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Enlightenment and enchantment: Technology and moral limits

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A B S T R A C T

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This essay places C.P. Snow's *The Two Cultures* in a particular intellectual context that points to important recent developments in the interdisciplinary discourse of applied ethics, particularly bioethics and its critical response to biotechnology. It also recasts the problem of the two cultures into a more fundamental question about the ethical governance of science—can we, should we, and will we in time finally bring about the end of the Faustian imperative of technocracy, and bridle unlimited consumption and economic growth based on depletion of finite fossil carbon and the ecologically destructive effects of its use?

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[Scientists] have the future in their bones.

— C.P. Snow

*...if the future is in the bones of anyone,
 it is in the bones of the literary genius and
 exactly because the present is in his bones,
 exactly because the past is in his bones.*

—Lionel Trilling

1. Introduction

No discipline, field, or branch of learning today can avoid perplexing questions about the social meaning and effects of the knowledge it generates. This is particularly true of science and technology, where debates concerning their application and social effects are intense. *The Two Cultures* is a clarion call for a science that will enhance the human condition.

My aim in this paper is to place Snow's essay in a particular intellectual context that points to important recent developments in the interdisciplinary discourse of applied ethics, particularly bioethics. I aim also to recast the problem of the two cultures into a more fundamental question about the ethical governance of science: can we, should we, and will we in time finally bring about the end of the Faustian imperative of technocracy, and bridle unlimited consumption and economic growth based on depletion of finite fossil carbon and the ecologically destructive effects of its use? [1]

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2. Reframing the “two cultures” problem

In my view, one cannot make sense of this discourse or the debate and discussion that Snow provoked in either conventional ideological or disciplinary terms. Snow tried to do both, but did not clearly distinguish between the ideological and the disciplinary, and thus did not succeed. The bioethics response to biotechnology does not fit neatly on a left-to-right (i.e., liberal-to-conservative) spectrum. Nor do these discussions simply pit the sciences against the humanities in any straightforward way; for example, the disagreements between molecular biologists and conservation biologists are as sharp as those between philosophers who favor more biotechnological applications and choices and theologians who do not. So the conflicts are as much *within* the scientific disciplines and the humanities disciplines as *between* them [2].

Nonetheless, there are important fault lines and distinctions to be made, and I offer one such orienting scheme here. It rests on two pairs of cross-cutting distinctions. The first is the distinction between two worldviews (I prefer this notion rather than the concept of “culture” for purposes of this discussion), which I refer to as the perspective of *enlightenment* and the perspective of *enchantment*. The second set of concepts needed to make sense of this debate over science, values, and governance is the distinction between two fundamental human orientations or stances toward both the social and the natural world, which I refer to as the stance of *creator* and the stance of *creature*—the human drive to reshape and improve nature, and the human need to accommodate our existence to natural limits and givens. These are my terms, and they require some initial definition and clarification.

The worldview of *enlightenment* is the material, empirical, and scientific outlook. In ontological terms, it views human beings as in but not of physical nature; as users of nonhuman nature but not fundamentally a part of nature. As Woody Allen has it, the enlightenment outlook is “at two with nature.” In epistemological terms, it is oriented toward the discovery of observable regularities in nature that can be set forth (albeit provisionally and rebuttably) as causal laws. The fundamental endeavor is that of “nomothetic deductive” explanation and prediction. The purpose of explanatory and predictive knowledge is enlightenment as empowerment—knowledge as creation and control.

On the other hand, the worldview of *enchantment* is an enterprise of explication and interpretation, not explanation and prediction. The subject matter of the humanities fields that partake of this worldview are systems and structures of meaning. Ontologically, human knowledge is embedded in the reality it seeks to understand. It seeks out the synthetic relationships in a web of meaning or semiotic systems and seeks to comprehend them in their context and particularity; it does not seek to abstract from them into more general theoretical constructs and covering laws. The worldview of enchantment offers an ecological vision of the relationship between humans and nonhuman nature, which are interconnected in the relationality—the web or “entangled bank”—of life itself. It is within this web of living nature and social meaning that human experience of the world has developed, and that we have come to comprehend, not only the natural environment, but also ourselves. Epistemologically, the worldview of enchantment is a quest to understand for the purpose of conserving and celebrating diversity, not controlling and reducing it.

The second distinction I want to introduce is that between creation and accommodation. Like enlightenment and enchantment, these are orientations toward nature. But they are not modes of knowing; they are modes of distinctively human being and modes of action on and in the natural and human world. In short, creation and accommodation are two fundamental aspects of the human condition. I suggest that it is imperative to understand and to account for them in any analysis of science and human values or the ethics of the governance of science and technology.

Many of the contending positions in the various science and values debates that I discuss in the next section equate the essence of our humanity and the essence of our moral responsibility in the world with one or the other of these two modes of being human, just as they select either explanation and control or explication and conservation as the defining characteristic of human knowledge. My own view is that these two aspects of the ontological situation of humankind (as well as the two aspects of the epistemological situation of humankind) are both necessary and vital. Neither should be (or could be) eliminated, but the essential tension between them must be maintained. That is the difficult task of the governance of science; that essential tension and balance is where science and values intertwine.

Man as creator (*homo faber*), the creation mode of being human, catches us up in the rage to make (or remake) the world—“the blessed rage for order,” Wallace Stevens called it. Man as creature, the accommodating mode of being human, grows out of our mortality and frailty as metabolic, created beings. It is our creaturely fragility and the tenuousness of our power and control over the conditions of our own existence and environment that demand the patience and humility fitting for a created being; they require the willingness (and intelligence) to set limits on our own creative/destructive behavior, to control our rage to reorder, and to live in a way of acceptance of the world as given [3].

The paradox of human being resides in the fact that we are at once dependent on the world of natural life and powerful enough to break away from it by creating an artificial world and a technological simulacrum of natural life. Heretofore in history manifested only in limited ways and on local scales, this human power to manipulate the natural and to create the artificial has reached the threshold of world-transforming potential on a global scale. This is a truly radical possibility not only because it may bring about the loss of life, biodiversity, whole species on a massive scale, but also because it might fundamentally transform our way of being in the world. It can thereby obliterate our humanity.

The human predicament is to be inclined one way by the exercise of power over being and another way by the patience to let being be. That tension is the energy from which the worldviews of enlightenment and enchantment draw; it is the animating force behind the quest to know that we call science and the quest to discern and respect that we call ethics (and the humanities more broadly). Governance is the fashioning of a social and institutional housing within which this tension can

live and be kept in some kind of equipoise. The fabricating power of the human as creator must be bridled, lest it destroy us. The patience and accommodation of the human as creature must be made active in support of the human and natural good, rather than passive and reactionary and uncaring.

The last couple of decades have produced a relentless discussion about the relationship between religion and science. This is a reprise of the distinction that C.P. Snow drew between the culture of scientific intellectuals and the culture of literary intellectuals, what we would today perhaps call the sciences and the humanities [4,5]. Snow was on the side of the modern, the scientific, the secular rationality of the enlightenment. His intellectual heirs are people like Dawkins and Hitchens [6,7].

In 1958, just five years after James Watson and Francis Crick revealed the molecular structure of DNA, and just before C.P. Snow gave his Rede lecture, Hannah Arendt warned presciently of the growing alienation that science was causing between humankind and the natural world. This warning, in her book *The Human Condition* [8], came at a time when the biological “revolution” was still nascent, and well before the dawn of contemporary genetic engineering and biotechnology. She writes:

The human artifice of the world separates human existence from all mere animal environment, but life itself is outside this artificial world, and through life man remains related to all other living organisms. For some time now, a great many scientific endeavors have been directed toward making life also “artificial,” toward cutting the last tie through which even man belongs among the children of nature... The question is only whether we wish to use our new scientific and technical knowledge in this direction, and this question cannot be decided by scientific means; it is a political question of the first order and therefore can hardly be left to the decision of professional scientists or professional politicians [8,2,3].

Arendt associates science with this radical, and radically dangerous, transformative power. Science unlocks the inner workings of nature so that nature can be “forced” (in Sir Francis Bacon’s memorable metaphor) to serve human needs and desires [9]. But again it is the step beyond Baconian science that most concerns Arendt, the step that will not merely use or manipulate nature, but replace it, particularly in the biological sphere [10].

Beginning roughly in the seventeenth century, the natural sciences largely jettisoned an explicitly values-based (theological) cosmology and natural philosophy in favor of a view of nature as a mechanistic arrangement devoid of *telos* or immanent meaning. During the Enlightenment period in the eighteenth century and the positivist movement in the nineteenth century, this objectifying, value-free view of reality was extended to the world of living organisms as well as to the social world. If the most rational and valid form of knowledge we possess removes value from its objects of study, including human beings, and if it embraces only utilitarian, material value as its central guiding purpose, from whence will come the ethical standards by which it should be guided, governed, or restrained?

Growing out of the humanities, but also drawing from those trained in the sciences and social sciences, a new enterprise has arisen during the past three decades to address such questions. This enterprise involves the interdisciplinary fields such as Science, Technology, and Society (STS) programs and what is generally known as “applied ethics” or “practical ethics,” an area in which subfields such as bioethics, environmental ethics, and engineering ethics are active and gaining broad attention.

The relationship between the technological applications of scientific knowledge and the ethical implications of its social and ecological effects is, I believe, the most important contemporary aspect of the “two cultures” phenomenon that C.P. Snow addressed. Writing at a moment of considerable emphasis on the beneficial social effects of new scientific applications, Snow provoked sharp responses from adversaries and critics such as Leavis [11] and Trilling [12]. However, it is also interesting to compare and contrast Snow with notable figures who wrote shortly before and after he did, such as Lewis [13] and Bronowski [14], and who in many ways expand and enrich the Snow–Leavis debate.

Bronowski highlights the common aspects of science and the arts and humanities. It is a mistake to see non-scientific bodies of knowledge and ways of knowing as the exclusive domain of values, while science is value-free. Science has its own inherent values and virtues, which scientists as individuals must internalize as a part of the practice of scientific thinking and investigation. Bronowski seeks to counteract the stereotype concerning the intellectual specialization and insensitivity of scientists, just as much of Snow’s discussion tries to connect a certain discipline in training and thought with virtues of character—although Snow is rather more combative in calling into question the character of non-scientists, or “literary intellectuals” as he calls them. Snow argued *ad hominem*; Leavis responded in kind. As a result, crucial aspects of the relationship between science and values, such as technology and moral awareness, were glossed over.

There remains a serious debate about the morally corrupting effect on well-meaning individuals of working for long periods of time within institutions that perpetuate harm and injustice, and science is not free from this danger. At the turn of the twentieth century, the great German sociologist Max Weber reflected on this issue in an essay entitled “Science as a Vocation” [15]. He was concerned with the larger historical process of the rationalization and disenchantment of the world, of which modern science was a fundamental part, especially the highly managed corporate science that Snow championed in 1959. Weber argued that this historical and cultural process does ultimately transform the character and undermine the moral imagination of highly trained individuals in the scientific, technical, and professional classes. The triumph of what I call the enlightenment worldview would produce, in Weber’s striking phrase, “specialists without spirit and sensualists without heart” [16].

Weber was acutely aware of the paradox that the ethical values necessary to govern both the conduct of scientific research and the use of technology are not entities that science per se can recognize or validate. If the ethical values used to govern science are not, according to the standards of science, things that can be rationally known, what is the basis of the authority of these values? Is the governance of science thus necessarily arbitrary and non-rational? Is the enlightenment worldview fundamentally incomplete?

Weber's concerns were afoot in England shortly before Snow's lecture. C.S. Lewis, a medieval scholar and popular religious writer and novelist, articulated a concern that has continuing resonance and relevance today. In *The Abolition of Man*, he asked what effect extending the power and control of the human will over biological processes would have on the moral seriousness with which we regard life and creation [13]. He also asked whether the traditional understanding we have of humanity and ethics would be overthrown or rendered incoherent in an age of biological engineering. Having demystified physical objects in nature, why wouldn't notions concerning the intrinsic value and dignity of human beings also become obsolete in the reductive acids of modernity and enlightenment?

I think it is fair to say that Lewis has proved to be far more influential than Snow, and Lewis' writings have inspired much of the work in contemporary bioethics that critically questions some aspects of biotechnology, particularly the prospect of human cloning. Among the leading thinkers developing the insights of Lewis are Leon Kass, Francis Fukuyama, Michael Sandel, and Jürgen Habermas [17–24]. This critique is centered, not so much around the possibility of instrumental harms but around the prospect of intrinsic wrongs, particularly the further transformation of our traditional moral norms of human dignity and a further tightening of the grip of formal legal rationality and technological power—Weber's iron cage.

3. Enlightenment and enchantment

The modern ideal of science and the worldview of enlightenment is a deeply skeptical and antitraditional doctrine. Its first impulse is to sweep aside all received doctrines and all claims to truth based solely on the authority of canonical belief or established practice.

Following from this demanding image of scientific truth, the worldview of enlightenment is equally severe in its demands on the mental discipline of the knowing subject. Not only must scientists avoid sources of error coming from outside, they must also control or suppress sources of bias within themselves. This does not mean that science must be a cold, passionless endeavor. Bronowski and Snow are surely right about that. But it does mean that the scientist *qua* scientist must establish an emotional distance from the phenomena he or she studies. In the worldview of enlightenment, the first virtue is objectivity or value neutrality; the cardinal sin is to allow judgments of value or preference to influence one's analysis of facts.

The worldview of enlightenment externalizes the relationship between the knowing subject and the object of knowledge. That is, the activity of science is ontologically separated from the reality it studies; it observes that reality but does not in any important or essential way participate in it. This doctrine (derived from the seventeenth century shift from a teleological and Christian cosmology to a mechanistic cosmology) means that objects of scientific knowledge are things to be described, manipulated, and controlled [25,26].

Broadly speaking, the humanities and the worldview of enchantment has responded to the challenge of enlightenment by defending the validity of classical learning and by embracing several related conceptions upon which the value of a continuing study of classical knowledge seems to depend. The most important of these conceptions are: first, a frankly normative (and, some would say, elitist) concept of high culture; second, the notion of a canon of texts representing (in Matthew Arnold's memorable phrase) "the best which has been thought and said" [27] on topics of perennial human concern; and finally the importance of preserving cultural traditions when industrial capitalism is relentlessly sweeping those traditions aside in favor of an uninhibited pursuit of material self-interest.

At stake is the continued authority of the humanistic canon and the normative significance of those texts; not only the significance of their substantive content, but also and more importantly, the significance of the standards of judgment, the sensibility, and the imaginative reach they exemplify. Also at stake are the methods, the habits of mind, that these "texts" (not only documents but all human artifacts, institutions, and performances) require, namely, the explication of messages in terms of what they mean, not the explanation of objects in terms of what causes them to behave as they do. Enlightenment and enchantment are not mutually exclusive; the same phenomenon can be seen from each of their points of view. But they do often provide incommensurable forms of understanding; they constitute the world differently, and often prompt us to different forms of action within it.

I turn now to the creation-accommodation distinction, and will expand upon it by reference to a discourse of bioethics in the face of biotechnology and the social and ecological implications of the power that it conveys.

The first half of the twentieth century was the era of atomic physics, and it is largely this that Snow seems to have in mind when he thinks of the culture of science. It is striking that, with the excitement about Watson and Crick's work surely still in the air, he did not have more to say about biology. At any rate, the second half of the century was a break-through era in biomedicine and the biological sciences.

Part of the task of bioethics is to think through the philosophical claims and assumptions inherent in biotechnology and in its "biopower"[28]. Thus far, ethical discourse has failed to grasp the nettle of the ontological crisis at stake in the era of biopower. There are two principal reasons for this. First, a problem with most ethical critiques of biotechnology is that they concentrate their gaze on biotechnology narrowly, as laboratory procedures and processes, and as an array of machinery [29]. More broadly and properly understood, a technology is a structure of interrelated ways of thinking and acting; ways of thinking about reality, nature, other people, and cognate ways of interacting with nature and with other people [30]. A technology is a complex of modes of production and relations of production. It is also a structure and a culture of fabrication. It marshals thought and action in the service of power, in the service of refashioning the given in accordance with human will and desire [31]. So defined, biotechnology cannot be understood apart from an appreciation of the phenomenon of biopower. But so long as biotechnology is seen as some new and amazing processes for making molecules do things, bioethics will fail to

come to grips with the deep connection between biotechnology, the political economy of advanced capitalism, and the culture of consumerism.

Second, bioethicists have focused ethics on the harms (actual and potential) of using biotechnology and distributing its products [23]. This all but rules out a radical or fundamental examination or critique of the ontological dimensions of biotechnology [32]. These ontological dimensions form the background preconditions of an ethical analysis and judgment; they are the context within which a concept like “harm” or “wrong” takes on its meaning. The stance we take toward life itself—our own position in the history of life and in the locality of living systems—also structures our perception of the nature and possibilities of ethical discourse.

To their credit, as I mentioned earlier, some lines of criticism of biotechnology have broached the notion that the widespread acceptance and use of these technologies—their normalization and routinization—will undermine traditional liberal and humanistic conceptions of human identity and human dignity. Moreover, broad theological concerns have been voiced to the effect that with biotechnology, mankind is exceeding the proper bounds of its knowledge and action, that we are overreaching ourselves and interfering with processes that should not be violated. Finally, there is the concern that the normalization of biotechnology will make it more difficult, if not impossible, to bring about a new sensibility of regard and “propriety” in the use and study of nature and an acceptance of essential ecological limits to growth and consumption that ecological philosophers have called for [1,10,33,34].

One shortcoming of these lines of critique, it seems to me, is that they presuppose the worldview of enchantment and the stance of creaturely accommodation as the starting point of their analysis, rather than working through the dialectic of the tension between enlightenment and enchantment. This gives those whose starting point is the enlightenment worldview and man as creator little reason to agree or find common ground. The enlighteners, like Hitchens today and Snow before him, can readily portray the vision of enchantment and acceptance of natural ecological limits to progress and technology as elitist, indifferent, cold-hearted, and reactionary, accepting as a part of the human condition the terrible maladies from which biotechnology claims to offer liberation. It warms one only a little when the enchanters reply by reminding us (correctly) that in the past the promises of biotechnology have been overblown and should by now mostly ring hollow.

4. Conclusion

We gravitate, at alarming speed, toward the regime of biopower. It is not foreign and threatening to us, a dystopian future such as that imagined in Aldus Huxley's *Brave New World*. It is a new manifestation of who we have become as people, as a society, and what we have been taught to desire. Huxley projected his insight forward; we need to supplement that by looking—as Trilling's literary genius would do—backward, within, and all around us. The future is not in our bones; it is set before us as stewards with awesome responsibility.

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