Of Rocks and Robots—Automation and Geology

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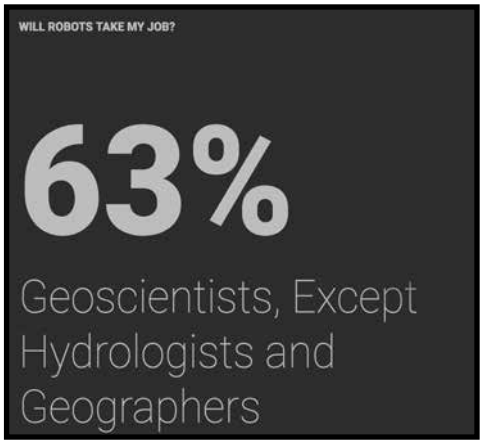
While economists expect that the impending Robot Revolution will not cause any net job or wage losses in the long run, research suggests that some geoscience fields—a majority, even—are susceptible to automation. An informal survey of 33 geologists finds that a majority of them expect that automation will help or have no impact on overall geology job prospects, even as they predict big changes for geology careers.

Automation—it is heralded in news media as at once the keystone of a society's progress while it is simultaneously derided as a destroyer of jobs. As it turns out, economists find that both outcomes are true—with the caveats that the jobs "destroyed" are replaced with different jobs. The reasoning is as follows: Automation in a sector of the economy allows workers to be more productive—eliminating some jobs in the process—but the increased productivity means cheaper goods. This causes other sectors to expand and demand more labor. Thus, any economic restructuring induced by automation ultimately results in an unchanged level of employment combined with cheaper goods—and if one's wage remains the same or even decreases slightly, when a dollar goes farther in the things it can buy, one's "real wages" have increased.

An economist explained this concept to me with the following simplified example. Four Victorian era weavers daily produce only enough cloth for one shirt each. Two tailors fit those four shirts to customers, as each tailor can fit two each per day. The weavers sell shirt-cloth for $1 each to the tailors, who part with their final product for $1.50 each ($0.50 profit each). One day, one of the weavers invents an automated loom to produce 10 shirts' worth of cloth each day, which he can sell for a mere $0.20 each ($2 total—equivalent to his earnings when he sold only two shirts for $1 each); his low prices quickly drive the other weavers out of business. The tailors, meanwhile, beneficiaries of significantly cheaper materials, lower their own prices to $0.80 per shirt and still profit more per shirt ($0.60 each, up from $0.50). Spurred by cheaper shirts, the townsfolk begin buying more—10 shirts each day now, up from 4 previously—which requires the addition of three more tailors to bring the town's tailor total to five. Thus, while three weavers became unemployed, their job losses were offset not only by the gain of three tailors, but also by the increased incomes of the tailors with their now-bursting apparel collections—in other words, the increase in productivity made everyone richer (except for perhaps three individuals).

The pessimist, of course, wonders what happens to the displaced weavers—whose worst-case scenario would, admittedly, sum in any model to a small sacrifice compared to the larger gains realized by their fellow citizens. Besides, in an ideal world, they would seamlessly retrain and move into a more productive field (e.g. tailors, in this example), where their efforts could better serve the economy and themselves. In the less-than-ideal world of Case and Deaton (2017), however, provided they lacked a college degree and met other certain demographic criteria, the weavers' diminished economic prospects could eventually see them succumbing to a so-called "death of despair" (a fate met by both of my parents, neither of whom outlived 50). Furthermore, at least one paper controversially found that certain industries exposed to certain forms of automation saw reduced wages and employment (Acemoglu & Restrepo, 2017). Disregarding such cases, however, overall, the current consensus of economists is that automation will harm neither wages nor employment prospects—quite the opposite. This isn't to say, however, that the jobs of today won't go the way of the saddle-maker. Enough, though, of anachronistic Victorian trades—what of geologists?

WillRobotsTakeMyJob.com and ReplacedByRobots.info are two websites that pull from a widely-cited report published in 2013 by researchers at the University of Oxford ("The Future of Employment: How susceptible are jobs to computerisation?"), which considered 702 occupations. According to this study, almost half of the current jobs in the United States could be automated. Homing in to our own field, the probability of automation for "geoscientists" was found to be a less-than-reassuring 63%; a whopping 91% for "geological and petroleum technicians;" and a measly 1.4% for "hydrologists." However, my economist acquaintance points out at that "just because the specific tasks of one job are automated away doesn't mean that other jobs adjacent to it aren't. Further, because those tasks performed by the robots are now much cheaper, the sectors dependent on those tasks now have much lower costs, meaning more expansion, meaning more jobs."



Screenshot about geoscientists from WillRobotsTakeMyJob.com

The huge differences in estimated automation risk surely result from the "occupational characteristics" (or typical job duties) that the study assigned to these roles (which will likely

Continued on p. 47

another geologist noted: "However, all we need to do is to adapt the training or education" to the needs of "other, newly emerging and exciting fields in the geosciences."

On the positive side, the BLS (U.S. Bureau of Labor Statistics estimates 14, 16, and 10 percent growth in jobs over the next decade in the previously-mentioned specialties of geological technician, petroleum technician, and hydrologist respectively (as against average expected growth of 5 to 9 percent in the typical profession). Less positively, together, these automation and job growth numbers seem to indicate that we'll see large numbers of geoscientists hired in coming years—just in time for them all to be automated! However, my view is that these numbers hint at forthcoming changes in the roles of geologists and geoscientists. The geologist of yesteryear may well be automated, leaving tomorrow's geologist employed; indeed, the role of geologist has changed over the ages: in Hutton's time, for example, nobody cared about groundwater remediation!

In my own optimistic view of things, automation could farm out the routine, mundane, and repetitive to the robots, freeing humans to focus on the more "fun" work. In fact, when I told my manager about my work on this article, she slyly asked whether I was going to mention my own attempts to automate myself, as I have been writing scripts to streamline certain repetitive, labor-intensive processes (with one large exception—reviewing data for errors and inconsistences). My script takes care of the monotonous task of one part of manually running certain routine tasks and models, leaving the scientists room to interpret results.

In closing, one respondent summarized the automation debate as follows: "Over the long term (multiple decades), ideally automation would free up practicing geologists to do more creative work more of the time; but the devil is in the details (and in what gets the emphasis), and if change is driven purely by commercial and/or administrative forces then the implementation of automation conceivably could lead to a new, unwelcome yoke around the neck of working professionals. Like all technology, automation itself is neither good nor bad; how it becomes applied in practice is the issue." Indeed, the future is yet to be written, and our decisions will determine whether automation raises all boats or merely sinks a few. Little wonder, then, why at least one older colleague of mine calls my hopeful outlook the naivety of youth. However, one thing is certain: change is coming.

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