

# Science and the Idea of Progress

David Glasner

FEW IDEAS ARE MORE ESSENTIAL to Western Civilization, its past, present, and future, than the idea of progress. And no field of human endeavor is more central to the idea of progress than the enterprise of science. Indeed, science and progress are so closely related in practice and in concept that we can scarcely think of one without immediately calling the other to mind. So, standing at the beginning of a new century and a new millennium, anyone who cares deeply about this civilization of ours and its fate in the next hundred or thousand years or even longer is bound to give some thought to science and its future progress.

In thinking about progress, one must also recognize how fraught with ambiguity that idea now appears to us. We certainly continue to believe and expect material progress in objective, conventional measures of human well-being, like wealth, output, population, and life-expectancy. But seemingly fewer people accept today that those conventional measures are the only, or even the best, ways by which to gauge human progress than were prepared to do so, say, at the turn of the last century or of the last half

century. Of course, one might point to our own more nuanced conception of the idea of progress as itself a reflection of progress of a certain kind. But that caveat would serve only to underscore the very ambiguity to which I am calling attention.

To speak about progress is implicitly to posit a destination towards which we are progressing. But to speak about any such destination for a civilization presumes a consensus about values that not only does not, if ever it did, exist any longer, but that may well be inconsistent with the very idea of a civilization or a Great Society that develops precisely because it sustains and nurtures a complex network of cooperation and interdependence without any agreement among its members about ultimate values. This conception of civilization, the most thoughtful articulation of which is to be found in the works of F. A. Hayek, but is by no means confined to him alone, renders application of the idea of progress in relation to society and civilization so problematic as to verge on meaninglessness.

We have, over the course of the past two or three centuries, become so accustomed to rapid material progress that we now take it more or less for granted as a necessary and inherent feature of our external environment, and, indeed, now

---

DAVID GLASNER is the author of *Free Banking and Monetary Reform* (Cambridge University Press) and the editor of *Business Cycles and Depressions: An Encyclopedia* (Garland).

regard it as an entitlement for which any lapse of realization someone, presumably a high government official, must be held accountable. But it has, alas, become increasingly plain that in all too many fields of human endeavor progress is far from inevitable. It could easily be argued that in many not insignificant areas of life we have for some time not been witnessing progress or even stagnation, but decadence, degeneration, and head-long retrogression.

While it is true that there is no accounting for tastes, who among us would care to argue that the popular, middle-brow, or high culture of the present age constitutes an advance over the popular, middle-brow, or high culture of a century ago? Consider some relevant comparisons. We only just observed in 1997 the centenary of Brahms's death. The population of the world has increased by 500 percent in the intervening century. Has this century produced any composer whose comparison to Brahms could provoke anything but derision? Charles Dickens died in 1870 at the age of fifty-eight. By the time he was fifty he had published almost all his great novels. A stupendous accomplishment. Leo Tolstoy died in 1910 at the age of eighty-two. Which author born in this century has made a contribution to literature that could even remotely be compared to those of Dickens and Tolstoy? One name comes to mind: Aleksandr Solzhenitsyn. But for all his heroism as an individual and the singular role he played in opposing Soviet tyranny, there are few who would rate any of his works as even approaching those of his great countryman, or those of Dickens, or, for that matter, any of the other great nineteenth century novelists, Thackeray, Eliot, Trollope, James, Hugo, Proust, Dostoevsky, or Turgenev in literary value. Or, to turn our attention to another area of creative endeavor, what twentieth-century artist, with the possible exception of

Pablo Picasso, could bear comparison with the artistic giants of the late nineteenth century, the French Impressionists, Gauguin, van Gogh, *et al.*?

Again, matters of aesthetic taste and judgment are notoriously difficult to resolve in any satisfactory way. Certainly it would be difficult to persuade anyone who believed otherwise that the arts have not progressed in the course of the last century. But it seems undeniable that there are ample grounds for arguing that the past century has produced not musical, literary, or artistic progress, but a palpable retrogression.

Nor are the signs of retrogression limited to the aesthetic realm. Signs of what many would regard as social decay abound; increases (until recently) in violent crime, a general breakdown in the family, increases in births out of wedlock, and a glamorization of violence and pornography are deeply troubling to a wide section of the public. There is undeniably a widespread unease with the direction in which modern culture, in the most comprehensive sense of the term, has and continues to develop. Ours is a culture that is getting less and less serious, more and more superficial, less thoughtful, more violent, and more intent on shocking our sensibilities simply for the sake of shocking our sensibilities. Can anyone imagine, to take a more or less random example, the reaction even a generation ago to the violence and brutality routinely portrayed on what has now become the most popular genre of cable television entertainment—professional wrestling?

It is sobering to note that in the sixteenth century, an early exponent of the modern idea of progress, Jean Bodin, could cite as an example of European progress beyond classical civilization, not only in material wealth, science, and technology, but also in moral rectitude, the disappearance of gladiatorial combat that had been the leading popular

entertainment of the Roman empire. While professional wrestling has yet to sink to the level of gladiatorial combat, can one say that the growing popularity, profitability, and increasingly mainstream public acceptance of an entertainment form that had long occupied a marginal and disreputable niche on the boundary of sport, entertainment and sideshow are other than huge steps backwards towards a not so glorious past that it used to please us to think we as a civilization had outgrown?

In his classic work on the idea of progress, J. B. Bury linked its early articulation in the sixteenth century and its rapid acceptance in the next two centuries to the emergence of the rationalist view of the world whose rise culminated in the eighteenth-century Enlightenment, and remains the dominant influence on Western thought. The rationalist world view holds that all problems, theoretical and practical, scientific, technological, moral, economic, or political can be solved by the conscientious application of reason. The rate of progress therefore depends primarily on the extent to which reason, as opposed to superstition or unquestioned authority or unexamined tradition, holds sway over the minds of men. Only as people finally freed themselves from the thrall of superstition, tradition, and authority, and began instead to deploy their own reason, could science and knowledge and creativity of all kinds begin to progress rapidly. And with the progress of knowledge and science, the apostles of rationalism anticipated further progress in all areas of human endeavor, in human conduct, and in the social arrangements governing that conduct. Dispelling the darkness cast by ignorance, superstition, dogmatic faith would allow mankind to clear away the obstacles of tradition and authority and oppression that had for so long blocked progress toward a better, freer, more humane, more glorious future.

Nor was it enough simply to apply reason to the solution of problems; reason had to be applied in the appropriate way, using the proper method. Two paradigms in particular were proposed. One was the pure observational method of Bacon, which held that from an accumulation of observations, the true laws of science could be inferred by a process of induction. The other was the pure deductive method of Descartes. From an unquestionably true premise, all knowledge would follow with logical certainty. These two ostensibly rational methods were almost diametrically opposed, but both were supposed to provide the unerring means for rejecting error and discovering truth.

Looking back from the privileged perspective provided by four centuries of hindsight, one is struck by the almost quaint charm of this naive faith in the ability of pure reason to arrive at truth if only it could be harnessed to the proper method of application. Unfortunately, our appreciation of this charming naiveté is muted by the early rationalists' overbearing dismissal of all conflicting opinions as mere expressions of benighted ignorance or superstitious prejudice.

With so much irrational error and entrenched folly to expose and eradicate, the triumph of reason was not generally expected to be complete for a very long time. But as inherited errors gradually receded before the triumphal advance of reason, progress was the necessary and inevitable consequence. And just as the application of reason had overturned inherited errors and prejudices about the nature of the physical world, so, too, would the application of reason to the study of history and society sweep away the inherited errors, prejudices, and injustices that had for so long afflicted mankind. Rousseau's *Social Contract* (1762), for example, was said by Taine to have reduced political science to the strict application of an elementary axiom

that rendered all study unnecessary. So reason became the instrument not just of understanding, but of reform (or, for those so inclined, revolution) and reconstruction.

Thus, in the Age of Enlightenment, it was possible to believe in progress and its inevitability, because progress seemed to be the necessary consequence of the discovery of truth, which, itself, was the inevitable result of the methodical application of reason. That there was any ambiguity in the notion of an objective, rationally discoverable truth was an idea that could not have found a receptive audience among either those who believed in the existence of a Revealed Truth in the word of God as recorded in the Holy Scriptures or those who believed in a rational orderly universe governed by rational laws of nature. The existence of rational orderly laws of society and morality seemed a truth no less self-evident. "Two things," wrote Kant, "fill the mind with wonder and awe...the starry heavens above me and the moral law within me."

The rationalist vision of steady progress towards the ultimate goal of absolute, objective, and certain truth through the methodical application of reason is now understood to have been an illusion, though some recalcitrants may still cling tenaciously to a naive faith in the power of reason to unlock the secrets of creation and solve the dilemmas, riddles, enigmas and mysteries of the natural and moral orders. Why was it an illusion? At least two reasons come readily to mind.

First, there is no method for rationally proving with certainty any proposition about the physical world. Neither the inductive method of Bacon nor the deductive method of Descartes can, as a matter of simple logic, provide any such proof. Little more than a century after Bacon's death, David Hume effectively debunked the notion of induction. No number of observations of white swans

can ever prove that a black swan will never be observed, but if not, the whole Baconian empiricist project lacks a logical foundation. Similarly that other pillar of rationalist thought, Descartes's aprioristic belief that from an unquestionably true premise all knowledge could be logically derived, proved to be equally untenable. Purely deductive inferences provide no knowledge about the world not already contained in the initial premises from which they are derived. Descartes's was thus a pure bootstrap theory of knowledge.

Subsequently Immanuel Kant tried to explain the mystery of how, despite the logical infirmities of both induction and deduction, it had been possible to achieve the certain knowledge of the natural world that Newton had attained. Kant's answer was that this knowledge was a priori valid because Newton had imposed a priori laws upon nature. While Kant's explanation might have made sense at a stage in the development of science when it appeared that Newton really had articulated a true and potentially complete account of the natural universe (or at least the elements from which such an explanation could eventually be constructed), his explanation began to break down when scientists began uncovering more and more dissonance between their observations and the predictions implied by Newton's theory. Ultimately, when the facts stubbornly refused to conform to the a priori paradigm of Newton's theory, the Newtonian theory was overturned by Einstein's theory of relativity. Once the most successful scientific theory in history had been refuted, it was no longer plausible to argue that science has or will ever provide us with knowledge that is absolutely, let alone certainly and demonstrably, true.

Perhaps even more subversive of the rationalistic faith harbored by the Enlightenment philosophers in perpetual progress through the advance of knowl-

edge and discovery of truth, has been the gradual realization that moral dilemmas and conundrums are not necessarily resolvable by rational methods. No single moral theory—the greatest good for the greatest number or the categorical imperative—can provide a compelling answer to all questions of morals or values. On the contrary, we cannot avoid the inescapable conclusion that there is a plurality of moral values and no unique way of comparing them, for such a comparison would require some a priori valid hierarchy of values that simply cannot be discovered by means of any rational thought process. Indeed, the competing values are often simply not commensurable. No increase in our knowledge, no discovery of previously hidden truths, no speculative philosophical inquiry can enable us to compare choices and weigh alternatives that are sometimes tragic and inherently incommensurable, when one value may be obtained or realized only through the sacrifice or negation of another. Such choices are not and cannot be determined through the application of any set of rational criteria; they entail not the exercise of rationality, but an act of will, or, perhaps, a leap of faith.

How, for example, can one rationally choose between the ideals of the unity of mankind and its diversity? By what rational principle can we evaluate whether it is better for local communities to retain their distinctive separate identities or to become integrated and assimilated into a larger community and thereby lose some, perhaps much, if not all, of those unique characteristics and traditions that made the smaller community distinctive and unique? Is it better for us all to speak a common language so that we can understand each other better, or to retain our mother tongues passed down from generation to generation in which so much of our inherited wisdom and history and knowledge of ourselves is embedded? Mankind seems inevitably to be drawing

closer together, bringing formerly isolated communities into contact with larger ones, but smaller communities, when exposed to larger ones, are increasingly unable to withstand the centripetal forces exerted by the larger ones. This process seems inevitable, but is it progress? Perhaps. Is it necessarily a better state of affairs than the alternative? To venture an answer with any degree of assurance would be to betray pretensions to omniscience that no mortal could possibly justify.

While our faith in the power of reason to ascertain and demonstrate the transcendent truths governing the natural and moral orders of the universe has proved to be misplaced, the reaction against reason has called into question the notion that any such transcendent truths even exist. It is one thing to say that we can never know with certainty whether we have found the truth; it is quite another to deny that truth exists and that the idea of truth even makes sense. The first is what Learned Hand called the spirit of liberty, the second is the essence of nihilism.

The notion that objective truth not only is not demonstrable but does not even exist was once founded on the supposition that the concept of truth requires that it be demonstrable. How, it was asked, can it make sense to say that a statement is true if it is impossible to prove that the statement is indeed true? But that question confuses the correspondence of a statement with objective facts (its truthfulness) with the ability to prove that such a correspondence does in fact exist. A statement may be true independently of whether it can be justified.

This distinction provided by the logician Alfred Tarski seemed to provide a satisfactory defense of the concept of truth, but the concept was later challenged from a different angle. Interestingly, the challenge originally came largely

from a historian of science, T. S. Kuhn, and was later developed by the philosopher Paul Feyerabend. It has since become a staple of postmodernist thought about science. At any rate, the point is that there is no such thing as a purely objective fact, and that every observation is colored by some theoretical framework. There are no theoretically neutral, purely objective observations; they are all, to some degree, subjectively filtered (interpreted) by the theoretical presuppositions that underlie the very process of observation. If there is no purely objective, observationally neutral reality, then, it is argued, it makes no sense to speak of an objective truth, because to do so would imply that some subjective observations (or interpretations of sensory stimuli) are somehow more pure, more accurate, more authoritative than any other observations or interpretations. But there are no objective grounds on which to determine which observations or interpretations are most pure, most accurate, most authoritative.

What matters in science is thus not objective facts, but a consensus within the relevant interpretative community of scientists. Their interpretations, conditioned by the received paradigm in which they have been trained and in which they conduct their research, cannot be refuted by a supposedly objective reality, because all the facts that they observe will be viewed through the theoretical lens provided by the paradigm shared by the interpretative community. What matters to this community is not objective truth, but coherence between the paradigm and their interpretation of the facts that are relevant to an evaluation of the paradigm.

While this postmodernist critique of the notion of objective truth underscores the tenuousness of any appeal to objective facts in assessing truth claims made on behalf of a scientific theory, the critique is not fully persuasive. For in reject-

ing the notion of objective truth, the critique implies that coherence between a theoretical paradigm and the interpretations of the relevant factual conditions within the interpretative community is or can be made independent of the facts as they really are—*i.e.*, of the truth. But that is just not so. Merely because an interpretative community interprets facts through the prism of its own theoretical paradigm does not provide the group with unlimited degrees of freedom in interpreting those factual conditions. Interpreting facts in one way to make their observations cohere with their paradigm will constrain how the interpretative group interprets other observations relevant to the theory. We cannot choose our subjective interpretations willy-nilly and expect that nature will dutifully comply.

An objective external world necessarily imposes constraints on the interpretations that an interpretative community can place on factual observations. Unless a theory is objectively true, we cannot expect that all factual observations made in the light of that theory will turn out to be interpretable in a mutually consistent way. One might imagine that there could be multiple theories or paradigms in terms of which all potential observations could be consistently interpreted. However, it does not seem plausible to suppose that two or more theories could admit of two entirely consistent sets of interpretations of all relevant factual observations without being either equivalent, or special cases of a more general theory from which both, under appropriate assumptions, could be derived.

So it is, after all, still possible to conceive of science as a search for truth, that is to say a search for true explanations of an objective external world that exists independently of our sensory perceptions of it. We will never know, at least not by rational means, if our expla-

nations are really true, but it is still meaningful, postmodernist objections to the contrary notwithstanding, to think of science as progressing toward such explanations. However, even if it is still possible to think about progress in science as meaningful and real, which makes science nearly unique among fields of human endeavor, it also seems that, after a century in which science has progressed more rapidly than ever before in human history, the idea of scientific progress elicits less enthusiasm than it has at any time since the scientific revolution of the sixteenth century.

Why have we grown so uneasy about progress in science? Of many possible reasons I should like to discuss two. First, progress in science seems to be inextricably connected with and serves as a necessary condition for the material progress that has transformed modern society several times over and is now on the verge of creating for the first time in human history a truly global society. While the rise in living standards is generally, though not universally, welcomed, the effects of the improvement in living standards and the growth of population are not uniformly benign.

The environmental movement has, for example, focused attention on the destructive effects that economic growth and technological progress have had on our physical environment. We may agree or disagree with some or all of their specific concerns and the proposed remedies, as well as with some or all of the philosophical presuppositions underlying those concerns. But it is impossible to dispute that economic growth and technological progress can and often do have destructive effects on the physical environment, though there may be difficult questions about whether economic development generates sufficient benefits to compensate for the damage.

It is equally true, though perhaps less well understood, that there is an intan-

gible moral environment as well as a tangible physical one, and that the same process of economic growth and technological progress that affects, sometimes destructively, the physical environment may also have negative, even destructive, effects on the moral one. By a moral environment, I mean not just the moral values, principles, and rules that govern (at least, to some degree) how people conduct themselves, I mean also the institutions, arrangements, and relationships by means of which effective moral values, principles, and rules are developed, transmitted, and brought to bear on conduct. Social change of all kinds, especially the rapid social change produced by economic growth, tends to undermine not just traditional religious and moral values, but it also, and more importantly in the long run, erodes the network of stable relationships on which the transmission and the application of these religious and moral values largely depend. Stable relationships within communities and even families are subjected to severe, sometimes intolerable, stress by rapid economic growth, if for no other reason than that rapid growth frequently renders traditional communities economically unsustainable and thus provides a powerful stimulus to migration. This very migration produces social instability both in the areas from which and to which the migration occurs. Rapid social change, driven by scientific and technological progress, inevitably threatens the kind of community life in which traditional values are preserved, enforced, and transmitted.

But adding to the unsettling social instability that progress in science leaves in its wake, recent advances in genetics and genetic engineering are raising disturbing concerns about our power to use science not just to control our external environment but to control who and what we are, in short to recreate ourselves as individuals, even as a species. We are

now approaching a juncture in human history when the words of Genesis 3:22 begin to evoke in us a genuine sense of recognition, perhaps even a certain foreboding, never before experienced.

And the Lord God said: "Behold, the man is become as one of us, to know good and evil; and now, lest he put forth his hand, and take also of the tree of life, and eat, and live forever. Therefore the Lord God sent him forth from the garden of Eden, to till the ground from whence he was taken."

With science putting into our hands powers to recreate not just our environment but ourselves in ways that not so long ago we could not have imagined, and after the moral constraints that used to inhibit our conduct have lost their binding force, we cannot but tremble at what kind of a future we may be creating for ourselves and our children. More than ever before, it seems, we will create our own destiny. And our fitness to undertake such a responsibility would appear to vary inversely with our willingness to do so.

Of course, mere hand-wringing about the disruptive and potentially destructive effects of scientific and technological progress on our society and on our moral and physical well-being serves a decidedly limited purpose. And the last thing that I could hope for would be to live in a society in which individuals could not freely engage in one of the noblest of all activities—the quest to better understand the world in which we live in all its rich diversity and wondrous complexity.

However, I do believe that it is appropriate to question the extent to which the quest to understand has been tied and perhaps subordinated to an effort to control. One ought not indulge in excessively idealistic stereotypes, but the quest to understand, borne out of a sense of wonder and awe at the natural world of which human beings are merely a part, is a modest activity, both in temperament

and scale, while the effort to control is an aggressive and a grandiose one. Yet, the conduct of modern science is becoming increasingly just another aspect of modern large-scale enterprise. And the research decisions of individual scientists are increasingly responding not to the problems that appear most interesting and challenging to scientists, but to the demands of the corporate and governmental sponsors that provide so much of the financial support for scientific research. Big Science has become the handmaiden of Big Government and Big Business.

While to an economist, the idea that a demand for scientific research of a particular kind draws forth a supply is neither surprising nor disturbing, most economists, even those with a good understanding of and healthy respect for how well markets allocate scarce resources among the myriad competing claims for those resources, also understand that under certain kinds of institutional arrangements, markets may not function well. They may instead produce undesirable outcomes, especially when those outcomes have significant environmental spillovers that the relevant decision-makers have no incentive to take into account.

For a long time, it was taken for granted that economic growth was always desirable—and the faster the better. In the first full flowering of the environmental movement, two economists, E. J. Mishan and Fred Hirsch, offered dissenting views. But their concerns, though not entirely ignored, did not prove very influential over the long run. This was partly because so many neo-Malthusian concerns about the sustainability of growth proved to be so exaggerated, but the relevant concerns are fundamentally non-Malthusian. The focus of these concerns is on the toll that rapid economic growth takes on the moral environment—on the intangible infrastructure of relationships that

sustain and perpetuate the sense of moral obligation without which our lives become degraded and ultimately degrading.

The point is not to stop economic growth, any more than to stop the progress of science. But if the process of economic growth is inextricably related to what Joseph Schumpeter called creative destruction, is it not possible that we have not been fully cognizant of the intangible wreckage that has been accumulating for these past two centuries of breakneck growth? Hand-wringing, as I have noted, has a decidedly limited usefulness, so although I did wish to raise a point about the ill-effects of economic growth often overlooked, I should like to relate it in a practical way to the issue of progress in science.

If as I have suggested, Big Science has become the handmaiden of Big Government and Big Business, and we are now on a course of rapid technological advance and innovation that is not only socially disruptive, but is speeding us towards a brave new world for which we are in no sense of the word prepared, is it perhaps not time to think seriously about reducing drastically the level of governmental support for scientific, particularly applied, research? During the height of the Cold War, such research could be justified because it was necessary (a) for immediate national security and (b) to maximize our advantage over the Soviets in science and technology and in material well-being which indirectly enhanced our national security. With the disappearance of that overriding threat to national security, that rationale for government subsidies to science and technology has disappeared as well. Eliminating such support would permit the reorientation of scientific research toward smaller scale, more individualistic projects characteristic, until very recently, of almost all of the great discoveries in the history of science.

But the withdrawal of Big Government would leave Big Business as the dominant customer and financial supporter of scientific and technological research. A significant scaling back of Big Science will not occur unless corporate support is reduced as well. Much of what Big Business now spends to support scientific research is spent in the expectation that the research will result in the acquisition of valuable intellectual property—patents copyrights, trade secrets, etc. The economic and philosophical justification for extending such property rights to intangible intellectual assets was once controversial. The controversy ceased not because it was demonstrated that extending private property rights to intangible ideas was socially optimal, but because it seemed plausible that doing so would accelerate the creation of new ideas, which would in turn accelerate economic growth. No one really bothered to inquire whether economic growth could ever be too fast. And so the protection, and the enforcement, of intellectual property rights has become a sacred cow of modern economic and legal thought. But if the blessings of rapid economic growth are not as unmixed as we once thought, we ought to start rethinking how much legal protection ought to be provided to intellectual property, particularly through patents. A sharp reduction in the scope and stringency of patent protection, perhaps abolishing the right of corporations rather than individual inventors to own patents, might well have a salutary chilling effect on the support for Big Science provided by Big Business.

A policy that would slow down scientific research and technological development—research and development that would undoubtedly produce substantial benefits to large numbers of people—is unlikely to attract broad popular support and has no natural constituency whose material interest it would pro-

mote. A change in policy of this magnitude would obviously upset all sorts of highly entrenched expectations, and a substantial slowdown in the rate of technological advance and economic growth would require us to cope with all sorts of disagreeable side effects. We may have unwittingly entered into a Faustian bargain that makes it impossible for us to

shift to a slower rate of technological progress and economic growth than we have become accustomed to without incurring greater sacrifices than we are willing to bear. Our challenge in the coming century will be to find some way of coping with this dilemma. Before we can cope with it we must first acknowledge it.