

# IS NOT THE TRUTH THE TRUTH?

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Scientific research is based on the idea that everything that takes place is determined by laws of nature, and therefore this holds for the actions of people. For this reason, a research scientist will hardly be inclined to believe that events could be influenced by a prayer, i.e. by a wish addressed to a supernatural being. However, it must be admitted that our actual knowledge of these laws is only imperfect and fragmentary, so that, actually, the belief in the existence of basic all-embracing laws in nature also rests on a sort of faith. All the same this faith has been largely justified so far by the success of scientific research. But, on the other hand, everyone who is seriously involved in the pursuit of science becomes convinced that a spirit is manifest in the laws of the universe—a spirit vastly superior to that of man, and one in the face of which we with our modest powers must feel humble. In this way the pursuit of science leads to a religious feeling of a special sort, which is indeed quite different from the religiosity of someone more naive.” (Albert Einstein)<sup>1</sup>

When I heard the learn'd astronomer,  
When the proofs, the figures, were ranged in columns before me,  
When I was shown the charts and diagrams, to add, divide, and measure them,  
When I sitting heard the astronomer where he lectured with much applause in the lecture-room,  
How soon unaccountable I became tired and sick,  
Till rising and gliding out I wander'd off by myself,  
In the mystical moist night-air, and from time to time,  
Look'd up in perfect silence at the stars. (Walt Whitman)<sup>2</sup>

Modern science, like ancient Greek tragedy, sprang out of a human concern for autonomy. Dissatisfied with existing as an integral part of a mysterious and often absurdly cruel creation inspiring fear, wonder, celebration, contemplation, and worship, the human spirit rose in rebellion and demanded to take charge, to unravel the mystery, to control as much of human life as it could wrest from the gods and fate. About this the leading spokesmen of the new science were explicit: the aim was to make us “masters and possessors of nature” (Rene Descartes) and to endow human life “with new discoveries and powers”; “the furthest end of knowledge [is] . . .

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<sup>1</sup>*The Human Side: New Glimpses from His Archives*, edd. Banesh Hoffman, Helen Dukas (Princeton University Press, 1981, p.144).

<sup>2</sup>*Leaves of Grass*, 1865.

a rich storehouse for the glory of the Creator and the relief of man's estate" (Francis Bacon).<sup>3</sup> All we had to do was cast aside our concern with value and moral purpose (first causes) in order to concentrate on sense experience and mechanical explanations (secondary or efficient causes). How things worked was more important than why they mattered or what they were for, because the former opened the door to power over nature, whereas the latter merely produced more impractical piffle to gather dust on the shelf beside volumes of Aristotle.

The new quest for autonomy raised an obvious concern: Who or what will guide the project? If we divorce moral concerns from the enterprise in order to focus on power, where will that take us? The question prompted various responses. Galileo airily brushed it aside, and Bacon, like many of his English colleagues, fudged and took refuge in rhetorical appeals to variations of the design argument.<sup>4</sup> Descartes, the most philosophically astute of the bunch, famously divided the human being into a material body subject to mechanical laws and a spiritual soul concerned with matters of faith and purpose. These two interacted, in his view, via the pineal gland (which he chose because he could find no other use for it). His dichotomy defined a radically new relationship between the human mind and the natural world and handed down to posterity what is still the most pressing problem in biology and psychology, the nature of consciousness.<sup>5</sup>

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<sup>3</sup>Rene Descartes, *Discourse on Method* (1637); Francis Bacon, *Novum Organum* (1620), *The Advancement of Learning* (1605).

<sup>4</sup>"We need guides in forests and in unknown lands, but on plains and in open places only the blind need guides. It is better for such people to stay at home, but anyone with eyes in his head and his wits about him could serve as a guide for them" (Galileo, *Dialogue Concerning the Two Chief World Systems*, 1632); "It is an assured truth, and a conclusion of experience, that a little or superficial knowledge of philosophy may incline the mind of man to atheism, but a further proceeding therein doth bring the mind back again to religion; for in the entrance of philosophy, when the second causes, which are next unto the senses, do offer themselves to the mind of man, if it dwell and stay there, it may induce some oblivion of the highest cause; but when a man passeth on farther, and seeth the dependence of causes, and the works of Providence, then, according to the allegory of the poets, he will easily believe that the highest link of nature's chain must needs be tied to the foot of Jupiter's chair." (Francis Bacon, *The Advancement of Learning*, 1605). Design arguments, simply put, claim that empirically established patterns in the world enable one to infer the existence of some higher being who must have created the pattern (just as the existence of a complex timepiece seems to guarantee the existence of a watchmaker).

<sup>5</sup>By one of the most delicious ironies in the history of science, the home of Descartes' soul, his skull, was separated from what remained of his material body when his corpse was exhumed for the first time (in

Once these pioneers of modern science had sorted out an appropriate balance between hypotheses, experiments, observations, and mathematics, the new endeavour quickly won all sorts of adherents, often with the enthusiastic support of religious believers eager to use the new science to slake their unquenchable desire to prove the existence of God or, if that was beyond their reach, to foster religious belief in an increasingly skeptical age (usually by invoking the design argument). An additional attraction much discussed at the time was that encouraging people to think about the new science might well foster social harmony by taking their minds off potentially explosive and insoluble sectarian religious and political disputes and cleaning up the language of public debates.<sup>6</sup> The dreams of these early enthusiasts seem to have been fully realized with the publication of Isaac Newton's *Principia* in 1687: the universe was indeed a mathematically precise machine set in place and maintained in its present state by none other than God Himself.<sup>7</sup>

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Sweden in 1666) and, after many adventures, finally came to rest, still apart from the rest of his bones, in the Musée de l'Homme, where, now boasting a Latin inscription and a list of the names of former owners, it was put on display between the skulls of a Cro-Magnon caveman and of Lilian Thuram, a member of the 1998 French football team, which won the World Cup. See Russell Shorto, *Descartes' Bones*, Random House, 2008).

“A mischief by which the greatness of the English is suppress'd, is a want of union of Interests, and Affections . . . heighten'd by our Civil differences, and Religious distractions. For the sweetning of such dissensions, it is not best at first to meet, and convers about affairs of state, or spiritual controversies. For those did first occasion our animosities, and the more they are rubb'd, the rarer they will prove. But the most effectual remedy to be us'd, is, first to assemble about some calm, and indifferent things, especially Experiments. In them there can be no cause of mutual Exasperations: In them they may agree, or dissent without faction, or fierceness: and so from induring each others company, they may rise to a bearing of each others opinions. . . . Till at last by such a Gentle, and easy Method, our several Interests and Sects may come to suffer one another, with the same peaceableness as men of different Trades live one by another in the same Street. . . . [S]o the greatness of the Divine Majesty is best to be worshipp'd, by the due honouring, and observing of nature, which is his immediate servant, and the universal minister of his pleasure. Thomas Sprat, *History of the Royal Society*, 1667.

<sup>7</sup>“From the foregoing system [Newton's astronomy] we learn, that God, the Creator of the world, does also exercise a continual Providence over it, and does interpose his general, immechanical, immediate Power, which we call the Power of Gravity, as also his particular immechanical Powers of Refraction, of Attraction, and Repulsion, etc., in the several particular cases of the phenomena of the world; and without which all this beautiful system would fall to pieces, and dissolve into atoms.” (William Whiston, *Astronomical Principles of Religion, Natural and Revealed*, 1717).

The astonishingly rapid development of the new science was fueled by at least two factors. The first was the wonder its discoveries inspired. New machines, like the telescope (1608) and the microscope (c. 1675), which required no special training to use, opened amazing new worlds (even today, Robert Hooke's *Micrographia*, published in 1665 by the Royal Society, is, among other things, an astonishing work of art); the growing evidence for fossils (which turned up by the thousands once the construction of canals got into high gear) encouraged all sorts of collectors to wander about the countryside suitably attired and spawned numerous speculative treatises on theories of the earth; voyages of exploration and trade brought back a constant supply of extraordinary new specimens from distant lands.<sup>8</sup> Discoveries and inventions in physics, medicine, and biology were amazing: William Harvey demonstrated for the first time that the human circulation system operated like an efficient machine (1628); Christiaan Huygens developed the first accurate pendulum clock and discovered the ring around Saturn (1655); James Lind's clinical trials (1747) led to the prevention of scurvy; John Needham, the first Catholic priest to become a member of the Royal Society (1747), conducted experiments demonstrating spontaneous generation of life in gravy; Luigi Galvani's electric sparks restored momentary movement to the leg of a dead frog (1780); and Edward Jenner successfully completed his first inoculation experiment in the fight against smallpox (1796).<sup>9</sup> And so on. Bliss was it in that scientific dawn to be alive!

A second and more important incentive was harnessing the new scientific efforts to commercial and military priorities. The Royal Society for the Promotion of Natural Knowledge (founded in 1662) and successive governments did what they could to promote scientific projects that would benefit trade and imperial expansion (hence the immediate priority given to problems of tides, navigation, and lumber for ships and to

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<sup>8</sup>By the year 1600 about 6000 plant species were known; by the year 1700 about 12,000 more had been added.

<sup>9</sup>Because he wished to secure the credit for his discovery and also buy himself more time to confirm it, Huygens announced his result by publishing the following in a pamphlet he distributed to his colleagues: "aaaaaa ccccc d eeeee g h iiiiii llll mm nnnnnnnn oooo pp q rr s tttt uuuu." This was a cryptogram for the Latin sentence *Annulo cingitur, tenui, plano, nusquam cohaerent, ad eclipticam inclinato*, ("It is girded by a thin flat ring, nowhere touching, inclined to the ecliptic"). Huygens published the solution to the cryptogram in 1659. See "Huygens' discovery of a ring around Saturn," *Digital Web Centre for the History of Science in the Low Countries*, <http://www.dwc.knaw.nl/biografie/christiaanhuylensweb/wetenschappelijk-werk/huygens-discovery-of-a-ring-around-saturn/?lang=en>. (Accessed February 21, 2018).

the widespread sharing of scientific information): one of their crowning early achievements was James Harrison's marine chronometer, essential for determining longitude at sea. Wonder and power, hand in hand.<sup>10</sup>

Not everyone was overjoyed, however. A number of conservative Christian writers fretted about the lack of moral control over the scientific enterprise, fearing that this dangerous assertion of human pride would lead to disastrous consequences. That prospect made the more astute of them very gloomy, for they could see that the horse had already left the barn. All they could now was lament. The intensity of Jonathan Swift's attacks on the Yahoos in *Gulliver's Travels* (1726) stems both from his sense of how these creatures would inevitably act once they acquired projectiles more lethal than lumps of their own shit to throw at each other and from his recognition that it was too late to do anything about it. Others deplored the ways in which the vital particularity of the world was being subsumed under inert mechanical laws: "Nature," Ralph Cudworth declared, "is art as it were incorporated and embodied in matter, which doth not act upon it from without mechanically but from within vitally and magically"; "To Generalize is to be an Idiot; To Particularize is the Alone Distinction of Merit" proclaimed William Blake (an observation that is itself, of course, a generalization); "We murder to dissect" lamented William Wordsworth.<sup>11</sup> Various vitalist and *naturphilosophische* alternatives were proposed, some of which flourished briefly and vanished.

Throughout the late eighteenth and nineteenth centuries, the power and status of the new science accelerated rapidly, and the gloom deepened. In a work written to demonstrate his scientific *bona fides*, the all-destroying Kant had earlier invoked the design argument as a useful protection against a charge of impiety, but later he drove a stake into its heart, thus dealing a lethal wound to the last best rational hope of

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<sup>10</sup>*The Philosophical Transactions of the Royal Society*, started in 1665, is the oldest and longest-running scientific journal in the world. In 1714 Parliament offered a prize of up to 20,000 pounds for anyone who could design a successful marine chronometer. James Harrison worked most of his life on the problem and, after considerable difficulties and the intervention of the king, was finally awarded a cash prize of 8,750 pounds in 1773, when he was eighty years old. Copies of Harris' winning timepiece were used by James Cook and William Bligh on their epic sea voyages.

<sup>11</sup>*The True Intellectual System of the Universe*, 1678. William Blake, *Annotations to Sir Joshua Reynolds's Discourses* (c. 1800); William Wordsworth, "The Tables Turned" (1798).

orthodox believers for an easy reconciliation with the new science.<sup>12</sup> The cutting edge of historical science eroded the notion of a permanent natural order set up and maintained by God (for, contrary to Newton's assertions, even the heavens had a history), and last-ditch attempts by scientific defenders of scripture to explain away the evidence of geology and paleontology by arguing for a history of periodic catastrophes (like Baron Cuvier's *Discourse*) raised more questions than they answered.<sup>13</sup> The first person to offer a thoroughly scientific account of evolution, Jean Baptiste Lamarck, may have died blind, poor, and vilified (in 1829), but his epitaph ("Posterity . . . will avenge you") indicated what lay ahead.<sup>14</sup> By mid-century the sea of faith was on the ebb, and its "melancholy, long, withdrawing roar" (Matthew Arnold's phrase) did not inspire confidence, a mood amusingly caught in Ernest Renan's oft-quoted agnostic's prayer: "O God, if there be a God, save my soul, if I have a soul."<sup>15</sup>

But help was at hand. If religion could no longer provide sufficiently agreeable and effective moral guidance in an increasingly mechanical world where diversity of religious views and widespread skepticism about matters of faith were facts of life, the human imagination as manifested in literary fiction could supply the deficiency. "Our calculations have outrun conception;" Peter Bysshe Shelley cried, "we have eaten more than we can digest. The cultivation of those sciences which have enlarged the limits of the empire of man over the external world, has, for want of the poetical faculty, proportionally circumscribed those of the internal world; and man, having enslaved the elements, remains himself a slave."<sup>16</sup> What society needed was English literature. "More and more," Matthew Arnold announced, "mankind will discover that we have to turn to poetry to interpret life for us, to console us, to sustain us. Without

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<sup>12</sup>The term all-destroying Kant (*alles zermalmenden Kant*) comes from Moses Mendelssohn, *Morgenstunden oder Vorlesungen über das Daseyn Gottes*, 1790. Kant invoked the design argument in *Universal Natural History and Theory of Heaven* (1755) and attacked it in *Critique of Pure Reason* (1781). The argument continues today (though not among reputable scientists), now under the label Intelligent Design.

<sup>13</sup>*Discourse on the Revolutionary Upheavals on the Surface of the Earth* (1812).

<sup>14</sup>*Philosophie zoologique* (1809).

<sup>15</sup>"Dover Beach" (1851). The famous agnostic's prayer is usually attributed to Ernest Renan, although some writers suggest that it is much older. John Henry Newman quotes it in *Apologia Pro Sua Vita*, Chapter 3 (1864) and calls it a "celebrated saying."

<sup>16</sup>*Defence of Poetry* (1821).

poetry, our science will appear incomplete . . .”<sup>17</sup> Nurturing the sensibilities by immersing oneself in what Arnold called “the best that has been thought and said” would safeguard the spiritual health of the nation.<sup>18</sup>

This new secular Gospel of Matthew proved surprisingly persuasive, especially to poets and professors of Belles Lettres and Rhetoric, and lovers of literature were not slow to respond. Soon after Harvard appointed Francis James Child the first official university English professor (in 1876), Child and his colleague, the poet and literary critic James Russell Lowell, ignoring the original purpose the university had in mind in setting up the department (to systematize the scientific study of the English language), hijacked the curriculum in order to pursue what they really wanted to do: teach English literature, that is, teach students to love “the elegance and grace of literature as a transmitter of sound philosophy and living truth [rather] than to become familiar with the etymology of words or the logic of grammar. . .”<sup>19</sup> English universities soon followed suit, and their professors became fervent messiahs.<sup>20</sup> For George Gordon, delivering his inaugural address as Professor of English literature at Oxford (1922), the situation was critical: “England is sick, and . . . English literature must save it. The Churches (as I understand) having failed, and social remedies being slow, English literature has now a triple function: still, I suppose, to delight and instruct us, but also, and above all, to save our souls and heal the state.”<sup>21</sup> Thus was hatched the consoling notion that the academic study of English literature in the university could mitigate the deleterious effects of the advancing hegemony of science and the decline of a shared religious faith. Teaching undergraduates Chaucer, Shakespeare, Milton, and Wordsworth would ensure that our material progress advanced in a morally appropriate manner.

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<sup>17</sup>*The Study of Poetry* (1880).

<sup>18</sup>*Culture and Anarchy* (1869).

<sup>19</sup>C. David Heymann, quoted in John Harris, *The English Department of the Spirit: The Rise and Fall of Literature in the University Curriculum* (Prince George, 2014). I am much indebted to Harris’ book in this discussion of the university curriculum.

<sup>20</sup>The Merton Professorship of English Language and Literature at Oxford was founded in 1885; The Regius Chair of English Language and Literature, at Cambridge in 1911, and the English faculty at Cambridge in 1919.

<sup>21</sup>Quoted in Terry Eagleton, *Literary Theory: An Introduction* (1983). [https://mthoyibi.files.wordpress.com/2011/05/literary-theory\\_an-introduction\\_terry-eagleton.pdf](https://mthoyibi.files.wordpress.com/2011/05/literary-theory_an-introduction_terry-eagleton.pdf). (Accessed February 20, 2018).

This (in retrospect) preposterous notion had a remarkably long life. In England, well before the mid-twentieth century, the work of the Scrutineers, led by F. R. Leavis and his wife Queenie, had helped to make the study of English literature the widely acknowledged moral centre of modern society: “In the early 1920s it was desperately unclear why English was worth studying at all; by the early 1930s it had become a question of why it was worth wasting your time on anything else.”<sup>22</sup> In North America, courses in English literature became compulsory, and well into the 1970’s all undergraduates in British Columbia’s universities had to take a one-year course in English literature, and all BA students had to take two—the first year English Literature and Composition and the second-year Survey of English Literature, the dreaded *pons asinorum* of the undergraduate BA curriculum. The fact that all this took place in spite of the lack of any credible evidence that the academic study of English literature had a significant effect on the moral character of anyone (least of all those professing the doctrine) spoke to the great need we had to believe we were doing something effective about the growing triumph of power over wonder in the sciences, a faith encouraged by any number of upbeat reports extolling the beneficial union of the sciences and the arts: Science will give us the knowledge and the tools, and the Humanities will tell us how to put them to proper use. For fifty years or more this soothing mantra was the theme of countless commencement speeches, including (as I recall) the one delivered by Adlai Stevenson at McGill in 1959, where I received my BSc degree.

Eventually the dream petered out. Few people nowadays, I suspect, remember Charles van Doren, a university English instructor, graduate of a highly respected Liberal Arts college (St John’s in Annapolis) with a PhD in English from Columbia and post-graduate work in Cambridge, son of Mark van Doren, a well-known literary critic, poet, and professor of English literature, winner of the Pulitzer prize for poetry (1940), and the novelist Dorothy van Doren, and nephew of Carl van Doren, a professor of literature and a Pulitzer-award winning biographer (1939). In 1957 youthful-looking Charles, blessed with this royal literary pedigree, became rich and famous on a television quiz show (the *Sixty-Four Thousand Dollar Question*) and won the

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<sup>22</sup>Eagleton, *loc. cit.* The centrepiece of the Leavis’ agenda was the quarterly journal *Scrutiny* founded in 1932 (by F. R. Leavis and L. C. Knights). It ended in 1953.



ultimate prizes of celebrity (in those days), his face on a cover of *Time* and a job hosting the *Today Show*. When allegations of cheating began to circulate, Charles energetically denied them: “It’s silly and distressing to think that people don’t have more faith in quiz shows.” However, confronted by a congressional committee investigating fraud, he eventually (in 1959) confessed: he had participated in a scam by receiving the answers in advance. I still remember the incredulous public dismay: “But he’s a . . . he’s an English professor! How could he have done such a thing?”—a response not unlike that of Lady Bracknell to the accusation that her nephew had been untruthful: “Untruthful? My nephew Algernon? Impossible! He is an Oxonian.”<sup>23</sup> Shortly afterwards in England the Cambridge spies put paid to the notion that a university liberal arts education—even at the most elite institutions—had anything to do with the production of gentlemen; by contrast, these students’ experiences at Cambridge had brought them together, sharpened their treasonous proclivities, and launched their conspiracy.<sup>24</sup> Meanwhile, in 1963 John Profumo, a graduate of Oxford (Law and the Bullingdon Club), had to resign from the cabinet (as War Minister) after lying to Parliament about his relationship with a prostitute he had shared with a Russian naval attaché (later we learned that he had also had a Nazi mistress for years, to whom he allegedly sent love letters on House of Commons stationary). What price salvation now?<sup>25</sup>

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<sup>23</sup>Oscar Wilde, *The Importance of Being Earnest*, Act 3.

<sup>24</sup>Originally there were four: Donald Maclean (Modern Languages), Guy Burgess (History), Sir Anthony Blunt (Mathematics, Languages, Art History), and Kim Philby (Economics). A fifth member, John Cairncross (French and German), apparently the one the Russians found most useful, was added to the list later. Burgess and Maclean disappeared in 1951 and showed up four years later in Moscow; Philby was suspected (but not prosecuted) and forced to resign from MI6 in 1951; in 1963 he defected to Russia; Blunt confessed in 1964 on condition he receive immunity from prosecution; he was stripped of his knighthood; Cairncross confessed to spying in 1951; he was not prosecuted but did lose his civil-service job. He was not linked to the others until 1990.

<sup>25</sup>My own naïve faith in the moral value of academic study, severely challenged by the Cambridge traitors (Kim Philby was a distant relative, whom my father, before the scandal, would mention with familial pride, fond of the memory that the two of them had gone to school together) was further shaken in 1969-70, when, filled with the missionary zeal of a recent graduate whose sensibilities had been finely honed at Bristol University by zealous disciples of Dr. Leavis, I arrived at UBC, only to step into a long and very nasty civil war about tenure in the English department, a dustup involving a number of professors whose behaviour would have delighted the Yahoos. I left at the end of the year, resolved never again to teach English at a research university.

By this time the Arnoldian moral tradition in English departments was running out of steam and devolving into what many people considered little more than endless unstructured dilettantish nitpicking over literary texts, without much attention to anything else, least of all the discipline demanded of modern academic scholarship. Spokespersons proselytizing new faiths kept banging on the dean's door: Frye babies, Fish mongers, and purveyors of all sorts of other tasty treats (Women's Studies, Marxism, Structuralism, Deconstructionism, CanLit, Queer Studies, and so forth). The study of English literature, while still remaining compulsory, fell into disarray in the coming decades as a bewildering number of ideologies fought a battle royal to determine who had the right to supply an official *raison d'être* or even an agreed-upon curriculum for the enterprise.<sup>26</sup> These fisticuffs now seem to be coming to an end at last in a whimpering stalemate, as the exhausted combatants yield the ring to the composition specialists.

Members of the academic science community generally ignored these English departmental shenanigans (also common in other departments of the Humanities) or else cast an amused glance at them every now and then. Many science research professors were no doubt delighted at the naughty but highly entertaining trick played on their post-modernist colleagues by Alan Sokol in 1996.<sup>27</sup> They reacted in much the same way to the assault launched by anti-foundationalists challenging the truth claims of science. Invoking the philosophical tradition from Nietzsche to Wittgenstein to Rorty, these assailants pointed out that science was a human invention, a language "game," which could never demonstrate that its map of nature corresponded to reality. It was, like all other systems of belief, an interpretation, and all interpretations were false, because there was no intelligible text. We began accepting the language and

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<sup>26</sup>I was teaching college undergraduate English courses during much of this time, and almost all of these newly fashionable methodologies passed over my head. It was always self-evident to me that my main task as a teacher of undergraduates was to improve the students' ability to read and write, and anyway I was far too busy marking often marginally literate essays to take the time to master the new disciplinary argot.

<sup>27</sup>Dr. Sokol, a professor of physics at NYU, wrote a jargon-riddled paper with an appropriately anti-science bias arguing that physical reality does not exist: it is essentially a linguistic construct. He submitted to it to the journal *Social Text* published by Duke University, which on its web page describes itself as "a daring and controversial leader in the field of cultural studies." The journal published Sokol's essay without a peer review. Sokol then revealed that the article was a nonsensical parody intended "[not] to defend science from the barbarian hordes of lit crit (we'll survive just fine, thank you), but to defend the Left from a trendy segment of itself." A brief but intense academic brouhaha ensued.

methods of the new science as a route to the truth (with a small t) because we decided years ago that they were useful ways of dealing with the sorts of questions we wanted answered, but that undeniable utility did not make them True (with a capital letter).<sup>28</sup> Confronted with this threat, the scientific community for the most part simply yawned and went on about its business. Those moved to reply simply reiterated their version of Falstaff's bellicose query: "Art thou mad? Is not the truth the Truth?"<sup>29</sup>

And they were correct to do so. Whatever the epistemological status of science, we have long made it *our* source of truth, and most of us (myself included) rejoice at how it has triumphantly delivered on its original promise to promote the "relief of man's estate." The astonishing progress we have made in last three hundred years (at least) in reducing poverty, servitude, starvation, and disease, improving literacy, education, life expectancy, human health, comfort, and freedom, and adding to our knowledge of the natural world owes almost all its major achievements, in large part, to science and technology.<sup>30</sup> Science has produced a number of charlatans and villains, of course, and there has been no shortage of inadequate theories, gross extravagance, and disastrous unintended consequences.<sup>31</sup> But science has also exposed and corrected errors,

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<sup>28</sup>I should, I suppose, state for the record that I find these anti-foundationalist arguments persuasive, but then I've always been fascinated by the statement variously attributed to J. B. S. Haldane, Arthur Eddington, and Werner Heisenberg (and hinted at in the Einstein epigraph to this essay), "Not only is the universe stranger than we imagine, it is stranger than we can possibly imagine." I'm of the opinion that these words should be inscribed above the portal of every scientific research laboratory or at least laser-etched onto T-shirts that are then distributed free of charge to all BSc undergraduates.

<sup>29</sup>Falstaff is, of course, attempting to bluster his way out of a series of highly improbable lies. *Henry IV*, Part 1, 2.4.

<sup>30</sup>See Max Roser, "The short history of global living conditions and why it matters that we know it." *Our World in Data*, <https://ourworldindata.org/a-history-of-global-living-conditions-in-5-charts>. (Accessed February 16, 2018).

<sup>31</sup>Two of the more notorious examples of unintended consequences are Alfred Nobel's development of dynamite (1867) and Richard Gatling's invention of the first prototypical machine gun (1861): "It occurred to me that if I could invent a machine—a gun—which could by its rapidity of fire, enable one man to do as much battle duty as a hundred, that it would, to a large extent supersede the necessity of large armies, and consequently, exposure to battle and disease [would] be greatly diminished" (1877) (quoted in *The Gatling Gun* by Paul Wahl and Don Toppel, Arco Publishing, 1971). In 1888 Nobel was so horrified to read himself described as *Le marchand de la mort* in his own obituary (written in response to the false news of his death) that he left most of his wealth to fund the awards that now that bear his name. A third example might well be Eli Whitney's invention of the cotton gin, which dramatically changed the economy of the southern states (by making growing cotton more lucrative), thus encouraging the importation of thousands more slaves and

denounced and dismissed imposters (not always as swiftly as one might hope, of course), and helped to clean up its own messes. No wonder the scientific community is supremely confident about its importance and mission, so much so that it can even organize an annual party to celebrate its occasional silliness.<sup>32</sup> What humanities discipline could afford to do that? The result would be much too close to the truth for comfort.

In the universities, many non-science disciplines have, for some time now, tacitly acknowledged this supremacy by abandoning traditional justifications for their offerings and passing them off to prospective students as useful programs for would-be CEO's in the technological-financial marketplace (the phrase "training in critical thinking" is often part of the pitch). We may well chuckle at the apologia for classical studies offered in a Good Friday sermon by the Reverend Thomas Gaisford, Regius Professor of Greek at Oxford ("It enables us to look down with contempt on those who have not shared its advantages and so fits us for places of emolument, not only in this world but in that which is to come"), but nowadays do we publicize a defense of academic studies in the Humanities that is any better?<sup>33</sup> In donating 75 million

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turning their possession into an economic necessity. See Robert O. Woods, "How the Cotton Gin Started the Civil War, in *ASME* (American Society of Mechanical Engineers) September 2009, <https://www.asme.org/engineering-topics/articles/history-of-mechanical-engineering/how-the-cotton-gin-started-the-civil-war>. (Accessed February 15, 2018).

<sup>32</sup>The highly coveted ten annual Ig Nobel Awards (for discoveries "that cannot, or should not, be reproduced"), awarded by the journal *Annals of Improbable Research*, are handed out annually at Harvard by Nobel prize winners in a ceremony parodying the one put on by the Royal Swedish Academy. My favourite winner (so far) is Kees "The Duck Guy" Moeliker, awarded a prize in 2003 for his paper on homosexual necrophilia in the mallard.

<sup>33</sup>Quoted in Sir Adrian Cadbury, "Partnership between education and business," in *Education in the age of information*, ed. Carl Payne, Manchester University Press, 1993, p. 55. Oxford University still awards the annual Gaisford Prize, named in honour of the professor. Imbued with the spirit of the Olympics (now taking place Pyeongchang as I write this) I cannot resist mentioning here what Wikipedia has to say about one of the most notable winners: "George Stuart Robertson won the prize for Greek Verse in 1894 with a translation of a hundred lines of Shakespeare into comic iambic verse, and the next year he won the prize for Greek Prose and a Blue for hammer throwing. He heard about the 1896 Summer Olympics, the first of the modern era, and later explained 'Greek classics were my proper academic field, so I could hardly resist a go at the Olympics, could I?' On arrival in Athens, he found to his dismay that his discipline of hammer throwing was not to be competed in, so in the spirit of amateurism he entered the shot put, the discus and the tennis. In the discus, he recorded the Games' worst ever throw, and in the tennis doubles he lost his only match but

dollars recently to the philosophy department at Johns Hopkins, William H. Miller III mentioned that the gift was, in part, an indication of his gratitude for the ways in which his philosophical education had helped him earn a fortune on the stock market. Not quite the goal Socrates had in mind, as I recall.<sup>34</sup> Academic purists who react to this news with dismay may derive some comfort from the fact that the first historically recorded stock option contract was exercised by Thales of Miletus, the putative founder of philosophy, in the sixth century BC, when he cornered the olive press market and made a small fortune.<sup>35</sup>

Amid this scientific age of wine and roses, however, we have become aware of more than a few nasty worms in the bud, concerns that lead to awkward questions about our enthusiastic application of scientific discoveries to technological innovation. The first of these (in my lifetime) was the threat of nuclear disaster, the second the degradation of the environment (announced by the publication of Rachel Carson's *The Silent Spring*, 1962), and the third the dangers of overpopulation (Paul Ehrlich's *The Population Bomb*, 1968). Over the years, various accidents, disasters, and unforeseen crises rang the alarm bells, and their names became familiar household words: Minamata (1956), Thalidomide (1962), Love Canal (1978), Three Mile Island (1979), Atlantic Empress/Aegean Captain (1979), Bhopal (1984), Chernobyl (1986), Exxon Valdez (1989), Aral Sea (1960-87), Seveso (1976), Tokiamura (1999), and Deepwater Horizon (2010), to name only the best known. We became inescapably aware that forests, ecosystems, and animal species are rapidly disappearing, even the most abundant and wondrous (like the Amazon jungles, the Great Barrier Reef, and the cod fishery). And the polar ice is melting away. What is going on? What can we do?

Forty years ago, it was generally believed that we still had options. I can remember earnest seminars on at least three. We could opt out of the system and hole up on a few acres in the countryside with a horse, a porta potty, and a copy of *The Whole Earth Catalogue*. The Gulf Islands in BC were a destination of choice. People with healthy

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nevertheless won a Bronze Medal. In a ceremony after the Games, Robertson recited an ode to athletic prowess which he had composed in Greek." (Accessed February 17, 2018).

<sup>34</sup>Brian Gallagher, *Nautilus* (January 23, 2018) <http://nautil.us/blog/why-did-a-billionaire-give-75-million-to-a-philosophy-department>. (Accessed February 17, 2018)

<sup>35</sup>Aristotle, *Politics*, 1.11.

investment portfolios or generous pensions or a viable scheme to grow and sell marijuana started heading off to Hornby, Denman, Gabriola, Salt Spring, and Lasqueti islands, where, in due course, video stores and coffee shops sprouted up around the community store like magic mushrooms. Real estate developers were delighted, as prices soared and lot sizes diminished. Others who still had faith in social action argued that the problem was not technology but a question of who owned the means of production. Deal with that, and all would be well. But there was no evidence then (any more than there is now) that socialism was more effective at monitoring the unchecked growth of technology than other arrangements, and in any case the entire movement was already beginning to fracture into identity politics (which has inexorably led to the curious situation nowadays where a great deal of revolutionary activity, especially on campus, is much more concerned with removing statues, restricting free speech, or introducing gender-free pronouns than it is with fighting for a living wage, safer technology, or just prices). That left the third option: trust science to solve the problems created by its faithful handmaiden, technology. And that third option is today, *faute de mieux*, all we have left. If we want to have more fish in the sea than plastic, or do something about the seventeen million pieces of space junk orbiting the empyrean, or have more effective antibiotics to fight disease, or slow down the warming of the planet, there's no longer much point in sacrificing a hecatomb to Zeus, or organizing national prayer meetings, or reciting Shelley to undergraduates, or writing urgent Marxist screeds to our local newspaper. We simply have to trust that if we provide the funds our scientists will come to the rescue once again. Their extraordinary successes in the past give us hope, but the catalogue of disasters is a grim omen of what may be in store.

Parenthetically, I should add that a fourth option has in recent decades become very common: turning one's back on the entire mess and howling with laughter or, more elegantly put, "withdrawing with style from the chaos."<sup>36</sup> This response seems especially popular with comic dramatists and professional comedians, whose schtick consists of pointing out, often in ways that are extremely funny, the ridiculousness of

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<sup>36</sup>"Since we cannot hope for order, let us withdraw with style from the chaos." Malquist, in *Lord Malquist and Mr. Moon* by Tom Stoppard (1966). The origin of this very modern form of comedy, according to Paul Fussell in his brilliant book *The Great War and Modern Memory* (OUP, 1975), can be traced to the trenches of World War I.

absolutely everything (e.g., *Monty Python, This Hour Has 22 Minutes*), and with certain fashions in high art that now offer human and industrial dreck as aesthetic objects for our edification and delight. At this moment the Museum of London has on display a deodorized sample taken from the monster fatberg fished up from the urban sewers (“130 tonnes . . . [of] calcified . . . fats, oils, faeces, wet wipes and sanitary products”). Naturally, the display offers for sale a selection of nifty T-shirts, tote bags, and badges.<sup>37</sup> Those concerned about our modern condition can, I suppose, leave the exhibit basking in aesthetic satisfaction. For this relief much thanks.

Given this situation, where science seems to offer the only reasonable way of addressing certain urgent problems, it does appear rather odd that nowadays well-established scientific findings often fall on deaf ears and that a significant percentage of the population (all of whom have had years of compulsory education in science) refuses to accept or is indifferent to important conclusions of the scientific community.<sup>38</sup> Hence, in the most technologically advanced countries of the world, we

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<sup>37</sup>Mark Brown, “Part of monster sewer fatberg goes on display at London museum.” *The Guardian*, February 8, 2018. <https://www.theguardian.com/culture/2018/feb/08/part-of-monster-sewer-fatberg-goes-on-display-at-london-museum>. (Accessed February 22, 2018). The interest of modern arts in human waste is, of course, well established. Piero Manzoni in 1961 shoved portions of his own turds into ninety small containers (30 gm freshly preserved per can), affixed an appropriate label in different languages (*Merda d'artista*, *Künstlerscheisse*, *Artist's Shit*, *Merde d'artiste*) and offered them for sale, setting the price, according to one report, at a value equivalent to the same weight of 18 carat gold. Artist as alchemist, turning shit to gold—get it? In 2007 Tate Gallery snapped up one can for 22,350 pounds. (See Sophie Howarth, “Piero Manzoni, “Artist’s Shit,” (2000). <http://www.tate.org.uk/art/artworks/manzoni-artists-shit-t07667>. (Accessed February 22, 2018).

<sup>38</sup>“More than four in 10 Americans continue to believe that God created humans in their present form 10,000 years ago, a view that has changed little over the past three decades. Half of Americans believe humans evolved, with the majority of these saying God guided the evolutionary process. However, the percentage who say God was not involved is rising.” Frank Newport, “In U.S. 42% Believe Creationist View of Human Origins,” *Gallup* (2014), <http://news.gallup.com/poll/170822/believe-creationist-view-human-origins.aspx>. (Accessed February 17, 2018). “According to the Yale Program on Climate Change Communication and the George Mason University Center for Climate Change Communication, which conduct an annual survey on what Americans think about climate change, only 13 percent of Americans correctly identified that more than 90 percent of all climate scientists have concluded that human-caused global warming is happening. (It’s actually at least 97 percent of climate scientists that agree human-caused global warming is happening.)” Ruairi Arrieta-Kenna, “Almost 90% of Americans don’t know there’s a scientific consensus on global warming,” *Vox* (2017), <https://www.vox.com/science-and-health/2017/7/6/15924444/global-warming-consensus-survey>. (Accessed February 17, 2018).

repeatedly witness public squabbles over evolution, global warming, renewable energy, stem-cell research, abortion, vaccination, contraception, and cloning, and congressional and parliamentary committees dealing with education, health, and the environment routinely feature politicians who stubbornly ignore the consensus recommendations of scientific research (a stance that, one suspects, does not necessarily arise from personal conviction but rather from an awareness of the views of those who fund their campaigns, select the candidates, and vote in elections).

The most extreme defenders of science, led by the Four Horsemen of the Non-Apocalypse (Richard Dawkins, Daniel Dennett, Sam Harris, and the late Christopher Hitchens) are wont to attribute this resistance entirely to the stupefying inanity of religious belief (“one of the most perverse misuses of intelligence we have ever devised”) and, in order to enlighten us all about science, channel their efforts into smiting God and people of faith as vigorously and frequently as possible.<sup>39</sup> *Aux armes, citoyens, écrasez l’infâme!* In so doing, they set aside the historical evidence of famous scientists who professed a religious faith (Isaac Newton, Gregor Mendel, and, at times, Albert Einstein, to cite three names that immediately come to mind) as well as the example of some eminent colleagues.<sup>40</sup> They also tend to cram all religions and all people of faith into the same piñata. I’m no fan of the “God Hates Fags” brigade or the rabid mullahs proclaiming another jihadi fatwa, and I can snort with glee when I see Pope Frances chiding the politicians of the world about the dangers of “fake news” or still feel outrage when I recall images of Cardinal Spellman sprinkling holy water on the B-52 bombers loaded down with napalm just before setting off to incinerate more Vietnamese people, but shooting all dogs because many of them have fleas (a recommended procedure for dealing with heretics in the Albigensian Crusade)

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<sup>39</sup>Sam Harris, “The Problem with Atheism,” *The Washington Post*, September 28, 2007.

<sup>40</sup>For example, Dr. Francis Collins, leader of the Genome Project and the National Institutes of Health, founder of BioLogos (an organization that “provides virtual and actual meeting places where the best Christian minds in the sciences, theology, biblical studies, philosophy, and other fields meet on these topics of mutual interest for the good of the church”), and author of books exploring his Christian beliefs and his commitment to cutting-edge scientific research. Harris objected to Collins’ appointment as head of the NIH (in 2009) on the ground that his religious beliefs made him unsuitable for determining matters of public policy.



seems to me, in these more enlightened times, a dubious intellectual position.<sup>41</sup> Besides, reflex bashing of religion may be evading a more complex and interesting issue: Why, at a time when we all clearly enjoy the benefits of the scientific culture everywhere around us and obviously need science to deal with any number of urgent problems, are so many people (including plenty who are not particularly religious) reluctant to accept or even inform themselves about some of its more important conclusions?

One possible answer is that certain aspects of science's unrelenting quest to relieve man's estate have left many people deeply troubled about our immediate prospects. One doesn't have to be a person of faith or a Luddite to be concerned about a world of, say, artificial intelligence, robots, genetic manipulation, designer drugs, and cloning. Who's next, I wonder, after Barbara Streisand's dogs, Argentine polo ponies, and Chinese monkeys? Fewer people nowadays can share the boundless optimism Carl Sagan promoted a short while ago—too much has happened in the intervening three decades. That is especially true because today it's quite obvious that any lingering sense that someone is in charge has long been exposed as an illusion. The bus taking us at accelerating speed along the freeway to a brave new world has no brakes and no driver, for science now has only two guiding imperatives: the first is that commandment of Robert Oppenheimer's that so troubled George Grant: "If the experiment is sweet, one *must* go ahead with it" (emphasis added), and the second goes something like this: "Follow the money."<sup>42</sup> Because scientific procedures are well known and diligently practised all over the world, local or national prohibitions against this or that scientific project (like stem-cell research or genetically modified food or transplanting human body parts) are impossible to enforce around the globe. If there's money to be made or power to be gained, the necessary research experiments and clinical trials will be financed and carried out somewhere or other. The market obviously has no conscience whatsoever and is more than willing to seduce scientists or anyone else to assist in the production and sale of any

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<sup>41</sup>Immediately before the Massacre of Béziers (1209) the Cistercian abbot and Papal legate Arnaud Amaury was asked how soldiers afraid of killing devout Catholics instead of the hated heretics should distinguish between the two. He is alleged to have replied, "Kill them all. The Lord will recognize his own" [*Caedite eos. Novit enim Dominus qui sunt eius*], sometimes translated more loosely as "Kill them all, and let God sort it out."

<sup>42</sup>Quoted in George Grant, *Technology and Empire*, Toronto, 1969, p.115.

commodities that will earn a profitable return.<sup>43</sup> And enlisting the enthusiastic cooperation of academic scientists is no more difficult for twenty-first century corporations than it was for twentieth-century tyrants. Not that these transactions are always easy to follow. As the learned pate ducks to the golden fool bearing munificent funds, universities agonize over whether or not they should permit their employees to accept research grants from polluted sources.<sup>44</sup> Meanwhile, professors debate how they should deal with colleagues who seem to believe that the admirable notion of academic freedom can serve as a suitable rationale for concealing the sources of big research dollars or the nature of their lucrative consulting contracts with businesses whose products and practices their studies are supposed to be evaluating.<sup>45</sup> There is more than enough here to make some people hesitant about leaping onto the bandwagon.

More interesting, and certainly more ironically amusing, is the notion that resistance to science may well be a product of nature's laws. After all, religious belief (one could

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<sup>43</sup>One of the most astonishing things modern technology has revealed in the past few decades is that *homo sapiens*, in addition to being a political animal with a rational soul (god given or otherwise), a sympathy for his fellow human beings, a thirst for knowledge, a will to power, a genetically determined consciousness, or whatever, clearly has an insatiable desire for cheap consumer goods, like processed foods, fizzy flavoured sugar-water, mind-altering or pain-relieving narcotics, bling, body piercings, tattoos, running shoes, entertainment on demand (music, games, comedy shows, films, pornography, gambling, sports, a whole freshly stocked "supermarket of surrogate experience"), and devices that enable often (usually?) meaningless or unnecessary conversations or snapshots at all hours of the day or night. For these goods consumers are obviously willing to pay a great deal, and scientists are happy to keep furnishing a steady supply, with a constantly replenished stream of minor innovations and built-in obsolescence to maintain demand. No wonder the main ambition of many gifted STEM graduates these days is to sign on with a Silicon Valley manufacturer of video games or to come up with a new app that will make them instant billionaires.

<sup>44</sup>Boorstin recounts an amusing story on the topic. In 1905, in response to a request for money, John D Rockefeller gave 100,000 dollars to the Congregational Church. The public and church ministry were outraged and demanded the money be returned. It was a "tainted money," a gift from "the greatest criminal of the age." The money was not returned, but the outraged protests continued. A short while later Rockefeller gave 10 million dollars to the General Education Board, and the protests instantly stilled. "Gifts of ten millions," the New York *Sun* commented, "deodorize themselves." (*The Americans: The Democratic Experience*). See also Sarah Boseley, "Renowned cancer scientist was paid by chemical firm for 20 years," *The Guardian*, December 2006. <https://www.theguardian.com/science/2006/dec/08/smoking.frontpagenews>. (Accessed February 10, 2018).

<sup>45</sup>See *Recommended Principles to Guide Academic-Industry Relationships*, American Association of University Professors, University of Illinois Press, 2014.

argue) probably offers real advantages in natural selection (helping people cope with hard times and encouraging them to live healthy lives, wear clean underpants, and reproduce as often as possible), and social attitudes conducive to religious belief may well be part of our genetic inheritance.<sup>46</sup> Hence, there could be a perfectly good neo-Darwinian explanation for a stubborn refusal to accept Darwin's theories. I doubt that firmer evidence for this hypothesis would convert the God bashers (if I may be permitted the term), but it might make them more disinterested and polite. After all, what would be the point of continuing to heap abuse on someone whose resistance to genetic determinism is genetically determined?

This last suggestion is at the moment only a speculative possibility, but it does raise an intriguing question about an issue central to Nietzsche's critique of both science and religion. What is the *value for living* of the truth science claims to be revealing? Instead of tacitly accepting that the scientific pursuit of truth is always a valuable end in and of itself, shouldn't we begin by exploring that claim more thoroughly? What about the value of untruth (after all, even Plato, who launched our quest for the good, the true, and the beautiful, understood the value of a noble lie)?<sup>47</sup> What happens if we try to evaluate those questions from the point of view of an individual's entire lived experience, rather than automatically genuflecting before the temple of scientific truth in the same way our ancestors prostrated themselves for thousands of years before the temples of their holy men and hierophants? We can accept that, from a utilitarian perspective, science has made human life much more commodious, safer, longer, and more prosperous. But has it made it more fulfilling? How much does our commitment to technological progress really enable the human animal to enjoy a more life-affirming existence as opposed to simply reinforcing the debased herd mentality originally created by religion and passed down to its legitimate successor, modern science? Of course, in an age when sending a friend dik or waxed-vag piks is for some people a more urgent priority than getting together to explore the value of a meaningful physical encounter these questions may be increasingly irrelevant.

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<sup>46</sup>See Tori DeAngelis, "Are beliefs inherited?" *American Psychological Association*. <http://www.apa.org/monitor/apr04/beliefs.aspx>. (Accessed February 18, 2018).

<sup>47</sup>*The Republic*, 414b-415d.

Perhaps we should remember that human beings, as well as being creatures who seek autonomy, also have irrational cravings that flout the authority of science, and their desires trump reason. “Man dies of cold, not of darkness.”<sup>48</sup> This is the problem that so corrodes the life of Fyodor Dostoevsky’s Underground Man, whose intellect welcomes scientific determinism but who recognizes (with regret) that it can never answer to his full humanity. It denies him the chance to indulge in the “whim” (as he calls it) of asserting that two plus two equals five. All rational constructions leave out of account his desire to defy them. The issue here is no longer autonomy but authenticity: “You see, gentlemen, reason is no more than reason, and it gives fulfillment only to man’s reasoning capacity, while desires are a manifestation of the whole of life—I mean the whole of human life, both with its reason and with all its itches and scratches. . . . I quite naturally want to live in order to fulfill my whole capacity for living, and not in order to fulfill my reasoning capacity alone, which is no more than some one-twentieth of my capacity for living.”<sup>49</sup> For him, a scientific account of his identity is insufficient. He wants an account of human life that, in addition to making it intelligible, also enables him to experience it as *worth* living.<sup>50</sup>

Frank Harris in one of his adventurous peregrinations around London solicited the services of a prostitute in a graveyard, and, after an exchange of the necessary coins, the two of them then fornicated on a gravestone. When his ardour was spent, young Harris was overcome by melancholy reflection: “. . . and there we were laying in copulation, with the dead all around us; another living creature might that moment have been begotten, in its turn to eat, drink, fuck, die, be buried, and rot.”<sup>51</sup> This summary account of human life is not the cheeriest ever devised, but how is it significantly different from what the reductive biologists offer? They tell us that we are essentially nothing more than survival sites for DNA (most of it junk), genetically

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<sup>48</sup>A saying attributed to Miguel Unamuno in response to his reading Goethe’s dying words (“Light, light, more light”): “[W]hat he should have cried for was ‘Warmth, warmth, more warmth,’ for we humans do not die of the darkness, we die of the cold.” Quoted in John R. Claypool, *God is an Amateur*, Forward Movement Publications, 1970, p. 75.

<sup>50</sup>Whether or not Dostoevsky’s text contains any indication of how Underground Man might heal his disease is a matter of dispute. We would probably have a clearer sense of a possible direction if Dostoevsky had restored a significant chunk of the novel removed by the censors before publication. But he did not.

<sup>51</sup> Frank Harris, *My Secret Life*, Grove Press, 1966, p. 508.

determined robots, temporary and random products of a process that didn't have us in mind, without free will, individual significance, or higher purpose. Our consciousness is simply the product of mechanical biochemical reactions; its psychic wants can be reliably and conveniently met by anti-depressants and Ecstasy on demand. And so on and so on. Is it any wonder that some human beings think about this for moment and say, "Thanks, but no thanks"?

To those who offer such objections, a defender of modern science has at least two replies, one reasonable, the other mystical. The former goes something like this: "You are perfectly free to pursue your quest for authenticity, or to follow your irrational faith, or to engage in whatever projects of self-creation you think will make your life more worthwhile, short of inflicting harm on others, provided you do that on your own time in your own private space, a freedom which our liberal society guarantees and which modern science makes possible. Our concern is the public realm, where for legitimate historical reasons our society has determined that rationality will inform and guide debates. The hostility many of our colleagues repeatedly express for non-scientific views is our contribution to arguments about public policy, the very basis of modern democratic procedures. Those debates will not be resolved in the near future, and the direction they take will develop over time, as it should, according to the ways in which historical events and popular culture—work, films, television, sports, fashion, music, fiction, and so forth—shape the views of the voters and the judgment of the courts." That, it strikes me, is a reasonable position, the one so eloquently articulated by John Stuart Mill (who, interestingly enough in these hypersensitive times, places no restrictions on the language of such public arguments).<sup>52</sup> A reconciliation between faith (in various guises) and scientific reason that satisfies all parties will continue to elude us for the foreseeable future, and the best we can do is strive to keep the public debates as open, amicable, and reasonable as possible. If that sounds like a recipe for "keep on muddling through and hope for the best," so be it.<sup>53</sup>

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<sup>52</sup>*On Liberty* (1859). Of course, one needs to acknowledge that not everyone has sufficient leisure time, energy, and resources (economic and otherwise) to pursue a significant personal agenda or can gain easy access to public forums where the necessary debates take place and that these issues are not merely personal, since public policy plays a significant role in rectifying such problems (e.g., by making child care, education, health care, affordable housing, and so on readily available).

<sup>53</sup>An interesting example of the "muddling through" I refer to is taking place right now in a number of states in the US, as legislators review and legislate the curriculum of science courses in state schools. In many places,

The mystical defence of science appeals to the sense of wonder that many scientists affirm goes hand in hand with the activity (see, for example, the quotation from Einstein at the start of this essay), an occasionally overwhelming sense of the beauty and majesty of its revelations, a moment to stop probing, suspend one's curiosity, and rest in contemplative joy or laugh in sheer delight, an experience that meets Nietzsche's famously enigmatic claim that "the existence of the world is *justified* only as an aesthetic phenomenon."<sup>54</sup> A short list of names of well-known modern scientists who have paid tribute to an experience of this sort reads like a *Who's Who* of quantum physics: Planck, Einstein, Heisenberg, Bohr, de Broglie, Schroedinger.<sup>55</sup> Such professions are far too frequent and eloquent to reject out of hand: science clearly can lead to moments that inspire, delight, and awe. Even Darwin (hardly the most mystical of men) tentatively appeals to the mysterious power of wonder in the final sentence of *On the Origin of Species* (1859): "There is a grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved."

But the word "wonder" presents difficulties, as well. For scientists are not always sure what it means and how it is related to their enquiries (it is not enshrined as a goal of the enterprise, nor is it a requirement of its methodology, and a capacity for wonder is not, so far as I know, usually included on the list of qualifications necessary for a research fellowship or a job). Is wonder something that stimulates and/or rewards rational enquiry or something more naïve that induces fear, superstition, or (worst of all) divine worship? Or is it both? Many of his contemporaries may have hailed the wonders of the new science, but Francis Bacon considered wonder "broken knowledge," and one of the most important aims of his project is to annihilate it, on

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particularly Idaho, the legislators are seeking to omit important aspects of the scientific account of climate change—for example, by deleting a section that links air pollution with fossil fuels or man-made industrial processes with climate change. In their committees they are being confronted by citizens demanding adherence to scientific standards. Similar attempts in other states to ignore the scientific consensus have been attempted. Most of them have failed. See "Some states are trying to downplay teaching of climate change . . ." *PBS New Hour*, February 20, 2018. <https://www.pbs.org/newshour/show/some-states-are-trying-to-downplay-teaching-of-climate-change-teachers-see-educational-malpractice>. (Accessed February 20, 2018).

<sup>54</sup>*Birth of Tragedy* (1872), Section 5.

<sup>55</sup>See Ken Wilbur, *Quantum Questions: Mystical Writings of the World Great Physicists*. (Boston, 2011).

the ground that what people understand they will no longer wonder at or look to religion to explain.<sup>56</sup> And Bacon was right at least to this extent: an appeal to the wonder and mystery associated with scientific enquiry (of the sort Richard Dawkins undertakes, for example) may simply open the door to an obvious theist response: “The whole of science can be said . . . to be operating within a larger framework. In other words, the higher we penetrate into space and the deeper we penetrate into the atom, all it shows . . . is that God has been gravely underestimated”<sup>57</sup>

The most eloquent, long-lasting, and influential scientific exploration of the ambiguities of wonder is *On the Nature of Things*, written by the obscure Roman poet Lucretius (c. 99 BC to c. 55 BC), which excoriates the naïve wonder and fear from which religious belief arises and celebrates the calm, contemplative delight which comes from observing the world closely, recognizing its material nature, and reposing in the tranquil joys that accompany an appreciation of its dynamic energy, fragility, and beauty. Lucretius’ aim is not primarily scientific (in the modern sense) but ethical: human beings will live better, happier lives if they set aside their religious and political traditions and attend to what he has to say about the doctrines of his beloved master, Epicurus. He knows that his primary task is not to offer his readers a cogent intellectual argument but to win them over with his powers of persuasion, with the eloquence of his convictions (his poetry, he tells us repeatedly in a favourite metaphor, is like the honey physicians spread around the lip of a cup in order to make the medicine it contains palatable). In that he proved wildly successful: he is the most influential apologist for materialistic science in the history of the subject. Even though his direct contributions to scientific knowledge were minimal, as a publicist for the wonders of science, Lucretius has no equal.<sup>58</sup>

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<sup>56</sup>*The Advancement of Learning*, I.

<sup>57</sup>*Unweaving the Rainbow: Science, Delusion and the Appetite for Wonder* (New York, 1998). The quotation comes from Tom Stoppard in 1973, during a public discussion at the Church of St. Mary Le Bow, in London, quoted in Kenneth Tynan, *loc. cit.* The fact that wonder seems to suggest something mysterious does not, of course, privilege any particular religious faith. Nor, indeed, need one appeal to a sense of the divine at all. Nature itself may be infinitely more complex than we often assume: “extravagant without limit, indifferent without limit, without purposes and consideration, without pity and justice, simultaneously fruitful, desolate, and unknown” (Nietzsche, *Beyond Good and Evil*, 1.9).

<sup>58</sup>His most famous line, the one summing up the tale of Agamemnon’s sacrifice of his daughter Iphigeneia, provided the advocates of the new science (including Francis Bacon) one of their most frequently quoted slogans: “That shows how much/ religion can turn mankind to evil” [*Tantum religio potuit suadere malorum*]

But (it must be stressed) Lucretius is no modern: he has no interest whatsoever in the central concern of our science, dominion over nature. The relief he offers is moral, not physical. Hence, he refuses to subject his (often wildly) speculative theories to experimental testing or to try sorting out different theories by making predictions. For him, any theory accounting for a natural phenomenon is acceptable if it is materially based (i.e., atoms in motion), reasonable (i.e., no appeals to divine interventions), and satisfies our sense experience. Sometimes he will offer two or three possible explanations that meet these criteria, without making any attempt to weigh them against each other (e.g, for the motion of the stars or for the appearance and disappearance of the sun every twenty-four hours). In fact, he dismisses any attempts to evaluate alternative explanations as a waste of time. There may be only one explanation governing a phenomenon on earth, but elsewhere in the heavens others may hold sway. What matters is the particular physical perception of a natural event and the awareness that it must have a physical cause.

Modern science makes the contemplative joy Lucretius espouses more difficult, because its emphasis falls, not on the perception, but on the rational (preferably mathematical) explanation, and thus raises more insistently the thorny issue of the relationship between aesthetic delight and rational knowledge. Is it the case that dissection always requires murder? “Do not all charms fly/ At the mere touch of cold philosophy? There was an awful rainbow once in heaven:/ We know her woof, her texture; she is given/ In the dull catalogue of common things.”<sup>59</sup> Richard Dawkins’ book *Unweaving the Rainbow* (which takes its title from this passage) makes an energetic attempt to defend modern science from Keats’ charge but by the end more or less convinces the reader that Keats is probably correct, simply because the contemplative joy that Dawkins celebrates is available, if at all, only to those fully initiated into the

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(1.101). Thomas Jefferson owned eight copies of *On the Nature of Things*, declared himself a firm disciple of Epicurus, and may have derived the phrase “pursuit of happiness,” at least in part, from his reading of Lucretius. See Carol V. Hamilton, “Why did Jefferson change ‘property’ to the ‘pursuit of happiness?’” *George Mason University’s History News Network*. <https://historynewsnetwork.org/article/46460>. (Accessed February 21, 2018). Lucretius’ explanations for things are for various reason not very satisfactory nowadays. Some readers excitedly claim that he “anticipated” all sort of later scientific discoveries (like natural selection or quantum physics), but that strikes me as excessive historical Whiggery).

<sup>59</sup>John Keats, “Lamia,” Part 2, 229 ff.



complexities of a highly specialized scientific discipline (and his argument is, as usual, compromised by the author’s drearily predictable swipes at non-scientific sources of wonder).<sup>60</sup> Confronted with one of our most ancient and celebrated natural splendours, ordinary mortals with some lingering class-room memory of refraction, reflection, and the dispersion of light in particles of water are left hanging between the naïve wonder of their ancestors and the sophisticated wonder of academic meteorologists.<sup>61</sup> As a lunar eclipse begins, it is no doubt more civilized not to follow the ancient custom of banging as many copper pots as possible to prevent witches from stealing the moon, but how much does even a partial knowledge of celestial mechanics reduce the potential wonder of the experience? Is it not the case that most people now rush to witness the phenomenon motivated primarily by the urge to capture an Instagram image? If so, who cares?

I have no intention of exploring this complex and contentious matter in any further detail.<sup>62</sup> I do, however, have two final remarks. First, the education, employment, and professional success of modern scientists are wholly centred on the acquisition of power over nature; if they experience moments of wonder in the enterprise, those are merely happy by-products (not something to highlight on a *curriculum vitae* or a program prospectus or in a lecture or term paper).<sup>63</sup> This observation is, of course, true of other *wissenschaftliche* professions, but it has a particular relevance to science and invites one to reflect on a teasing question: Could it be that “we first emancipated

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<sup>60</sup>*Unweaving the Rainbow: Science, Delusion and the Appetite for Wonder*, Houghton Mifflin, NY, 1998.

<sup>61</sup>My own sense (derived from a statistically insignificant survey of what I recall of the scientists I have met and the books I have read) is that the informed contemplative wonder Dawkins and others describe is, for understandable reasons, more likely to be found in those researchers who probe the heavens above or the particles at the very heart of matter (the astronomers, physicists, and quantum mathematicians). Scientists who peer into the long grass to observe every brutal detail of what goes on there or who concern themselves with the randomness of our genetic inheritance are, it strikes me, less prone to extol the virtues of wonder than the former).

<sup>62</sup>Any detailed treatment of this topic would require a much closer examination of the precise meaning of the word *wonder*—and especially of the range of emotions associated with it. Modern science, it seems to me, has largely removed from the word any suggestion of *astonishment* and *fear*, two of the more important emotions traditionally associated with the term.

<sup>63</sup>Scientists do sometimes talk about the importance of the related notion of “elegance.” But the concept seems to elude precise definition, and some of them, like Francis Crick, have found elegance an unreliable guide. See Patrick House “What is Elegance in Science” *New Yorker*, August 17, 2015, <https://www.newyorker.com/tech/elements/what-is-elegance-in-science>. Accessed February 23, 2018.

curiosity at the expense of wonder, and then readmitted wonder to take care of public relations”<sup>64</sup> Second, the issue is by no means merely academic, for if modern science is indeed potentially inimical to wonder, then its practitioners may wish to reflect for a moment on what Charles Darwin had to say when he came to sum up his life’s work:

I have said that in one respect my mind has changed during the last twenty or thirty years. Up to the age of thirty, or beyond it, poetry of many kinds, such as the works of Milton, Gray, Byron, Wordsworth, Coleridge, and Shelley, gave me great pleasure, and even as a schoolboy I took intense delight in Shakespeare, especially in the historical plays. I have also said that formerly pictures gave me considerable, and music very great delight. But now for many years I cannot endure to read a line of poetry . . . [and] I have also almost lost my taste for pictures or music. . . . My mind seems to have become a kind of machine for grinding general laws out of large collections of facts, but why this should have caused the atrophy of that part of the brain alone, on which the higher tastes depend, I cannot conceive. . . The loss of these tastes is a loss of happiness, and may possibly be injurious to the intellect, and more probably to the moral character, by enfeebling the emotional part of our nature.<sup>65</sup>

At the start of this essay I made an apparently casual reference to Greek tragedy. That was deliberate, because, although initially I had little sense of the path this essay would chart through the labyrinthine subject of “faith and reason,” I knew I wanted to end up with Greek tragic dramatists who explored this topic. So, by way of a coda to the above excursion, I would like to make a few brief comments about three famous plays.

In the first, Aeschylus’ *Oresteia*, our oldest extant dramatic trilogy, the central conflict is between two competing views of justice: one based on the irrational passion for vengeance demanded by the ancient gods, the Furies, and one based on the powers of rational persuasion, symbolized by the god Apollo. Because of its faith in the old gods, the community of Argos, to its dismay, has been and is being torn apart by an apparently endless chain of vicious revenge killings. The hero of the trilogy, Orestes,

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<sup>64</sup>Philip Ball, “Why science needs wonder.” *New Statesman*, 2 May 2012. <https://www.newstatesman.com/sci-tech/sci-tech/2012/05/why-science-needs-wonder>. (Accessed February 19, 2018).

<sup>65</sup>*Autobiography* (1876). Although this passage gives us all something to ponder and I would never dismiss such a candid and eloquent account from a person of undoubted genius, I do believe we should be careful of drawing from it any firm conclusions about science. I am now more than ten years older than Darwin was when he wrote these melancholy words, and I can attest to the fact that old age may well affect the aesthetic sensibilities to a significant degree, whether we are professional scientists or not. But, as I say, the passage does invite one to reflect.

in an attempt to end the slaughter, consults Apollo and with his help and the approval of his fellow citizens, kills his mother and her lover (Clytaemnestra and Aegisthus), both of whom, in an act motivated by personal revenge and sexual passion, treacherously murdered his father (Agamemnon). Having done so, he freely submits himself to a trial for murder, where he will be judged by a jury of Athenian citizens. In the last play of the trilogy (*Eumenides*), the trial takes place, and Orestes is acquitted with the help of Athena.

What's astonishing about this resolution is the way it comes about through a reconciliation between passionate faith and reasonable persuasion. The Furies are not overpowered or dismissed or converted: they happily agree to accept the urgent invitation to incorporate themselves with due honour and significant power into the new political arrangements, because without their blessing the city will not thrive. At the same time, the Furies concede that rational persuasion also plays a vital role in ensuring justice in a city governed, not by the gods, but by its citizens, hundreds of whom (at the end of the play) joyously celebrate the new partnership and the end of the ancient blood feud. Here Aeschylus is not offering a practical recipe for political harmony or any theoretical argument on behalf of a particular ideology but rather holding up an aesthetic vision, the glorious dream that a synthesis of passionate faith and persuasive reason is possible, an arrangement that will guarantee justice in the community and enable it to thrive. The extraordinary optimism, power, and eloquence of this vision has made the trilogy a towering cultural landmark, "probably the greatest achievement of the human mind."<sup>66</sup>

The second play, Sophocles' *Oedipus the King*, is rather different, a darkly ironic vision of an extraordinarily gifted man who chooses to confront the mysterious cruelty of the universe no matter what the cost. Oedipus, a man celebrated for his wisdom, which has saved Thebes once before (when he answered the riddle of the Sphinx) and earned him the kingship, confidently takes on the challenge of rescuing the city from a deadly plague, in answer to the citizens' cries for help. He is their only recourse, and they urge him to act. He willingly charges into the task, relentlessly unearthing more and more details of an increasingly ominous story, ignoring all pleas for him to stop.

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<sup>66</sup>The exact wording of this frequently quoted tribute is uncertain but the words are always attributed to Algernon Swinburne.

He will not pause in his quest to find the truth. When he does find it, the horror of the knowledge leads him to seize the brooch from his dead wife's corpse (what he has discovered has led her to commit suicide) and stab out his eyes. He leaves the city a blind outcast, fated to be a lonely suffering beggar for the rest of his life.<sup>67</sup>

Not unsurprisingly *Oedipus the King* has often been interpreted as, in part, an allegory about the Promethean element of the human spirit. Challenging the gods is a risky business for human beings, even for the best-intentioned, brightest, and most innocent. Whatever we confidently expect to discover at the end of the heroic quest for the truth will almost certainly not be what our efforts do, in fact, reveal. Blinding oneself is an ominously appropriate act for the person who, on the basis of his past success, believed that his courage and intelligence would give him full knowledge of himself. There is no clear moral here, and any summary evaluation of Oedipus is difficult, because (a fact sometimes overlooked in interpretations of the story) his dreadful experience does save Thebes.

The third play, Euripides' *Bacchae* is a howl of despair. Written very near the end of the Peloponnesian War, when the playwright was in exile in Macedon, soon to be torn apart by a pack of dogs (in 407 BC), this work pits Pentheus, the young king of Thebes, against his cousin, the god Dionysus, who with his hordes of ecstatic, devoted worshippers has swept into Greece after conquering the cities of Asia Minor.<sup>68</sup> The religion Dionysus brings with him is irrational, intoxicating, intensely beautiful, and insanely destructive. Against it Pentheus, the voice of civilized authority, marshals his armed forces. But the king's apparent confidence masks an emotional immaturity that leaves him ignorant of his own identity and totally dependent on a sense of his own royal importance and reflex assertions of military force. These are no match for the ecstatic frenzy and irrational destructiveness of Dionysus and his maenads. The details of Pentheus' brutal death (ripped apart by his mother and aunts in a mad fit inspired by Dionysus) and the sight of the different

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<sup>67</sup>The text of Sophocles' play does not clearly indicate that Oedipus leaves the city immediately. However, in many productions of the play the closing image the audience sees is the blind king hobbling off. In Sophocles' later work, *Oedipus at Colonus*, we learn that Oedipus wandered away from Thebes at some point after his self-mutilation and has spent years as a suffering vagrant.

<sup>68</sup>For details about the traditional stories of Euripides' death see Mary R. Lefkowitz, "The Euripides *Vita*", <http://grbs.library.duke.edu/article/viewFile/7231/5835>. (Accessed February 22, 2018).

parts of his body being carried back to Thebes and left scattered on stage (the only unburied corpse in Greek tragedy) denies Pentheus any status as a great hero: he is just a pathetic victim of his own emotional insecurity and Dionysian irrationality.

The conclusion of the *Bacchae* is about as far from the conclusion of the *Oresteia* as one can imagine. There is no synthesis here, no basis for a finer civilized life, no remnant of traditional Thebes, for the god punishes them all with exile. Cadmus, the legendary founder of the city, who originally came from Asia Minor to build a new civilization in Europe, is portrayed as a doddering old fool more concerned with the status of his family than with anything else. Dionysus contemptuously sends him away to be transformed into a serpent, and the horde of irrational dancing worshippers then leaves in order to overwhelm the next Greek city.

Given the “life is a choice of nightmares” vision of Euripides’ last play, it is perhaps not surprising that Plato made the decision to stop writing plays and to focus his imaginative energies on exploring a new form autonomy in the person of his Socrates, who offers a way to apply human reasoning to an understanding of nature and of oneself that can lead us to the good, the true, and the beautiful and, what’s more, can do so without involving suffering.<sup>69</sup> On the contrary, learning to “know oneself” is good for the soul in this life and an appropriate way to prepare for its life in the next (concepts totally foreign to the great tragic figures of the past). Plato’s portrayal of Socrates in the early dialogues is deliberately setting him up as a new model of heroic conduct, a man who has turned his back on the tragic vision of the great dramatists in order to launch the optimistic enterprise we are still pursuing: the quest for the true, the good, and the beautiful.

I draw no conclusions from this brief mention of Greek tragedies, other than to observe that we are not the only ones who have wrestled with issues of reason and faith and that revisiting visions of the interplay between the two, written by those who looked at nature with eyes far less sentimental than our own, in an age that had not yet succumbed to a providential view of history or a belief in the inevitable benefits of

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<sup>69</sup>I believe Jan Kott was the first to apply this famous phrase from Joseph Conrad’s “Heart of Darkness” to an interpretation of the *Bacchae* (in *The Eating of the Gods*, 1973).

a commitment to never-ending rational progress, may provide insight or at least a few issues to think about.