By **Luke A. Schwerdtfeger**

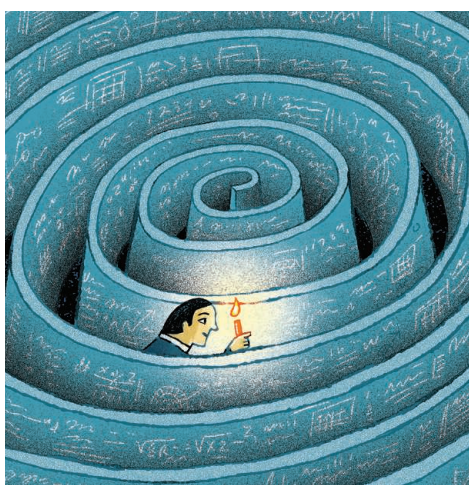
Spirals of science

The timing was perfect. A few weeks after the experimental protocol that had served me for years inexplicably stopped working, my grad school adviser approached me about writing a review paper detailing the history of our field. I was feeling hopeless about my lab work. I had seemingly tried everything to fix the broken tissue culture system, but nothing worked, crippling not only my productivity, but also my confidence. Shifting my focus to literature review and writing offered a welcome respite. And although I didn't expect it, this historical venture ended up teaching me how science proceeds across generations—and it provided the key to getting my research back on track.

While diving into the literature, I stumbled upon a string of reports from the 1910s describing experiments that were shockingly similar to the protocol I had been struggling with. The more I read, the more I questioned whether anything I was doing was actually novel. They led me to another set of intriguing papers, including one from 1934 describing a tissue culture method so complex that it seemed impossible.

Maybe there was unrealized value in this long-forgotten system, I thought. I set off to replicate the work.

After a couple of tries, I succeeded, which provided a much-needed confidence boost. I was amazed that such an advanced system had been invented more than 80 years ago. I couldn't wait to tell my adviser that I had replicated it.



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To my surprise, he wasn't as enthusiastic as I was. He asked a simple question: What's the utility? I didn't have an answer. This method was much more difficult than my current, albeit broken, protocol. So why should we care about it? Why not instead pour my time and energy into fixing my modern protocol?

I was determined to come up with some hidden utility for the rediscovered system. It was too interesting, too radical compared with what I had been doing to not be useful. But I couldn't think of anything. My surge of inspiration gave way to gloom. I was stuck with my broken method.

Returning to my adviser's office the next day, I was ready to admit that he was right and that replicating the historical method had been a waste of time. But he asked another simple question: Had it taught me anything? The answer was yes. On a technical level, it reminded me of the importance of paying attention to details, even minute and seemingly insignificant ones, which were critical for reproducing such an intricate method. Just as important, my excitement in trying a challenging, complex method got me out of my research slump. Perhaps that was the true utility.

With renewed vigor and focus on the details, I finally got my protocol working again, after nearly 5 months of troubleshooting. The problem turned out to be infuriatingly simple: a bad component in the tissue culture media. As fate would have it, I got my protocol working just as our review paper was accepted for publication.

My adviser often uses the phrase "spirals of science" to describe how science progresses. The idea—which he inherited from his postdoc adviser—is that researchers sometimes retrace paths conceptually similar to those explored by previous generations. But each generation is assisted by the knowledge of the scientists who came before, which allows the spiral to progress upward.

This notion hadn't fully resonated with me when he mentioned it after we found the tissue culture papers from the 1910s. But after troubleshooting my protocol while diving into the history of my field, I saw exactly what he meant. And I took confidence from the thought that, no matter how slowly, I was progressing up the spiral. ■

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