Is Scientific Genius Obsolete?

Dean Keith Simonton proposes that the phenomenon of genius has become irrelevant in understanding outstanding creativity in the modern natural sciences.

Most scientists devote their entire careers to studying phenomena that they can readily assume will not go away anytime soon. Massive objects will always exert a mutual attraction; most life forms will always undergo change across generations; and the poor will always be with us. Hence, physicists can always study gravity, biologists evolution, and economists unemployment. Yet not all researchers can make this assumption: The very phenomenon that they investigate may have actually ceased to exist. I may be one of those unfortunate investigators.

I have devoted more than three decades to studying scientific genius, the highest level of scientific creativity[1]. Where the creative scientist contributes ideas that are original and useful, the scientific genius offers ideas that are original, useful, and surprising. The addition of the third criterion is crucial. It means that the ideas—whether they be theories, discoveries, or inventions—are not just extensions of already established domain-specific expertise. In a sense, the scientific genius conceives a novel expertise. Einstein's special theory of relativity illustrates an idea that was original, useful, and surprising.

In the history of science, geniuses have played a decisive role in two striking ways. First, geniuses have created entirely new scientific disciplines, such as Galileo's creation of telescopic astronomy. Second, geniuses have revolutionized already established disciplines by introducing some "paradigm shift." Darwin's evolutionary theory is a classic example. These epochal

accomplishments are possible because geniuses do not confine their thinking to any narrow domain of expertise. Lacking that restriction, they can more easily conceive novel disciplines or transform old ones. Their innovations are then surprising.

Yet perhaps neither of these two opportunities is available to contemporary scientists. By now, every scientific discipline that can exist might already exist: No phenomenon amenable to scientific inquiry has been omitted from the comprehensive list. Moreover, at least in the natural sciences, all extant disciplines operate according to theoretical principles and methodological techniques that are very unlikely to change in any breakthrough fashion. Future research results will most likely be incremental rather than revolutionary.

Because what has been said can be easily misunderstood, let me quickly add three clarifications.

First, I am not endorsing the "end of science" argument that John Horgan once proposed[2]. On the contrary, I believe the scientific enterprise will continue getting "faster, better, stronger." There will merely be no need for the introduction of new disciplines or revolutionary paradigms. At worse, some disciplines will just approach asymptotically some ill-defined limit of precision and comprehensiveness, much as seems to be happening in many competitive sports. Just as an athlete can still earn Olympic gold but only beat the world record by a fraction of a second, scientists can continue to receive Nobel medals for improving the explanatory breadth of theories or the preciseness of measurements. These laureates will still count as great scientists, just like the Olympians.

Second, I am also not arguing that science is becoming "dumbed down"–that modern investigators are not as smart as Copernicus, Descartes, Newton, Linnaeus, Pasteur, or Einstein. Indeed, research conducted on contemporary scientists shows that they generally feature very

high IQs[3]. If anything, more raw brains may be required to become a first-rate scientist today than it took to become a genius during the "heroic age" of the scientific revolution. Would Laplace or Maxwell have been bright enough to master the formidable mathematics of current superstring theory? Furthermore, if the Flynn Effect[4] applies to scientists as well as to the general population, we would expect IQs to be increasing anyway. Thus, if genius is defined solely as having an exceptional general intelligence, such IQ-geniuses are certainly alive and well in today's sciences.

Third and last, I am not asserting that brilliant scientists can no longer *attempt* to introduce novel paradigms or even to devise original disciplines. It is just that such innovations are far less likely to catch on. The likelihood of acceptance verges on absolute zero. In 2002, Stephen Wolfram published his *A New Kind of Science*, a book that purported to launch a revolution that never happened[5]. As the principal designer of Mathematica software and a recipient of one of the first MacArthur "Genius" Awards at the impressively young age of 21, one might have thought that his "simple programs" concept would have rocked the boat a bit more than it did. Yet it seems that this kind of genius is no longer needed in the natural sciences. Given his failure, can we really expect any better results from far more marginal scientists who endeavor to revolutionize science via publications in non-refereed open-access journals or postings on personal websites?

In fact, the days when some obscure doctoral student can solo author three revolutionary papers while working fulltime as an assistant examiner at a patent office—as Einstein did in 1905—are probably long gone. Science has become so big, and the knowledge base so complex and specialized, that the best work emerges from well-funded collaborative teams, producing papers with multiple authors, not one of whom could have conducted the research alone.

Furthermore, although the research frontier remains rich in unanswered questions worthy of empirical or theoretical inquiry, the core of most disciplines is far more secure. Young scientists spend high school, college, and much of graduate school mastering basic concepts and techniques that will still form the core curriculum for their children.

I have tried to imagine scenarios where an old-style genius might prove relevant in modern science. One obvious candidate would be a physicist who successfully creates a "theory of everything" that (a) unifies all four fundamental forces of nature, (b) generates surprising but empirically testable predictions, (c) requires relatively few assumptions (requiring, say, no more than four dimensions), and (d) necessitates extensive revisions in the introductory textbooks (not just in the materials used for graduate seminars). Another scenario would have some great psychologist, sociologist, or economist coming up with a Grand Unified Theory that satisfies comparable specifications in psychology, sociology, or economics—or all of them together! Should these events take place, then the scientific genius may not have gone extinct after all.

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1. Simonton, D. K. *Scientific Genius* (Cambridge, 1988).

2. Horgan, J. *The End of Science* (Addison Wesley, 1996).

3. Simonton, D. K. *Creativity in Science* (Cambridge, 2004).

4. Flynn, J. R. *What Is Intelligence* (Cambridge, 2008).

5. Wolfram, S. *A New Kind of Science* (Wolfram Media, 2002).