ETHICS, SCIENCE, TECHNOLOGY, AND ENGINEERING

A Global Resource

SECOND EDITION

VOLUME

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Davis, Paul K., and Kim Cragin, eds. 2009. *Social Science for Counterterrorism: Putting the Pieces Together*. Prepared for the Office of the Secretary of Defense. Santa Monica, CA: Rand Corporation.

Enserink, Martin. 2002. "Secret Weapons Tests' Details Revealed." *Science* 298 (5593): 513–514.

Flynn, Stephen. 2004. *America the Vulnerable: How Our Government Is Failing to Protect Us from Terrorism*. New York: Harper Collins.

Ghosh, Tushar K., Mark A. Prelas, Dabir S. Viswanath, and Sudarshan K. Loyalka, eds. 2010. *Science and Technology of Terrorism and Counterterrorism*. 2nd ed. Boca Raton, FL: CRC Press.

Includes more than twenty case studies of terrorist uses and potential uses of science and technology and ways to counter them.

Greenberg, Daniel S. 2002. "Self-Restraint by Scientists Can Avert Federal Intrusion." *Chronicle of Higher Education*, October 11, B20.

Jackson, Ronald J., Alistair J. Ramsay, Carina D. Christensen, Sandra Beaton, Diana F. Hall, and Ian A. Ramshaw. 2001. "Expression of Mouse Interleukin-4 by a Recombinant Ectromelia Virus Suppresses Cytolytic Lymphocyte Responses and Overcomes Genetic Resistance to Mousepox." *Journal of Virology* 75 (3): 1205–1210.

Jenkins, Dominick. 2002. *The Final Frontier: America, Science, and Terror*. London: Verso.

Presents the argument that changes in technology have created a situation where all citizens are vulnerable to catastrophic terrorist attacks.

Knezo, Genevieve J. 2001. *Federal Research and Development for Counter Terrorism: Organization, Funding, and Options*. CRS Report RL31202. Washington, DC: Congressional Research Service. http://www.ieeeusa.org/policy/REPORTS/CRSterrorismresearch.pdf

Knezo, Genevieve J. 2002. *Possible Impacts of Major Counter Terrorism Security Actions on Research, Development, and Higher Education*. CRS Report RL31354. Washington, DC: Congressional Research Service. http://www.fas.org/irp/crs/RL31354.pdf

Lum, Cynthia, and Leslie W. Kennedy, eds. 2012. *Evidence-Based Counterterrorism Policy*. Dordrecht, Netherlands: Springer.

How science can inform and improve counterterrorism interventions.

MacKenzie, Debora. 2012. "Bird Flu Research to Be Published in Full." *New Scientist* 22 (20) (February 17).

Malakoff, David. 2003. "Researchers Urged to Self-Censor Sensitive Data." *Science* 299 (5605): 321.

Mann, Charles C. 2002. "Homeland Insecurity." *Atlantic Monthly* 290 (2): 81–102.

Monastersky, Richard. 2002. "Publish and Perish?" *Chronicle of Higher Education*, October 11, A16–A19.

Focuses on the dilemma of scientific openness and national security.

National Research Council (NRC), Committee on Science and Technology for Countering Terrorism. 2002. *Making the Nation Safer: The Role of Science and Technology in Countering Terrorism*. Washington, DC: National Academies Press.

National Research Council (NRC), Committee on the Role of Information Technology in Responding to Terrorism, Computer Science and Telecommunications Board. 2003. *Information Technology for Counterterrorism: Immediate Actions and Future Possibilities*. Edited by John L. Hennessy, David A. Patterson, and Herbert S. Lin. Washington, DC: National Academies Press.

National Research Council (NRC), NAS Committee on International Security and Arms Control. 2007. *Science and Technology to Counter Terrorism: Proceedings of an Indo-U.S. Workshop*. Edited by Roddam Narasimha, Arvind Kumar, Stephen P. Cohen, and Rita Guenther. Washington, DC: National Academies Press.

Plous, Scott L., and Philip G. Zimbardo. 2004. "How Social Science Can Reduce Terrorism." *Chronicle of Higher Education*, September 10, B9–B10. https://www.socialpsychology.org/pdf/chronicle04.pdf.

Richardson, Jacques G. 2002. *War, Science, and Terrorism: From Laboratory to Open Conflict*. London: Cass.

Sees the connection between science and terrorism largely as an outgrowth from the partnership between science and the military and asks to what extent science is promoted by actual or threatened armed conflict and whether war is an extension of science by other means.

Smith, Marcia S. 2002. *Science and Technology Policy: Issues for the 107th Congress, 2nd Session*. CRS Report RL31352. Washington, DC: Congressional Research Service.

Susser, Ezra S., Daniel B. Herman, and Barbara Aaron. 2002. "Combating the Terror of Terrorism." *Scientific American* 287 (2): 70–77.

Wallerstein, Mitchel B. 2002. "Science in an Age of Terrorism." *Science* 297 (5590): 2169.

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THEODICY

Theodicy is a concept developed by Gottfried Wilhelm Leibniz (1646–1716) to justify the existence and absolute perfection of God despite the evil that exists in the world. The term appeared in 1710 in the title of Leibniz's work *Theodicy: Essays on the Goodness of God, the Freedom of Man, and the Origin of Evil*, and with it he coined an optimistic variant par excellence on theories of evil. Insofar as science and technology are often interpreted as responses to evil, theodicy is related to their modern emergence.

BACKGROUND AND EMERGENCE

Theories of evil have been developed by Plotinus (204–270), Augustine (354–430), and others in which evil is seen as necessary for universal harmony. Within the framework of the complex theological discussions on the origin of evil, Leibniz's theodicy denies both the idea of God as a malevolent creator of the world (a position taken by certain Gnostics) and the refutation of this theory by

Origen (c. 185–254) and Augustine who, in postulating human freedom, attributed moral responsibility for all the evils of the world to human beings, in the form of sin.

Leibniz's particular approach was to interpret perfection as the state of a thing when it attains its highest level of being. This definition highlights God's perfection. From the quantitative point of view, God has all perfections; from the qualitative point of view, these perfections reach their highest form in him. God is therefore omniscient and omnipotent. Despite the impressions that evil, injustice, and suffering give us of the world, God's perfection is necessarily expressed in his creation.

This theory is, paradoxically, a key philosophical element of transition to modernity, a vital bridge to the new philosophies that emerged in the second half of the eighteenth century: the philosophy of history, philosophical anthropology, and aesthetic philosophy. The advance of these philosophies is tied to a new understanding of human nature that rejects the naturalism of seventeenth century thought, as well as traditional Christian theology. All the images of the human that developed in the eighteenth century were optimistic in ways reflecting theodicy—as can be illustrated in moral humanity (Anthony Ashley Cooper Shaftesbury [1671–1713]), rational humanity (Jean-Jacques Rousseau [1712–1778], Immanuel Kant [1724–1804]), economic humanity (Adam Smith [1723–1790]), and perfectible humanity (Condorcet [1743–1794]).

Although the idea of a human fall did not immediately disappear, a new concept began to replace it—not exactly of human greatness, but of the ability of humans to do what was necessary to make the world better for the human species. To understand this situation is to recognize the significance of Leibnizian theodicy for modern science and technology, as well as for ethics in the era of modernity. Leibniz's theodicy was both necessary for and representative of the modern world, insofar as it gave expression to a vision of the human condition as one which, aided by science and technology, was no longer characterized by powerlessness, suffering, and evil. These were henceforth looked at outside Leibniz's own metaphysical framework as being essentially surmountable.

COLLAPSE AND CONTINUITY

With the Lisbon earthquake of 1755, Leibniz's justification of God in the face of worldly evil collapsed, in a complex historical context where science began progressively to replace religion as the cultural frame of reference. Nevertheless, the semantic core of Leibniz's arguments—that to compensate for evil is in fact the purpose the divine creator had before him—held firm. As Odo Marquard (1989, 38–63) argued, Leibniz provided the teleological framework in which science and technology could become both means and ends. In Leibniz's theology, that basic principle is "*malum* through *bonum*": God does not make up for evil with good, but evil is rehabilitated by the good it pursues. Tolerance in the face of evil is justified by having the highest good as the end in view, insofar as evil is the condition that makes the good possible.

In this sense, the principle of theodicy is that the ends justify the means. With the collapse of Leibnizian theodicy in its original form, human beings take the place left vacant by the omnipotent creative will, and theodicy is transformed into anthropodicy or human progress. Humanity as an end in itself is free to use everything else as mere means, inheriting God's role in order to realize and complete theodicy in history. Every goal achieved became a new means toward another end.

As a result of this teleological sequence of means and ends, what came to predominate was not the possible uses of the means, but the very means themselves. The ends no longer justified the means, the means justified the ends. This logic is linked to the cost/benefit compensation criterion of utilitarianism: every good has its price. As Thomas Robert Malthus (1766–1834) wrote in his *Essay on the Principle of Population* (1798): "There is evil in the world, not in order to produce despair, but rather activity." This idea is equally present in other modern thinkers, such as Bernard Mandeville (1670–1733): "There are 'private vices' [*malum*], but they are 'public benefits' [*bonum* through *malum*]."

THE EXAMPLE OF COURNOT AND TEILHARD

Among those who developed philosophies of history guided by an optimistic approach or who believed in humanity's ascending progress to an ideal state were the Frenchmen Antoine-Augustin Cournot (1801–1877), a teacher of mathematics and author of several works on the philosophy of history, and Pierre Teilhard de Chardin (1881–1955), a Jesuit priest, paleontologist, and philosopher of nature. Though sometimes neglected, these two thinkers developed unusual and powerful syntheses that reflect the subtle and penetrating influence wielded by the Leibnizian idea of an omnipotent creative will. Their work had significant repercussions during their own lifetimes, and their theoretical constructs are still surprisingly topical in the twenty-first century: Cournot as a prophet of posthistorical technological civilization, Teilhard as the prophet of transhumanism.

For the century in which he lived, Cournot was the thinker who developed with the greatest persistence a philosophy of history in which science and technology take pride of place. His philosophy of history is based on a series of binary opposites: chance and necessity, reason

and instinct, passions and interests. With these concepts, his reading of history was finalistic, and he argued for the likelihood or even the inevitability of what has come to be called "the end of history," a partly Hegelian premise that was revived at the end of the twentieth century in a world that claimed the end of ideology, of utopia, of politics, of the human. Hermínio Martins (1998), who has emphasized the importance of Cournot for the philosophy of technology, argues that Cournot's "end of history" semantics do not imply a form of necessitarianism, in the sense of extinction or termination, but more correctly exhaustion, completion, fulfillment, or consummation.

Cournot's temporal interpretation of collective human existence is based on a system of three great time-phases, as found in the work of Auguste Comte (1798–1857) and Karl Marx (1818–1883), and closely related to different kinds of discourse. The first phase has been labeled *ethnological* and is characterized by the subordination of reason to instinct, of the planful to the unreflective. Habit and custom predominate, and are accompanied by natural or human disasters. The second stage is the phase of history itself. This is defined by an increase in rationality in thought and action, and by a combination of passions and interests as the springs of action with sufficient power to give rise to colossal events, of which the French Revolution is an example. The third and terminal phase is the closest possible approximation to the ideal, which humanity will never be able to attain. In this phase, "political faiths" decline, as occurred during the French Revolution, and give way to the peaceable play of economic interest and the *doux commerce*.

This third stage establishes a posthistoric society that conquers nature by systematic scientific discovery, technological invention, innovation, and economic growth. Cournot anticipates positions that were further developed in the twentieth century, such as Joseph Schumpeter's (1883–1950) routinization of economic innovation and what Alfred North Whitehead (1861–1947) calls the "invention of invention." But Cournot does not show any significant concern with the possible intrinsic limits of scientific progress, which might bar further fundamental technological advance.

Teilhard's approach to human history also embodies finalism, and the role of scientific and technological advance within it, although his vision embraces different domains from those of Cournot. Teilhard's arguments have roots in the philosophy of Henri Bergson (1859–1941), and are part of the new theology of history that seeks to protect theology from the temptation of rationalist hermeneutics. Nonetheless, it did not shy away from dealing with "earthly realities," such as the relationship between humans and nature, the carnal nature of human beings, scientific humanism, and the theology of science. Teilhard's thinking embodied these contributions, and added a lively intuition of the evolutionist and voluntarist scientific and technological type that aroused serious suspicions in Rome. Contravening some basic postulates of Christianity, he argued for the "spiritual value of matter," and developed a conception in which humankind, with its artistic achievements, technological artifacts, and religions, is part of an overall evolutionary scheme in which there exists a progressive manifestation of biochemical complexity on the path to a growing unified consciousness.

In the tradition of the omnipotent creative will, Teilhard argued that perfection lies in the progress not of individuals but of humanity as a whole on a path toward unification with God who, being in essence supernatural, is at the same time the natural outcome of evolution. In his main work, *The Phenomenon of Man* (1959), he develops a suggestive synthesis of science and religion, in the context of a view of the universe as a system that develops from one phase to another with ever-higher forms of consciousness. Postulating history as progress, the flow of the moral perfectibility of humanity as a whole, science and technology provide the motor for intelligibility, enabling new forms of awareness and clear-sightedness. Far from the profane vision of science, Teilhard understands the operative frameworks of science as participants in evolutionary terms attaining their epilogue in Christifying salvation. All of science thereby becomes a certain form of liturgy. Simultaneously, the holistic and technological dimensions to history encounter in the science and technology of the last century the most grandiose drivers of impulsion/ebullition, ensuring that even the unprecedented evils of the twentieth century might, in part, be understood as lateral sideshows to ongoing changes. Teilhard represents a landmark to Internet-era ideologues advocating the role of globalization as a new stage fostering the continuation of evolution in the Darwinian sense of the term. While *Homo sapiens* constitutes the biological state of evolution, this process might subsequently be taken on by humanity as it gradually becomes aware of its own unity through information technology networks.

Teilhard's speculations anticipated those who favor a transhuman future, which appears possible and desirable. These transhumanists are convinced that the new computational technologies are creating a collective human intellect, a kind of cognitive and mental hyperextension of the human mind. Cournot, by contrast, thought that organic life would remain fundamentally inaccessible to mathematical and experimental science, while postulating that increasing knowledge of inanimate nature would be sufficient to ensure technical perfectibility and material progress.

SEE ALSO *Leibniz, G. W.; Progress.*

BIBLIOGRAPHY

Anderson, Perry. 1992. *A Zone of Engagement*. London: Verso.

Cournot, Antoine-Augustin. 1861. *Traité de l'enchaînement des idées fondamentales dans les sciences et dans l'histoire* [Treatise on the chain of fundamental ideas in science and history]. Paris: Hachette.

Cournot, Antoine-Augustin. 1875. *Matérialisme, vitalisme, rationalisme* [Materialism, vitalism, rationalism]. Paris: Hachette.

Leibniz, Gottfried Wilhelm. 1952. *Theodicy: Essays on the Goodness of God, the Freedom of Man, and the Origin of Evil*. Edited by Austin Farrer; translated by E. M. Huggard. London: Routledge and Kegan Paul.
First published in French in 1710.

Marquard, Odo. 1989. *Farewell to Matters of Principle: Philosophical Studies*. Translated by Robert M. Wallace with the assistance of Susan Bernstein and James I. Porter. New York: Oxford University Press.

Martins, Hermínio. 1998. "Technology, Modernity, Politics." In *The Politics of Postmodernity*, edited by James Good and Irving Velody. Cambridge: Cambridge University Press.

Ruyer, Raymond. 1930. *L'humanité de l'avenir d'après Cournot* [The humanity of the future according to Cournot]. Paris: Alcan.

Teilhard de Chardin, Pierre. 1959. *The Phenomenon of Man*. Translated by Bernard Wall. New York: Harper.

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THERAPY AND ENHANCEMENT

It is common, in classifying interventions, to sort them into those that are *therapeutic*, that is, directed at diminishing the harms suffered by a patient, and those that are *enhancing*, that is, directed at increasing the goods experienced by a patient. At least three independent but related questions can be raised about the therapy/enhancement distinction: (1) Can the two terms *therapy* and *enhancement* be defined clearly, reliably, and accurately? (2) Assuming they can be satisfactorily defined, under what circumstances is it morally justified for a physician to engage in either activity? (3) Assuming they can be satisfactorily defined, what implications does labeling an intervention as therapeutic or enhancing have on the issue of whether the cost of the intervention should be borne in part or in whole by third-party funding agencies?

DEFINING THERAPY AND ENHANCEMENT

The distinction between therapy and enhancement can be most clearly made by first having available a clear definition of a third term: *malady*. The following definition, adapted from *Bioethics: A Return to Fundamentals* (Gert, Culver, and Clouser 1997, 104), classifies all clear cases of maladies as maladies and does not classify as a malady any condition that is clearly not a malady. An individual has a malady if and only if he or she has a condition that is not normal for a person in his or her prime, other than his or her rational beliefs or desires, such that he or she is suffering, or is at a significantly increased risk of suffering, a nontrivial harm or evil (death, pain, disability, loss of freedom, or loss of pleasure) in the absence of a distinct sustaining cause.

Therapies are interventions whose intention is to reduce or eliminate the harms that are a defining characteristic of maladies. If an intervention is not directed toward reducing or eliminating the harms associated with a malady, then it is not a therapy. Enhancements are interventions directed toward increasing the personal goods experienced by another person, such as abilities (including knowledge), freedom, and pleasure. If an intervention is not directed toward increasing another's personal goods, then it is not an enhancement. These definitions seem to correctly classify all cases of therapies and enhancements.

An extensive project, the Enhancement Project, sponsored by the Hastings Center concluded that the terms *therapy* and *enhancement* could not be defined clearly and could thus serve only as "conversation starters." In the words of the project coordinator, "Like many distinctions, the treatment/enhancement distinction is permeable, unstable, and can be used for pernicious purposes" (Parens 1998, 25). The concept of enhancement is also often conflated with notions of transhumanism, which presents even more definitional difficulties. In contrast, the present article argues that the two basic terms can be defined clearly, with the advantage that clear definitions decrease the likelihood of any pernicious applications of the terms.

There are inevitable borderline cases. For example, how should one classify the administration of growth hormone to a child destined to be very short but who shows no evidence of an endocrinopathy? There is disagreement about this question, but not because of any avoidable vagueness in the definitions given here. Instead, the disagreement is about whether this condition is a malady. If it is not a malady, then administering growth hormone is not a therapy; if it is a malady, then administering growth hormone is a therapy. Both Eric T. Juengst (1998) and Norman Daniels (1994) also use the concept of malady in distinguishing between therapies and enhancements, although Daniels's definition of malady differs from the one given here.