

## The Pace of Change

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- in [European History](#), [Technology](#)

*Danny Dorling—*

Did you think that the rate of innovation was rising and that more and more was being invented every year? Did you pause to question the claim, if you ever heard it, when, on January 23, 2018, at Davos, Justin Trudeau said: “Think about it: The pace of change has never been this fast, yet it will never be this slow again.” Did you stop and think: Really—is that true?

If you step back and think what the phrase “the pace of change” means, then you might well conclude that it was not faster in 2018 than any year before, almost no matter how you choose to define it. That is because you could quite easily find earlier years and earlier decades in which it had been faster.

The pace of change was faster in the past in terms of how quickly knowledge developed. Your grandparents or great-grandparents may well have faced huge dilemmas in terms of what to believe—if you compare what was understood in their

childhoods to what had become common knowledge when they were old. At school in England in the 1970s and 1980s I was taught that an ice age was coming while being made to sing church hymns at school. We now know that the planet is (and was then) heating up at an unprecedented rate; and most schools in most countries are a little more careful today how they handle religion and small children. Although I may think that a great deal changed in my own lifetime, in the first half century of my grandparents' lifetime, the pace of change was even greater, from the first airplane to the first nuclear bomb and moonshot.

There is great dispute over which decade in the last century saw the greatest rate of invention. When electricity was still relatively new to us, there was much more to be invented. We easily forget how just over a century ago most fields in most rich countries were ploughed by horses, or that the 747 airplane is now over half a century old. We think the internet is new, but I have used it for almost all my working life, and I am as old as the first 747.

The timing of individuals' contributions to innovation has become later and later in their lives; as the low hanging fruit, the easier innovations have already been secured. As Benjamin Jones wrote in a 2005 paper titled "[Age and Great Invention](#)," "the mean age at which innovators begin making active

contributions has increased by about 8 years over the course of the 20th Century” rising from twenty-three to thirty-one, and “innovators are productive over a narrowing span of their life cycle.” And note, this was fifteen years ago now.

There are many explanations as to why innovation rates, along with productivity, have been stalling for decades. The simplest is that there is less that is new to be discovered; that we are on the downslope of an age of discovery. Another is that a prerequisite of innovation is incrementally mastering knowledge, such that mathematics education “recapitulates the order in which concepts were discovered in human history,” and so (despite specialization) “there would theoretically come a point at which so much has to be learned that there is no time remaining for innovation” as Alex Mesoudi [put it](#) in 2011.

In mathematics there will always be new theories to prove; but the most beautiful, simple, and elegant have (most probably) all been discovered—the low hanging fruit. Leibniz and Newton were around at the right time, were of the right gender for their time, were born in the right parts of the world, and were lucky—and clever. The person today as clever, lucky, well-located, and supported who proves the next great theory in math may never become well known because what they discover will not be that interesting.

The slowdown in the rate of the increase in efficiency is not always for the worse. For instance, what would we use faster and faster computers for? Moore's law, which suggests that the speed of computing continuously rises, is finally breaking down (processors no longer double in speed every few years); but long before that law stopped being a law, we should have begun to question the utility of what we were using faster and faster computing speeds for. Artificial Intelligence is still largely pattern recognition; but it is constantly said to promise revolution just around the corner. I am skeptical because it has been "the next big thing" at least four times in my lifetime. However, rather than be skeptical, we should be thankful for what we are no longer achieving the rates of acceleration to be able to do. When I began my research studies, in 1989, the world's fastest computers were still being used to simulate nuclear explosions to make bigger and better bombs. In many ways it is good that we have slowed down. And there are other ways, ways that we do not currently value enough, in which we could collectively think in better ways if we were to begin to think more slowly and carefully. Relearning the old lessons of a pandemic to be much better prepared for the next time would be a good place to start in being differently innovative. Less haste and more care are needed.

Finally, asking why innovation is slowing is a little like seeing a cannon ball fall and asking, "why is it falling?" Eventually almost everything that first goes up falls back to earth. The

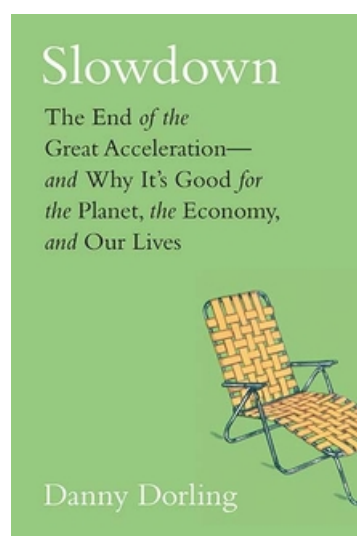
questions should be: Why did it suddenly rise up so fast in the first place? What fired it upward and how? Why did innovation rise as much as it did? Was it the enclosure of land, then the use of coal power instead of horse power? Why was there suddenly a flurry of thinking over new political ways of being once we began to doubt religion and the power of kings? Why then? And why was such innovation not snuffed out?

The slowdown in the pace of change is not an end of history; it is just an end of great leaps in certain areas that we currently value very highly—which we value because the pace of change within them has recently been so very great that we are still in awe.

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