

## Science and ethics

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Ethics is the branch of philosophy that deals with values of human conduct with respect to the rightness and wrongness of certain actions and to the goodness and badness of the motives and ends of such actions.<sup>1</sup>

In the case of science, ethics is the link between the scientist and society. Scientists seek a systematic understanding of the physical world and therefore make decisions that are crucial for the progress on mankind.<sup>2</sup> Good ethical behaviour usually leads to good consequences both for the scientist and for society.

Science should be in the interest of society. One of the main points that are considered in discussion about the ethics of science is the possible consequence of the scientific research. History shows us that disregarding ethics when it comes to applying the results of scientists work can lead to devastating outcomes. For instance, the Manhattan Project can be considered one of the most important scientific successes of the twentieth century. The project began simply and, ironically, with a letter to the US President Roosevelt from a great man of peace and humanitarian, Albert Einstein, in which he said that “uranium may turn into a new and important source of energy in the immediate future,” and that, while not certain, “extremely powerful bombs of a new type may be constructed.”<sup>3</sup> Nonetheless, he never worked on the project to make the atomic bomb.

The construction of the first atomic bomb was the result of the collaboration of leaders from all scientific fields, from the study of nuclear physics (Robert Oppenheimer, known as the ‘father of the atomic bomb’, Enrico Fermi) to chemistry and engineering. However, the morality of using atomic warfare in World War II is questionable. The deployment of bombs over the Japanese cities Hiroshima and Nagasaki in August 1945 may have ended the war, but the costs were high: hundreds of thousands of innocent lives lost. Even though some argue that this was the least devastating option available at that time, it is impossible to determine what would have been best for humanity. Although the development of the first atomic bomb was a technological achievement, the question of morality and responsibility to ethics will forever plague the topic.<sup>4</sup>

But what are the responsibilities of scientists? A responsible person may be defined as one who is aware of his duties and ready to fulfil them, being able to answer for all of his actions. On one hand, Einstein was saddened when the bombs were used in Japan and after the war he joined many organizations working to control and eliminate nuclear weapons. Furthermore, he fought against the development of the hydrogen bomb. Just before his death he signed one of the most powerful anti-war statements ever written, the Russell-Einstein Manifesto in which he expresses the fear of massive destruction made possible by nuclear weapons that could bring an end to humanity. The manifesto states: “Here, then, is the problem which we present to you, stark and dreadful and inescapable: Shall we put an end to the human race; or shall mankind renounce war?”<sup>5</sup> On the other hand, Enrico Fermi, the man who worked on developing the atomic bomb had foreseen the dangers of nuclear weapons: “A little

bomb like that,” declared the physicist, enthralled by his first taste of nuclear fission, “and it would all disappear.”<sup>6</sup> However, after the war, he went on to develop the hydrogen bomb.

Ethics should not only guide the application of the scientific discoveries, but also the path that leads to them. It can be debated whether in order to obtain significant results the scientist can use unethical methods. In other words, does the end justify the means? For example, few practices of modern science caused more controversy than the use of animals in testing. Possible uses of animals range from cosmetics testing to vaccine testing to toxicity testing to organ transplants<sup>7</sup>. It is blamed by some people, but others say that for the development of a groundbreaking medical discovery which may save thousands of lives it is a price worth to pay. Numerous antibiotics and vaccines have been developed this way. Testing drugs on animals is a crucial step, before it is safe for them to be given to humans. Direct experiments on people would be far more dangerous and could have devastating results. For example, the Nazi human experimentation, said to be carried in the name of medicine, resulted in a massacre and not in scientific breakthrough. In the early 1940s, during World War II, the German Nazi performed a series of medical experiments in concentration camps on a large number of prisoners. They included various experiments on twins to find their similarities and differences, freezing experiments to stimulate the conditions the army had to suffer on the Eastern front, malaria experiments, sterilization experiments etc. Most of them were conducted by Josef Mengele, nicknamed “The Angel of Death”, who was the Chief Medical Officer at the Auschwitz concentration camp at that time. Many subjects died during the experiments or soon afterwards. After the war, during the trial, the captured Nazi doctors attempted to excuse themselves by arguing that there were no explicit rules governing medical research on human beings. Therefore, legal regulations over the scientific research on humans which consisted of standards such as the voluntary consent of patients, the avoidance of unnecessary pain and suffering etc, were introduced.<sup>8</sup>

The progress of science has already created and will continue to create new and unexpected situations, to which the existent moral norms can hardly apply.<sup>9</sup> The ability to assume one’s responsibility is the best guide for keeping science under reasonable control. In addition, some legal regulations over the scientific research must exist, but these should be characterized by reasonable flexibility.

Finally, I think that scientists must have intellectual integrity because it is the only way mankind can continue to trust science rather than fear it. Many people seem to be afraid of science and technology because they see them as a kind of blind force, growing without control. The only way we can feel secure in a community is when we are confident that everyone fulfils his duties.

1022 words

## Referecens

<sup>1</sup> <http://dictionary.reference.com/browse/ethics>

<sup>2,7</sup> E. Seebauer, R. Barry, "Fundamentals of ethics for scientists and engineers", Oxford University Press, 2001

<sup>3,5</sup> [http://www.wagingpeace.org/articles/2007/10/04\\_krieger\\_nuc\\_weapons.php](http://www.wagingpeace.org/articles/2007/10/04_krieger_nuc_weapons.php)

<sup>4</sup> <http://www.pitt.edu/~sdb14/atombomb.html>

<sup>6</sup> Rhodes, R, "The Making of the Atomic Bomb", 1986

<sup>8</sup> [http://en.wikipedia.org/wiki/Nazi\\_human\\_experimentation](http://en.wikipedia.org/wiki/Nazi_human_experimentation)

<sup>9</sup> Shea & Sitter, "Scientists and their responsibility", Watson Publishing International, 1989