

Richard Gunstone, ed.
Encyclopedia of Science Education
 Dordrecht: Springer Reference, 2015

Morals and Science Education

Holmes Rolston III
 Colorado State University, Fort Collins,
 CO, USA

Science and conscience have a vital, if sometimes uneasy, relationship. Moral education demands levels of responsible agency that science education does not, owing to the shift from what *is* the case to what *ought* to be the case. Facts and causes are the domain of science and values and duties the domain of ethics; but criticism is equally requisite in both. Science and ethics alike are embedded in traditions where truths are shared through education. Ethicists often find stages in moral life; no analogous claims have been made for scientific life. Morality has to be chosen, entered into, lived, and practiced, in ways that science does not. People are responsible for their values as they are not for their science.

Astronomy is sometimes thought to leave humans lost and lonely among the stars, and this may leave puzzles where to place Earthbound

human morality in a vast meaningless universe. “The more the universe seems comprehensible, the more it also seems pointless” (Weinberg 1988, p. 154). More recently physics has made dramatic discoveries at astronomical and submicroscopic ranges, such as the formation of elements in the stars involving microphysical process, such that the midrange scales, where the known complexity mostly lies (in ecosystems or human brains), depend on the interacting microscopic and astronomical ranges. This “anthropic principle” endorses and even celebrates human cognitive and moral powers. We humans do not live at the range of the infinitely small, nor at that of the infinitely large, but we may well live at the range of the infinitely complex. That restores human dignity and worth (Barr 2003).

Biological sciences often carry implicit or explicit overtones of who and what humans are, which may not be coherent with the implicit or explicit human self-understandings in classical or contemporary moral education. Human behavior is shaped by selfish genes (Dawkins 1989); we should biologicize ethics as disguised self-interest (Wilson 1975, p. 562). If so, can humans be altruistic? Scratch an “altruist” and watch a “hypocrite” bleed (Ghiselin 1974, p. 247). Ethicists may agree about selfish tendencies in human nature but argue that humans can and ought to be educated toward a common good, or at least more enlightened self-interests. Theologians may find that humans are in need of redemption. Meanwhile, biologists may find more cooperation coded into the human genome than previously thought (Nowak and Highfield 2011).

The sciences may also open up new possibilities (cloning, genetically modified genes; Bruce and Bruce 1998) or threats (climate change, mass extinction; Gardiner 2011) with which inherited moral systems are unfamiliar. Moral education may enlighten and elevate the human nature that has evolved biologically (Campbell 1976).

By prevailing Darwinian accounts, biological natural history results from natural selection, which is thought to be blind, both in the genetic variations bubbling up without regard to the

needs of the organism and in selection for survival, without regard to advance. Other biologists hold that such behavior can be more positively interpreted. Organisms defend their lives; their so-called selfishness is really self-actualizing, the defense of vitality. Reproduction is the ongoing sharing of biological value and promise. The genes function to conserve life; they also make possible a creative upflow of life struggling through turnover of species and resulting in more diverse and complex forms of life over millennia.

Such biologists emphasize the continuing vital creative processes over time, the ascent of life from the simple to the complex, a prolific (pro-life) biosphere, the conservation and elaboration of genetic information, and the effective and efficient results of genetic creativity and natural selection. This may lead to a sense of respect for life, made possible by our human singularity, the sole species with moral powers, and with responsibility for caring for other humans and for the Earth.

Reinterpreting natural history more constructively may also have implications for human self-estimates. Humans evolved from prehuman primate ancestors; we may be told that we inherit a monkey's mind. "DNA evidence provides an objective non-anthropocentric view of the place of humans in evolution. We humans appear as only slightly remodeled chimpanzee-like apes" (Wildman et al. 2003, p. 7181). But humans have over three times the brain size of chimps, so that a 3 % difference in protein structures makes 300 % bigger brains. Cognitively, we are not 3 % but 300 % different (Marks 2002, p. 23).

When you compare Einstein with a chimp, it does not appear that Einstein is only slightly remodeled; nor do we wonder whether an atomic bomb built with his theory that $E = mc^2$ is a slightly remodeled ant-fishing stick. An explosion of cognitive powers emerges with the human mind, an event otherwise unknown in natural history. Neurosciences may agree that the human mind is immensely complex and also find openness and mutability (in synaptic connections) that permits humans to be morally responsible (Merzenich 2001). "We are hugely

different. ... the differences are light years apart" (Gazzaniga 2008, p. 13).

The ecological sciences will add that on Earth humans are (and ought to be) at home, the root idea in ecology. A moral priority is a sustainable biosphere. Ecologists also find that humans are degrading the biosphere. They may be apprehensive about ecosystem services or impending extinctions (Millennium Ecosystem Assessment 2005). They will demand education in conservation biology. No one is rational if he or she is neutral, dispassionate, about one's home. One is immoral if unconcerned about life in jeopardy on one's home planet. Biologists are almost unanimous in their respect for life on an endangered planet. The Earth's impressive and unique biodiversity warrants wonder and care.

In both science and moral education, one seeks enlightenment. Philosophers may push the claim that modern science, after 400 years, still leaves the ultimate value questions urgent and unresolved. Indeed, there is no scientific guidance of life. The value questions remain as acute and painful as ever.

Cross-References

- ▶ [Biology, Philosophy of](#)
- ▶ [Cultural Values and Science Education](#)

References

- Barr SM (2003) Modern physics and ancient faith. University of Notre Dame Press, Notre Dame
- Bruce D, Bruce A (1998) Engineering genesis: the ethics of genetic engineering in non-human species. Earthscan Publications, London
- Campbell DT (1976) On the conflicts between biological and social evolution and between psychology and moral tradition. *Zygon J Relig Sci* 11:167–208
- Dawkins R (1989) The selfish gene, new ed. Oxford University Press, New York
- Gardiner SM (2011) A perfect moral storm: the ethical tragedy of climate change. Oxford University Press, New York
- Gazzaniga MS (2008) Human: the science behind what makes us unique. Ecco, Harper Collins, New York
- Ghiselin M (1974) The economy of nature and the evolution of sex. University of California Press, Berkeley

-
- Marks J (2002) What it means to be 98 % chimpanzee: apes, people, and their genes. University of California Press, Berkeley
- Merzenich M (2001) The power of mutable maps. In: Bear MF, Connors BW, Paradiso MA (eds) Neuroscience: exploring the brain, 2nd edn. Lippincott Williams and Wilkins, Baltimore, p 418
- Millennium Ecosystem Assessment (2005) Ecosystems and human well-being: synthesis. Island Press, Washington, DC
- Nowak M, Highfield R (2011) Supercooperators: altruism, evolution, and why we need each other to succeed. Free Press, New York
- Weinberg S (1988) The first three minutes. Basic Books, New York
- Wildman DE, Uddin M, Liu G, Grossman LI, Goodman M (2003) Implications of natural selection in shaping 99.4 % nonsynonymous DNA identity between humans and chimpanzees: enlarging genus *Homo*. Proc Natl Acad Sci U S A 100:7181–7188
- Wilson EO (1975) Sociobiology: the new synthesis. Harvard University Press, Cambridge, MA
-