
Science and the Idea of Progress

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The history of science, wrote George Sarton in 1936, is “the only history which can illustrate the progress of mankind.” Sarton is widely regarded as the founder of the discipline of the history of science, and his passionate advocacy for the discipline was premised on an unwavering belief that the spirit of human progress was embodied in modern science. Many would concur with Sarton’s assessment and it is certainly difficult to imagine what human progress would look like without the key ingredient of modern science. That, however, is the issue that I wish to explore. Is science the only human endeavor that manifests tangible progress? Can we imagine what progress might look like in the absence of something like science?

The obvious place to look for an answer to this question is the period before the emergence of modern science. (We could also look to non-Western cultures.) Here we encounter a rather different conception of progress and, indeed, of “science.” When medieval thinkers spoke of progress what they had in mind was the moral development of the person. “Progress” consisted in the cultivation of the virtues and a movement towards personal fulfilment. Scientific activity was understood under this rubric, with science typically thought of as a capacity possessed by individuals. It was an “intellectual virtue” that consisted in the ability to arrive at scientific conclusions. As the thirteenth-century philosopher and theologian Thomas Aquinas explained: “science can increase in itself by addition; thus when anyone

learns several conclusions of geometry, the same specific habit of science increases in that man.” Scientific advancement, in other words, consisted in personal accomplishment achieved through practice in the relevant activity. It was not the case, then, that pre-modern versions of science (along with their equivalents in non-Western cultures) had strived to be progressive but had consistently fallen short. They were successful in their own terms. However, early modern Europe saw the appearance of a different idea of progress, one that came to be embodied in the new sciences. We now take this latter idea of progress so much for granted that it can be difficult to envisage societies and historical eras that entertained goals different from ours.

The older understanding of “progress” remained influential even after the birth of modern science. John Bunyan’s best-selling *The Pilgrim’s Progress* (1678) exemplifies the way in which progress could still be related to the religious and moral formation of the individual, and to their personal history. It tells of the “progress” of the allegorical figure “Christian,” who is making his way from “this world to that which is to come.” That said, during the seventeenth century this conception of personal progress began to give way to a new understanding that emphasized the impersonal and cross-generational accumulation of knowledge. The development of the individual became model for the development of the whole human race into a kind of historical adulthood. The French philosopher, scientist, and theologian Blaise Pascal (1623–62) offered this insight into how the two ideas of progress were initially linked: “not only does each man advance from day to day in the sciences, but all mankind together make continual progress in proportion as the world grows older, since the same thing happens in the succession of men as in the different ages of individuals. So that the whole succession of men, during the course of many ages, should be considered as a single man who subsists forever and learns continually.” This was an idea of progress that transcended the individual and applied to the whole of society. It also entailed the view that long-term, cumulative, historical progression was possible.

At first this new notion of progress retained a close connection to virtue and morality. Francis Bacon (1561-1626), who powerfully influenced the fortunes of the new sciences of his age, was a prominent advocate of “the advancement of learning” as he called it. Bacon argued that charity—the greatest of all the Christian virtues—could be understood not only in terms of personal moral development, but also as the promotion of the welfare of the whole of society. The new sciences were to be enlisted in this moral vision as providing the practical means by which charity could be enacted. Science was to be directed towards “the benefit and relief of the state and society of man”. This became a common theme among supporters of the new science and, later in the century, of the newly founded Royal Society. Science, one apologist for the Society wrote, aims at the “*Invention of Arts, and Helps for the benefit of Mankind.*”

Aside from its original religious motivations, all this may seem rather obvious—the application of science to promote social goods. But the idea that knowledge should be applied primarily to the aggregate welfare of the human race remained controversial. Critics of the new science argued for the traditional view that the primary goal of learning should be moral and spiritual formation. They often maintained, with some justification, that the much-vaunted experimental science had failed to produce much by way of practical benefits anyway. Jonathan Swift’s well-known lampooning of the Royal Society in *Gulliver’s Travels* (1726) thus represented a standard line of criticism that dated from the very founding of the Society in 1660. The Royal Patron himself was said to have “laughed mightily” at the experimental endeavors of the fledging society, which seemed to consist in such frivolous and undignified activities as “weighing air” and gratuitously vivisectioning harmless animals. Experimental science was widely alleged to be “useless” in comparison to more traditional learning. The latter had more elevated goals and every prospect of accomplishing them.

Things have changed. Looking back on these developments from the vantage point of the nineteenth century, the eminent historian Thomas Macaulay perceptively characterized the new scientific movement in

two words: “Utility and Progress”. The ancient and medieval approach, by way of contrast, “disdained to be useful, and was content to be stationary. It dealt largely in theories of moral perfection. It could not condescend to the humble office of ministering to the comfort of human beings.” All true, but from the perspective of antiquity and the Middle Ages the focus on personal virtue was the correct one. Moral rectitude had a direct bearing on one’s eternal destiny. This was vastly more important than devoting disproportionate attention to the amelioration of temporary inconveniences that might attend the present life.

The new understanding of progress was novel not only in relation to what had come before, but also when compared to other cultures. This is not the place for a detailed cross-cultural survey on the idea of progress. But a cursory comparison of Western Europe to China is suggestive. For the millennium leading up to the twentieth century, the imperial examination provided the gateway to participation in the Chinese civil service and access to the highest offices. This examination called for knowledge of classical literature, poetry, and religion, and offers a window into the cultural priorities of Chinese society. The situation was to change only in the late nineteenth century when critics charged the examination system, and the priorities that lay behind it, with having stifled scientific and technological progress. It might be said that the apparent “failure” of Chinese society to develop modern science—a question that has long exercised historians of science—was less to do with a lack of capacity, and more to do with a set of social values that ranked moral, religious, and literary accomplishments ahead of technological advancement. It was not so much that China could not “do science.” Rather, they chose not to. This had been true of the West, too, until the seventeenth century pivot away from understanding progress in terms of piety and personal morality.

These early modern transitions might appear to portend a departure from religious preoccupations: a step towards the secularization of knowledge and learning. Thomas Henry Huxley, the fierce nineteenth-century advocate for natural science, and Darwinism in particular, saw it this way. Science had been inhibited by the “diversion of men’s

thoughts from sublunary matters to the problems of the supernatural world suggested by Christian dogma in the Middle Ages.” Knowledge had “dammed up for a thousand years” with the levee finally breaking in the seventeenth century. However, this now common view fails to appreciate how important religious considerations were in providing the values and narrative needed to secure the social legitimacy of the new approaches to nature.

Initially, the momentous changes that took place during the period of the scientific revolution depended crucially on the harnessing of a range of theological principles. Again, Francis Bacon offers a good example of how this was accomplished. Firstly, the benefits conferred by the sciences were to be understood as Christian charity in action. No longer merely a virtue to be cultivated by the individual, charity began to be understood in its modern sense as an activity devoted to the provision of social benefits. Robert Boyle, the pioneering experimentalist and leading figure in early Royal Society, also promoted this principle, proposing that natural science was a pious activity that conferred knowledge of God through the study of his works. Subsequent application of this knowledge to practical concerns amounted to Christian charity in action. For Boyle, science thus embodied the summation of the biblical commandments: Love of God, and love of neighbor.

The new sciences were also allotted a role in the history of redemption and promoted as the means by which a fallen humanity could re-establish its lost dominion over the natural world. Alluding to the biblical story of the fall of Adam and Eve, Bacon observed that through sin and disobedience, the human race had lost both its moral integrity and its control over the natural world. Religion was charged with the restoration of the moral losses, while science was to provide the means by which control over nature could be re-established. In this sense, science was to partner with religion in a unified redemptive endeavor. This became a common theme in defenses of experimental science and of the activities of the Royal Society.

Related to the idea of science as a redemptive enterprise was an understanding of the scientific revolution as an historical event destined by providence to accompany the religious reforms of the sixteenth century. The Protestant Reformation became the model for a more general reformation of learning. Bacon wrote that “it was ordained by the Divine Providence” that both religion and the sciences would undergo a reformation. Protestantism also played a key role in critiquing the medieval ideals of the cultivation of virtue. It was not so much that being virtuous was a problem, but rather that medieval Catholicism (for Protestants at least) had placed too great an emphasis on the virtues. This led to the view that one’s salvation was dependent upon whether one was morally good and how much effort was expended on self-improvement. Against this, Protestant reformers alleged that individuals were saved in spite of their sinful condition, and that personal attempts to be good were ultimately of little avail in securing salvation. However, by downplaying the role of the moral industry of the individual this theological stance inadvertently promoted the new conception of progress, now relocated from the circumscribed sphere of individual morality into the realm of history and society.

We can draw the conclusion that initially the new idea of historical advancement by means of science came about not through a wholesale abandonment of moral and religious considerations, but rather because of a revised understanding of moral progress and of the historical workings of providence. What follows from all of this?

At the outset we might observe that one consequence of these developments is a shifting of the goalposts in relation to what counts as “useful” knowledge. The fledgling natural sciences once had to justify their utility in moral terms that were the home ground of “the humanities” (to use a somewhat anachronistic category). Clearly a great reversal has taken place. The present plight of the humanities, widely regarded by advocates and critics alike to be suffering a crisis of legitimacy, is not unrelated to the post-seventeenth century changes in our understanding of what forms of knowledge are useful. The

genealogy of this modern idea of progress also points to the fact that the predicament of the humanities is connected to processes of secularization.

A related legacy of the modern understanding of scientific progress is a present tendency to focus on those challenges that are susceptible to scientific solutions, evincing the truth of the maxim that to the person with a hammer, every problem looks like a nail. The spectacular success of the sciences can inadvertently promote a situation that preferences only one kind of problem, or one dimension of a problem. Accompanying this is a tendency to assume that every problem has a scientific solution. In response to the Covid-19 pandemic, biomedical scientists did a remarkable job of producing safe and effective vaccines in an astonishingly short space of time. Persuading people to be vaccinated, however, turned out to be less straightforward, requiring ways of addressing complex questions to do with truth, trust, values, and human identity. In addition to the disciplines that offer explanations and applications, we also need those that enable us to interpret and understand human behaviors. Scientific advances do not take place in a social vacuum.

A third problematic aspect of the advance of modern science relates to the environmental crisis. There is a growing realization that some aspects of the prevailing narrative of progress are deeply implicated in global climate-change. There is an obvious sense in which this is true. Rising standards of living, enabled by scientific and technological advances, have depleted natural resources and contributed to environmental degradation. But there is a more subtle way in which our positive appraisals of science and its accomplishments have a downside. Unquestioning confidence in the problem-solving capacities of science can paradoxically promote a failure to give proper weight to predictions about the future that are based upon best-practice scientific modelling. It turns out that a strong faith in science can lead to complacency about global warming. Psychologists have spoken in this context about “compensatory control theory.” But we don’t need a fancy psychological theory to understand that it is convenient to imagine that science will solve our problems if the alternative requires

us to make difficult changes to the way we do things. Some governments have accordingly factored into their emissions reduction targets unspecified and yet-to-be-developed “new technologies” that are still well over the horizon. Again, less attention has been paid to ways of effecting behavioral change and managing the social transitions that will necessarily attend the path to carbon neutrality.

Finally, there is an interesting parallel here between faith in science and faith in a providential Deity, with some religious constituencies reasoning analogously that God will avert any impending environmental catastrophes. US congressman Tim Walberg has declared that: “As a Christian, I believe that there is a creator in God who is much bigger than us. And I’m confident that, if there’s a real problem, he can take care of it.” While this faith commitment may seem fundamentally opposed to faith in science, there is a historical connection that goes back to the original religious legitimation of science in the seventeenth century. A providential view of history was one of the factors that helped establish the social legitimacy of the new science in the first place. Belief in providence was directly aligned with belief in the value of science. Counterintuitively, some social-scientific studies suggest that faith in the power of science to do good is positively correlated with religious faith.

What constitutes progress, in sum, is not as straightforward as it may at first seem. Thinking about alternative conceptions of progress helps place our present assumptions into historical perspective. Crucially, commitment to the idea that science makes progress needs to be tempered by the realization that not all values can be reduced to scientific ones and there are limits to what science alone can accomplish. This is perhaps something we can learn from our medieval forebears: some problems demand moral solutions.

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