950s and early 1960s. What Mr. Wizard did on his show was brilliant in its simplicity. He showed something amazing happening, then made the behavior comprehensible, by building it up step by step in front of your eyes. The shows were broadcast live, and he worked in what looked like a kitchen. Behind the simplicity, we now know, were considerable art and labor: Mr. Wizard eventually filled 18 file cabinets with the fruits of his research into the literature of science and demonstrations.

One or two kids participated in each show, asking questions and assisting in the experiments. They were regulars—"Jimmy," "Rita," a few others. Mr. Wizard treated the kids with respect, like people who mattered. He listened to their questions and made sure they got the point of his answers.

It wasn't, of course, interactive TV in the modern sense, but I felt actively engaged, because I was represented by proxy. And I would interact again afterwards, by trying to do the experiments. Most of them used everyday materials. (His book¹ contains many examples.) I remember turning celery purple, getting balloons to stick to walls and combs to pick up bits of paper, supporting weights on straws, and many other such experiments. I enrolled in

the Mr. Wizard club. The daily mail took on a whole new interest when I could look for something addressed to *me*, and the newsletters were full of new experiments and explanations.

As a child I was fascinated by magicians and the idea of magic. What is magic, after all, but surprising behavior—and what could be more natural than to be interested in that? I asked Santa Claus for a magic kit, and he was nice enough to get me several. I learned the tricks, and enjoyed giving a few shows, but really I was disappointed—the "magic" was just a bunch of tricks, most quite simple, based on psychology and deception. Mr. Wizard's magic was more satisfying.

Sources and sinks of curiosity

Aristotle wrote that "all knowledge begins in wonder," and Albert Einstein wrote, "I have no special talents. I am only passionately curious." Even after allowing for rhetorical embellishment, these remain most impressive testimonials to the importance of curiosity. How can we teach scientific curiosity?

An odd question, that may seem. Human babies are born curious. Modern research has shown that long before they can speak, indeed before they can focus their eyes and see properly, babies are alert to novelties and seek them out. That curiosity goes very deep in human nature. The helplessness and extended infancy of human children allows them to finish wiring up their brains through interaction with the world rather than by following a preordained program. The flexibility and openness of children's basic architecture imperils their survival, but human evolution demonstrates that the payoff from learning what the world has to teach is more important. This tradeoff only works when our curiosity allows us to take advantage of opportunities to profit from variation and surprise; otherwise, we'd be better off hard-wired and ready for action.

Our developing brains produce an

excess of brain cells. Otherwise identical but differently wired, they compete to survive: Those that have been active thrive; the others, starved for stimulation, commit suicide (apoptosis). That suicidal tendency is one reason why drugs that generally depress nervous activity, such as ketamine, nitrous oxide, and alcohol, are especially harmful to infants.

But as childhood progresses, the competition between cells winds down, and the wiring pattern increasingly stabilizes. Each of our ancestors could not afford to remain forever curious about which plants are poisonous and which edible or capable of cultivation, and about which animals are dangerous and which harmless or conquerable—working conclusions had to be drawn, so that he or she could get on with the business of life. Our maturing brain tells us, in effect, "Enough has been learned; it's time to get on with the job of producing the next generation!"

This rough division into a learning phase and a doing phase makes good sense. The balance between those phases that was appropriate for our ancestors—the balance encoded in our genes—is, however, not necessarily the best balance for today. Nowadays dangers are less acute, and lives are longer, so the interval devoted to learning and experimentation should be extended. Accumulation of knowledge in our culture as a whole, recorded in books, traditions, and artifacts, means there's more to learn as well. And the cumulative aspect of knowledge adds an extra premium to the value of discovery, by ensuring that it will benefit many future generations. Because of all these factors, our built-in allotment of curiosity is no longer optimal; especially, it tends to dampen too soon.

So, how to nurture curiosity? Here are three ways: Don't destroy it; reward it; exemplify it. To see how that's done, let's study a case history: the work of a teacher who kindled the flame of

curiosity for many thousands of people, Professor of Curiosity Mr. Wizard.

Two enemies of curiosity are fear and complacency. They are represented in proverbs, which by their nature tend to enshrine conservative conventional wisdom. "Curiosity killed the cat." Perhaps, but the curiosity of feline hunters nets them many a meal in return. Some of Mr. Wizard's demonstrations involved fire, chemical reactions, and even mechanical contraptions that could get you into trouble. Of course, he gave ample cautions and warnings. But the great lesson that powerful forces could, through understanding, be controlled and turned to advantage shone through. "There's nothing new under the Sun." Well sure, to the extent that baryon number is conserved, but Mr. Wizard showed us surprises every week. His surprises involved materials that were under the Sun—indeed, right in our homes—all along; although the materials were old, our awareness of their hidden potential was new.

Another enemy of curiosity is futility: the acquired sense that curiosity will not be rewarded. Mr. Wizard demonstrated the opposite. He showed us things that seemed uncanny, then how, by poking around and asking questions, they could be understood. I still remember vividly, after watching Mr. Wizard, suddenly "getting it" in many specific cases: how movable positive and negative electric charges could explain the phenomena of static electricity, how air pressure (or its absence) could cause cans to explode or collapse, how prisms let you pry colors apart to make rainbows and then put the colors back together. Such successes gave a pleasure not so different from the pleasure I later felt in completing successful research projects. I'm convinced that those early pleasures made me hungry for more.

Curiosity's best friends are the people whose lives it has enhanced. They broadcast its virtues, not only as a method of inquiry but as a way of life. Mr. Wizard radiated joy and serenity—reciprocated gifts, I like to think, from those 18 file cabinets and the children he served. He embodied the rewards of the curious life.

Greater and lesser wizards

Other wizards are more famous.

The Wizard of Oz practiced deliberate mystification. He is the fictional prototype of a long line of tricksters, going back to the temple priests of ancient Egypt and earlier, and through to Uri Geller and a host of lesser charla-

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Mr. Wizard and two helpers in the 1950s.

tans today. Their elaborate houses of cards collapse under the pressure of curiosity, so they ward off curiosity.

Harry Potter, and in a different way the "magic realism" genre, presents essentially an irrational world with less ironic detachment than Frank Baum's Oz series. In those worlds, curiosity gets no traction, for anything can happen, and what you discover today tells you little about what will happen tomorrow. Great power is distributed randomly and whimsically, not as the result of intellectual work. A tempting fantasy that is allied to the romantic concept of "genius." It has, in Bertrand Russell's memorable phraseology, "all the advantages of theft over honest labor." To the extent that these fictional conceptions are absorbed and internalized, they tend to legitimize intellectual passivity and wishful thinking.

How should we react to the apparently irrational? Each wizard teaches a different way. The Wizard of Oz says to worship and fear the irrational. (To be fair, the *author* of the Wizard of Oz debunks him.²) Harry Potter says to accept the irrational at face value. Mr. Wizard says to poke around, ask questions, and try to understand it. He is the true wizard, and the best.

More, please!

Well before Don Herbert hit the airwaves in 1951, Richard Feynman had his own Mr. Wizard—his father. In a charming interview, available on the Web,³ Feynman describes how his father would read to him from the *Encyclopædia Britannica*—not merely reading, but questioning and engaging:

Everything we'd read would be translated, as best we could, into some reality, so that I learned to do that, that everything I'd read I'd try to figure out what it really means, what it's really saying, by translating.

He goes on to describe some experiments with a wagon and ball, illustrating the magic of inertia, that Mr. Wizard might well have used. Feynman concludes the interview by saying,

that's the way I was educated by my father, with that kind of examples and discussions—no pressure, just lovely, interesting discussion.

Fathers and mothers who'd like to help their kids stay curious, and maybe take a shot at raising a new Richard Feynman, should watch Mr. Wizard too!⁴

References

1. D. Herbert, *Mr. Wizard's Supermarket Science*, Random House, New York (1980).
2. For more on the fascinating story of Frank Baum and his books, see M. Gardner, R. B. Nye, *The Wizard of Oz and Who He Was*, Michigan State U. Press, East Lansing (1957, rev. ed. 1994).
3. The video interview is at http://onegoodmove.org/1gm/1gmarchive/2006/04/on_his_fathers.html. Related material appears in R. Feynman, *The Pleasure of Finding Things Out: The Best Short Works of Richard P. Feynman*, Perseus, Cambridge, MA (1999).
4. DVDs of many episodes of *Watch Mr. Wizard*, and other Mr. Wizard material, are available at <http://www.mrwizardstudios.com>. ■