

Audrey Vaver  
November 14, 2018

### **STS & The Passage of Time:**

#### A Historical Analysis of Both Positive and Negative Social Responses to Changes in Science and Technology

When we compare what the world was like hundreds of years ago to how it is today, we can see how many changes have occurred in both the way we live and the physical world itself. But although the world is dynamic and ever-changing, the human desire for knowledge has remained constant, and with that desire comes innovations in science and technology. Today, the term “technology” yields the specific image of smartphones, space crafts, and other high-tech gadgets, and while these devices have increased our efficiency and ease of life, they’ve also undoubtedly complicated our society and brought about some irreversible problems. However, even though we didn’t start seeing that type of technology until the late twentieth century, innovations in science even hundreds of years ago have created this very same issue, even if the definition of “technology” was very different than it is today. For example, the introduction of heliocentrism as a replacement for geocentrism was immediately rejected by society. Now, we can’t picture our solar system being set up any other way, but when Copernicus suggested that idea, it was difficult for society to grasp a complete change in our perception of the universe, even if he was right. We also see this pattern of science-induced culture shock when Darwin published his theory of evolution. While his discoveries opened the floodgates for the study of genetics, it also sparked controversy in those who believed in Creationism, thus creating a great deal of conflict. Moving into the twentieth century, the creation of the assembly line and mass production were instrumental in industrializing the nation, yet skilled workers were undermined

by unskilled workers, and the quality of American-made products declined. Each of these examples demonstrates how scientific discoveries and technological innovations incur tremendous controversies in both the past and the present.

An early example of science catalyzing controversy is in the fifteenth and sixteenth century with Copernicus and his theory of heliocentrism. Around this time, the world was focused on metaphysics, with some of the most famous scientists being Galileo, Tycho Brahe, Johannes Kepler, Leonardo Da Vinci, and Rene Descartes, all of whom were concerned with the greater universe. Before Copernicus proposed the notion that the earth revolves around the sun and not the other way around, the Catholic Church was a dominant force, and scientists were fearful to publish any discoveries that contradicted the Church's beliefs. In fact, the Church threatened Galileo and other astronomers so that the Church could maintain a strong following. While the Church wasn't necessarily concerned with the discoveries themselves, they did recognize that if the public was educated on the true nature of the universe, they would worship the scientists instead.

But even if the Catholic Church wasn't a threat, it was difficult for society to grasp the notion of heliocentrism anyway. In addition to the desire for knowledge, another innate human characteristic is the desire for logic. We, as humans, need clear and sound explanations for everything in order to believe them, which is why no one had proposed heliocentrism earlier. It didn't make sense that the sun would be the center; everyone saw the sun rise on one side of the horizon and set on the other, thus demonstrating how the sun is revolving around the Earth. Copernicus also did not have an extensive educational background, giving people no reason to believe in his theories. Nonetheless, they were true, and the discoveries made by Copernicus

catalyzed immense progression in astronomy, thus changing our perception of the universe forever.

Another example that comes to mind is Charles Darwin and his theory of evolution. Darwin's theory stated that all living creatures evolved from an earlier version of that creature, including humans. This, of course, challenged creationism, which stated that living creatures are a part of God's creation, as written in the Bible. As time went on, society became more accepting of evolution as more evidence was released. Today, in public schools across the nation, students are taught that modern-day humans evolved from primates; but it took time for society to adopt evolution as a replacement for creationism. In fact, evolution's path to becoming widely accepted was long and winding. The Butler Act of Tennessee, for example, outlawed the teaching of human evolution in 1925, and the Supreme Court didn't deem the outlawing of evolution unconstitutional until 1968.

The conflict between evolution and creationism is a clear example of a negative societal reaction to a scientific innovation. Although there was strong evidence for evolution, such as fossils that clearly display different stages of a species, there were a great deal of people who believed that God created everything on Earth, thus displaying how the personal beliefs of members of society at this time got in the way of the progression of science. What Darwin discovered was an incredible scientific feat; finally scientists had legitimate and tangible evidence for how we came to be, but even today there are still people who reject the theory. Although this discovery was a monumental moment in scientific history, the backlash from those who believed in creationism prevented the spreading of the idea, ultimately resulting in a smaller

percentage of people learning evolution than there could've been if the innovation hadn't caused conflict.

The previous two examples demonstrate this dilemma in an indirect way. Here is where we must distinguish between science and technology. Since Copernicus's theory of heliocentrism and Darwin's theory of evolution were scientific discoveries, and not technological innovations, they only changed our perception of the world. Technological innovations, however, change the way we live, causing more tangible externalities than a scientific discovery. With Darwin's and Copernicus's theories, the negative effects stem from society's initial reaction toward their discoveries. This is not necessarily permanently harmful, but a lack of disbelief in a scientific discovery can prevent further development of the discovery if it receives significant backlash. While eventually the negative effects mostly faded, the negative effects of a technological innovation are much more permanent, and therefore more dangerous to society.

One technological innovation that changed our way of life was the introduction of mass production. Mass production was introduced in the nineteenth century, where skilled workers were replaced with machines and unskilled workers who would make the production process much more efficient, thus causing the economy to boom. Suddenly, people who were unable to receive training and education had more accessibility to jobs, causing unemployment to plummet. The technology created during the industrialization of America was instrumental in the progression of the nation in terms of its efficiency and its economy. However, the negative impacts of industrialization and mass production are often overlooked. Factories allowed unskilled and uneducated individuals to work, but skilled workers were no longer valued by society, thus reducing the incentive to earn an education. Additionally, workers operating the

machinery were easily replaceable, and as a result the foremen gained significantly more power, forcing workers to unionize. The quality of the products produced by machinery in production lines was also sacrificed, and companies became more focused on earning as much money as possible instead of putting out a high quality product.

Mass production is a system we still practice today, and we have become incredibly reliant on our factories in order to fuel our capitalist economic system. Another technological innovation we rely on heavily is our smartphones and smart devices. Smartphones are the perfect representation of our digital age; they are sleek, compact, and have endless capabilities, allowing us to perform our daily tasks faster than ever. But smartphones also take away our incentive to learn for ourselves. A commonly asked question today is, “why do I have to learn how to do that if I can just look it up on my phone?” The usage of technology in the classroom can save paper and time, but it can also be a large distraction and sends the message that technology must be used in every aspect of our life. Our phones are also vessels for bullying; they provide a way for people to act without seemingly any consequences. Clearly, there are many consequences of smartphones, but it’s also clear that now we will never be able to survive as a society without them.

While science is often used as an umbrella term, a scientific discovery produces quite different results from a technological innovation. A scientific discovery is simply new information found through science that tells us more about our world. A technological innovation, however, specifically affects the way we act, as it is something we use. Both mass production and smart devices show how once a technological innovation has been integrated into our daily lives, there is no going back. With scientific discoveries, there’s no way of

“unknowing” something, but a discovery just teaches us about the world; excluding society’s reactions, there’s no negative effect of simply learning more about something. Technological innovations, however, change the way we act, which can have significantly more effects on our environment, our behavior, and many more factors. In fact, our desire to innovate and constantly improve can blind us from the negative effects, causing irreversible damage.

But sometimes, technological innovations and scientific discoveries catalyze each other. A technological innovation can lead to a scientific discovery, and a scientific discovery can lead to a technological innovation. For example, the increase of factories as a result of mass production caused an increase in our usage of fossil fuels and therefore more pollution. Also, the products produced in those factories are made of plastic, which ends up in our oceans and landfills. Smartphones are made of materials that cannot be recycled, thus adding to the problem even more. With the effects of these innovations, scientists noticed unusual changes in our environment, like heat waves, rising sea levels, coral bleaching, and cold spells. An investigation of these effects led to more discoveries about how our planet reacts to our actions, and the result of that investigation is what we now call Global Warming. Here, we run into the same issue that Darwin and Copernicus experienced with their discoveries: there are people who don’t believe in Global Warming, and if they don’t believe in it, they won’t do anything to solve the problem. With heliocentrism, it seems impossible that people didn’t believe Copernicus, as it seems like it’s common knowledge that the planets revolve around the sun, and not the earth. This is also where we can see an example of history repeating itself. Similar to the examples involving Copernicus and Darwin, Global Warming is a theory that society is reluctant to accept, and that lack of acceptance prevents us from actually solving the problem.

On the topic of Global Warming, we can also see an example of a scientific discovery catalyzing a technological innovation, and we can see an example of where a technological innovation isn't necessarily negative. Once scientists learned that our consumption of energy is significantly detrimental to our environment, focus turned toward solar, wind, and hydro energy as a replacement for fossil fuels, and we also started producing electric cars. Here is an example of a positive use of technology; the reason this technology was created was to solve a specific problem where the usage of the technology can only be positive. While there are clearly many negative effects that result from technology, technology that is created for specific fields, such as medicine and the environment, are mostly, if not only, beneficial to our society.

There are even examples within popular culture that show the negatives of technology. Mary Shelley, for example, focused on this theme in her novel *Frankenstein*. In the book, Dr. Frankenstein creates life using science, a brand new discovery. However, his creation was immediately rejected by society, and many problems result from the discovery. Although this book was written many years ago, it shows the timelessness of this dilemma. It also shows the irreversibility of scientific discovery; once a discovery is made, there is no turning back. Another example of popular culture referencing the downsides of technology is the television show "Black Mirror," which describes many fears associated with technology and the future. These two examples show that there are in fact people who are concerned with our transition into the future, even if they're only expressing their concern for the purpose of entertainment.

So now, we are left with an important question: what is the solution? So far, we have made a clear distinction between a scientific discovery and a technological innovation, and although they yield similar results, both should be handled in completely different ways. But for

each, the first step to a solution is to recognize the pattern in history of science and technology causing societal damage. This has been such a problem for as long as humans have been innovating, which can only mean it is destined to continue, and the issue may even heighten with the advanced technology we see today. For scientific discoveries, evidence from the past demonstrates how sensitive the general public is to new information, so it must be released with thoughtfulness and care. Likewise, the general public should also be more open to receiving that information; sometimes our skepticism can hold us back from progressing in the right direction. For technology, on the other hand, just because we have the ability to produce a new device doesn't mean we necessarily should. Technology that is more tailored to a specific field, like medicine or the environment, will be much more beneficial in the long run as it produces fewer negative externalities. But who's to say there even is a solution? It is often the case that we have no idea how society is going to react to either a scientific discovery or new technology. There's also a chance that as technology continues to become heavily integrated into our world, we grow and change with it, eliminating any problem. We might become so reliant on technology that we need it to survive, but that might not necessarily be a bad thing. The fact of the matter is that we are growing into a world of digital, and using that digital power to help the struggling aspects of our society can significantly improve our quality of life, but overlooking the potential consequences can become severely detrimental, and will cause our world to suffer.



### Works Cited

1. Berra, Tim M., and William V. Mayer. "Darwin and the Theory of Evolution." *The American Biology Teacher*, vol. 43, no. 4, 1981, pp. 205–205. *JSTOR*, JSTOR, [www.jstor.org/stable/4447223](http://www.jstor.org/stable/4447223).
2. Donley, James G. "Seeds of Mass Production." *Scientific American*, vol. 146, no. 4, 1932, pp. 230–231., [www.jstor.org/stable/24965903](http://www.jstor.org/stable/24965903).
3. Heller, Henry. "Copernican Ideas in Sixteenth Century France." *Renaissance and Reformation / Renaissance Et Réforme*, vol. 20, no. 1, 1996, pp. 5–26. *JSTOR*, JSTOR, [www.jstor.org/stable/43445785](http://www.jstor.org/stable/43445785).
4. Miller, Geoffrey. "The Smartphone Psychology Manifesto." *Perspectives on Psychological Science* 7, no. 3 (2012): 221-37. <http://www.jstor.org/stable/41613560>.