

## A priori Limitations and Scientific Inquiry

**Aleksander Kadiev**

Assistant Professor / College of General Education

**Namseoul University**

91 Daehak-ro, Seonghwan-eup, Seobuk-gu, Cheonan,  
Chungcheongnam-do 31020, South Korea

Email: [alek@nsu.ac.kr](mailto:alek@nsu.ac.kr)

Tel: +82-41-580-3562 (office)

Tel: +82-10-2860-9747 (Mobile)

URL: [www.nsu.ac.kr](http://www.nsu.ac.kr)

**Abstract:** *This article delves into the debate regarding whether science should be free from a priori limitations or if it should adhere to ethical and safety considerations. It explores the interplay between science, religion, and safety, focusing on the perspectives of Judaism, Christianity, and Islam. While all three religions have historical roots in encouraging scientific inquiry, they also raise objections to certain scientific endeavors based on theological or ethical grounds. The article discusses contemporary debates within each religion regarding issues such as genetic engineering, artificial intelligence, and environmental conservation. It also examines safety considerations in scientific research, highlighting concerns related to human trials, environmental impact, and biosecurity.*

*The article argues that while scientific research is crucial for progress, it must be balanced with ethical and safety considerations. It emphasizes the importance of recognizing and addressing objections raised on religious and safety grounds, advocating for stricter adherence to ethical guidelines, increased transparency, and collaborative efforts to minimize environmental impacts. Ultimately, the article calls for a commitment to prioritizing ethical and safety concerns in scientific inquiry to foster public trust and ensure the well-being of humanity.*

**Key words:** science, religion, ethics, safety, research, priori limitations, progress

## 1. INTRODUCTION

Should science be free from a priori limitations or should it follow the evidence wherever it leads without such limitations?

This question is becoming increasingly relevant in the 21<sup>st</sup> century as science and technology have been developing at a dazzling speed. The new reality of scientific discoveries within the last 50 years juxtaposed to thousands of years of human traditions and experiences has brought about challenges in understanding the essence of human existence. I will attempt to clarify these challenges as well as the importance of the subject for further research.

The scope of this article will be limited to two major sources for the imposition of a priori limitation on scientific research i.e. religion and safety considerations. Although Ethics could arguably comprise a third source, it is reasonable to assume that the most important source of Ethics is religion.

## 2. Science and Religion

Let's delve into the interplay between science and, perhaps the weightiest of the two, religion. For the sake of efficiency, I would limit the religious views on science to the three major monotheistic religions: **Judaism, Christianity and Islam**.

### 2.1 Judaism

Judaism, one of the world's oldest monotheistic religions, has a rich intellectual tradition that spans centuries. The relationship between Judaism and science has been a subject of interest, with various perspectives emerging over time. This article explores the views of Judaism towards science, highlighting both historical and contemporary perspectives. Judaism has a long history of valuing intellectual pursuits. The Talmud, a central text in Rabbinic Judaism, encourages the study of various fields of knowledge. Early Jewish scholars, such as Maimonides in the medieval period, emphasized the compatibility of reason and faith. These historical roots laid the foundation for a positive relationship between Judaism and scientific inquiry.

From a theological perspective, Judaism emphasizes the belief in a Creator who endowed humans with the ability to reason. The understanding that the natural world is a product of divine design encourages the exploration of the universe through scientific means. Many Jewish scholars argue that scientific discoveries reveal the intricate beauty of God's creation.

While the Torah, the central reference in Judaism, is not a scientific textbook, it contains verses that some interpret as alluding to scientific principles. For instance, the creation narrative in Genesis is often seen metaphorically, allowing for compatibility with theistic evolution or the Big Bang theory. The emphasis on the sanctity of life in Jewish teachings, however, poses ethical considerations in scientific research.

Judaism encourages the pursuit of knowledge as a means of fulfilling one's religious duties. The concept of "Tikkun Olam," repairing the world, is often invoked to justify scientific endeavors aimed at improving the human condition. From medicine to technology, Jewish scientists and scholars have contributed significantly to various scientific fields. However, some individuals or groups within Judaism express concerns about specific scientific research for ethical, moral, or religious reasons. Here are a few potential perspectives, though it's essential to approach these with an understanding that they may not be universally held within the Jewish community:

### **2.1.1 Concerns about specific scientific research**

Some individuals within the Jewish community express concerns about the ethical implications of certain scientific research, such as genetic engineering or certain medical experiments. Ethical considerations often stem from interpretations of Jewish teachings regarding the sanctity of life and one's duty to act responsibly in the world. Cloning and genetic engineering constitute one of these concerns. Issues related to tampering with the natural order, playing God, or violating principles of sanctity of life may be raised.

Similarly, objections to certain forms of stem cell research may be based on concerns about the destruction of embryos, violating the sanctity of life or potential human life. Furthermore, some individuals within the Jewish community express concerns about the development of artificial intelligence, particularly if it raises questions about consciousness, the soul, or the nature of humanity.

Pertaining to the environment, certain Jewish environmentalists advocate for limitations on scientific practices that are deemed harmful to the environment. This perspective might draw from the Jewish principle of "Bal Tashchit," which prohibits wasteful destruction.

## **2.2 Christianity**

Christianity, as one of the world's major religions, has had a complex relationship with science throughout history. The Middle Ages witnessed both conflict and cooperation between Christianity and science. Figures like Thomas Aquinas attempted to reconcile faith with reason, emphasizing the compatibility of theology and natural philosophy. The heliocentric model proposed by Copernicus challenged the geocentric worldview supported by the Church. Galileo's subsequent support for heliocentrism led to a clash between science and ecclesiastical authority.

On the other hand, The Enlightenment period saw a significant shift, with scientific inquiry gaining momentum. The relationship between Christianity and science became more nuanced, with some theologians embracing scientific progress while others expressed reservations.

The debate between creationism and evolution has been a focal point in the intersection of Christianity and science. Young Earth Creationists interpret Genesis literally, while others,

such as proponents of theistic evolution, seek to harmonize the biblical creation narrative with evolutionary science. Theological discussions often revolve around the concept of humans being created in the image of God. This raises questions about the compatibility of evolutionary theories with Christian beliefs about the unique nature of human beings.

### **2.2.1 Concerns about specific scientific research**

Issues like genetic engineering, artificial intelligence, and bioethics present challenges that require a thoughtful Christian response. Discussions center on the responsible use of scientific knowledge and its alignment with moral and ethical principles. The Christian perspective on environmental issues, including climate change, has gained prominence. Many Christians emphasize the responsibility of humans as stewards of creation and advocate for environmental conservation based on biblical principles.

While many Christians embrace science and see no inherent conflict between faith and reason, similar to their Jewish counterparts in faith, there are some who raise objections to certain scientific endeavors based on theological or ethical grounds. These objections may seek a priori limitations on scientific research.

Some Christian groups and theologians object to certain aspects of genetic engineering, particularly human cloning. Concerns often revolve around the sanctity of human life, the potential for playing God, and ethical questions surrounding the manipulation of human genes.

The use of embryonic stem cells in scientific research is a contentious issue within Christianity. Some believe that the destruction of human embryos for the purpose of extracting stem cells raises ethical concerns, as it involves the destruction of potential human life.

As advancements in artificial intelligence continue, some Christians express concerns about the potential creation of conscious entities. Questions about the nature of consciousness, the soul, and the moral implications of creating beings with human-like attributes are central to these objections.

While many Christians reconcile their faith with evolutionary biology, there are groups that object to specific aspects of the theory, such as the notion of natural selection - acting without divine guidance. Young Earth Creationists, in particular, often object to evolutionary ideas that challenge a literal interpretation of the "Genesis" (the first book of the Bible) creation narrative.

The idea of merging the human brain with computers or uploading human consciousness into digital systems raises theological concerns for some Christians. Questions about the nature of the soul, identity, and the potential for playing God in reshaping human existence are central to these objections.

In some cases, objections arise within Christian circles regarding theories in physics and cosmology that challenge a literal interpretation of biblical cosmogony. For instance, objections are raised against certain aspects of the Big Bang theory or the age of the

universe. These objections; however, do not represent the views of all Christians, and many individuals and denominations fully embrace scientific inquiry and technological progress. The relationship between Christianity and science is diverse, and there are varying perspectives on the compatibility of faith and certain areas of scientific research.

### **2.3 Islam**

Islam, a religion that originated in the 7th century CE (BC), has often been perceived as incompatible with scientific inquiry by some individuals. However, a nuanced exploration reveals that Islam has a rich history of encouraging the pursuit of knowledge and scientific exploration.

Islam emerged in the Arabian Peninsula. During the Islamic Golden Age (8th to 14th centuries), Islamic scholars made significant strides in various fields - including astronomy, mathematics, medicine, and philosophy. This era was marked by the translation of Greek and Roman texts into Arabic, fostering an environment conducive to intellectual growth. The Quran, the holy book of Islam, repeatedly emphasizes the importance of knowledge and encourages believers to reflect on the world around them. Verses such as "Do they not reflect upon themselves and their surroundings?" underscore the significance of intellectual inquiry.

Islam promotes the concept of *Ijtihad*, or independent reasoning. Scholars are encouraged to use their intellect to derive legal and ethical rulings, fostering an environment that values critical thinking and rational inquiry.

Islam places a high value on reason ('*Aql*). The Prophet Muhammad is reported to have said, "Seeking knowledge is obligatory for every Muslim man and woman." This emphasis on knowledge includes both religious and secular domains.

#### **2.3.1 Islamic contributions to science**

Islamic astronomers, such as Al-Battani and Ibn al-Haytham, made significant contributions to the field. Al-Battani accurately calculated the length of the solar year, while Ibn al-Haytham's work on optics laid the foundation for the scientific method.

Avicenna (Ibn Sina) wrote the influential "Canon of Medicine," a comprehensive medical encyclopedia. His contributions to medicine and pharmacology had a lasting impact on the development of medical sciences.

Mathematicians like Al-Khwarizmi played a crucial role in introducing algebra to the world. The word "algebra" itself is derived from his influential book, "Kitab al-Mukhtasar fi Hisab al-Jabr wal-Muqabala."

#### **2.3.2 Concerns about specific scientific research**

While historical Islam embraced science, some contemporary challenges have emerged. Interpretations of religious texts and political factors have sometimes hindered scientific progress in certain Islamic societies. While Islam, in general, encourages knowledge and

inquiry, there have been instances where specific objections or limitations on scientific research have been raised.

Certain objections stem from ethical considerations, particularly in areas such as genetic engineering, cloning, or certain medical practices. For instance, concerns about the manipulation of human life and the potential violation of Islamic principles regarding the sanctity of life. Some individuals may interpret Quranic verses in a way that they believe imposes limitations on specific scientific research. For instance, debates arise regarding the interpretation of verses related to the creation of life and the role of human beings as stewards of the Earth.

In some cases, objections to scientific research may be based on gender-related issues related to gender, reproduction, or embryology. These objections may be rooted in particular cultural or conservative interpretations of Islamic teachings.

Some objections within the Islamic context focus on the potential misuse of technological advancements. This could include concerns about the development and use of certain weapons technology or other applications that may have harmful consequences.

References to the principles of justice, peace, and avoidance of harm may be invoked to support such objections.

Objections might be raised when scientific research is perceived to clash with specific Islamic ethical guidelines. This can encompass issues such as the use of certain substances, practices that are considered contrary to Islamic morals or research that involves harm to living beings. Islamic ethical guidelines and principles related to harm and benefit may be referenced in these cases.

### **3. Science and Safety**

Now let's look at the second major source for a priori limitations on scientific research i.e. safety considerations.

Scientific research plays a pivotal role in advancing knowledge and innovation. However, the pursuit of scientific discovery is not without its controversies and objections on the basis of safety. The following are several prominent areas of concern revolving around safety considerations in research practices.

One major objection to scientific research involves the safety of human participants, particularly in clinical trials. Critics argue that the potential harm to human subjects may outweigh the benefits of the research. Ethical guidelines and regulatory frameworks aim to address these concerns, but instances of ethical lapses have occurred, prompting ongoing debates on the balance between scientific progress and the safety of research subjects.

Another objection to scientific research stems from its potential impact on the environment. Experiments involving genetically modified organisms (GMOs) or certain chemicals may pose risks to ecosystems and biodiversity. Critics argue that insufficient precautions are taken to prevent unintended consequences, and the long-term effects of such experiments are not adequately studied.

The concept of dual-use research, where scientific findings could have both beneficial and harmful applications, raises concerns about biosecurity. Critics argue that insufficient precautions are taken to prevent the misuse of research findings for malevolent purposes, such as the development of bioweapons. Striking a balance between scientific openness and national security is a persistent challenge.

Objectors also point to issues of transparency and reproducibility in scientific research. Concerns arise when researchers fail to disclose potential hazards or when studies cannot be replicated, undermining the credibility and safety of the scientific process.

#### **4. Humanity at crossroads:**

Getting back to the question at the beginning of this article while considering the myriad of concerns and objections towards scientific inquiry, it is necessary to dive deeper into the roles science, religion (ethics) and safety play in humanity.

A good start in defining those roles would be a quote from a prominent scientist, Albert Einstein: ““You can speak of the ethical foundations of science, but you cannot speak of the scientific foundations of ethics.” Most certainly science has a marvelous role of exposing reality for what it is, but by no means do we derive any meaning from those discoveries.

Science takes things apart and gives us understanding of the objective reality, while religious values (ethics) give us meaning as to the implications of the scientific discoveries. In other words, science does not hold any normative attributes. It does not stipulate if something is good or bad; it simply states the facts.

It must be burdensome for an inquisitive scientist to be restrained by some sort of morality or ethical rules in her/his pursuit of knowledge following the evidence wherever it leads; nevertheless, without the ethical and safety considerations as observed earlier, the passionate scientist may enter a realm of moral vacuum without any meaning. An extreme example of such a scientific pursuit of the evidence without a priori limitation would be embodied in the, ironically so called, “angel of death” i.e., Dr. Mengele during the Nazi regime of Germany.

Let’s suppose that Dr. Mengele’s research findings - while experimenting on prisoners against their will and with absolute disregard for their lives – were beneficial to the future of humanity. Should such research be allowed in any civil society? Most likely the majority of people on earth would be appalled by the idea of such unbridled research, void of ethical boundaries. Notwithstanding somewhere someone might be endeavoring to do just that. So, we are faced with a dilemma: if we don’t do it, someone else will, so should we compromise our ethical standards and forge ahead?

Sadly, such dilemmas are quite pressing at our present time in regards to various scientific fields. Let’s consider Artificial Intelligence (AI). A number of brilliant scientists from Steven Hawkins to Elon Musk have been sounding the alarm and advocating for regulatory oversight by governments the world over in regard to AI development due to the apparent

apocalyptic dangers an unrestricted development of AI poses to humanity. To further clarify the point let's consider a specific example. Science tells us that if I put inorganic cyanide - a chemical compound that contains a  $C\equiv N$  functional group that consists of a carbon atom triple-bonded to a nitrogen atom – into the cup of coffee of my grandpa, he would experience within a few short minutes headache, dizziness, fast heart rate, shortness of breath, and vomiting. This phase may then be followed by seizures, slow heart rate, low blood pressure, loss of consciousness, and cardiac arrest. What science doesn't tell us is whether I should or shouldn't do that.

Another example illustrating a myopic pursuit of the evidence without a priori limitation is presented in the book "Silent Spring", a groundbreaking environmental science book. The book raises concerns about the widespread use of pesticides, particularly DDT, and their harmful impact on the environment, wildlife, and human health. "Silent Spring" eventually played a pivotal role in the environmental movement and the establishment of the U.S. Environmental Protection Agency.

Unfortunately, the results from misguided scientific pursuit of the evidence could be devastating to the environment and large number of people when carried out on a large scale and so in the name of progress and safety. A prime example for such devastation is The Four Pests Campaign, a Chinese government-led initiative that took place from 1958 to 1962 during the "Great Leap Forward". The campaign aimed to eliminate four pests: rats, flies, mosquitoes, and sparrows, which were considered harmful to crops and public health. The campaign was carried out by mobilizing the population to kill the pests using various methods, including pesticides, traps, and hunting. However, the campaign against sparrows resulted in severe ecological imbalance, leading to the Great Chinese Famine of 1959-1961.

Religion/ethics and safety must have preeminence in my view when addressing scientific inquiry. The role of science is to ultimately serve and benefit humanity as a whole and not only special interest groups or individuals. Ethics is to bring meaning to the scientific inquiry while establishing checks and balances to its direction. The alternative may be a world that is void of moral values and in danger of self-destruction.

## **5. Causes for Deficiencies in Science**

Now let's examine the other side of the issue by looking at what specific occasions drive scientific inquiry into clash with religion and safety considerations.

*Here are some potential reasons that might be cited when discussing instances where ethical and safety considerations are disregarded.*

### **5.1 Pressure to Publish**

Researchers may face pressure to publish their work quickly, especially in competitive fields where academic success is often measured by publication output.



### **5.2 Financial Interests**

Researchers or institutions may have financial interests in the outcomes of their research, such as patent applications, stock ownership, or industry collaborations, which could potentially compromise ethical considerations.

### **5.3 Inadequate Oversight**

In some cases, inadequate institutional oversight or regulatory frameworks may contribute to ethical lapses.

### **5.4 Lack of Training or Education**

Researchers may not receive sufficient training in ethics or may not fully appreciate the importance of ethical considerations in their work.

### **5.5 Competitive Environment**

In highly competitive research environments, there may be a temptation to cut corners or bypass ethical considerations in order to gain a competitive edge.

## **6. Conclusion**

While scientific research is indispensable for progress, it is essential to address objections raised on the grounds of religious beliefs and safety considerations.

It is crucial to emphasize that the scientific community must recognize the importance of ethical and safety considerations and actively work to address and prevent instances where these principles are disregarded. Various organizations and guidelines, such as the Declaration of Helsinki and the Belmont Report, provide frameworks for ethical conduct in research. Violations of ethical standards should be taken seriously, and researchers should be encouraged to report concerns to relevant authorities for investigation and resolution.

Stricter adherence to ethical guidelines, increased transparency, and a commitment to minimizing environmental impacts can help alleviate concerns and foster public trust in the scientific enterprise. Balancing the pursuit of knowledge with the responsibility to prioritize ethical and safety concerns is an ongoing challenge that requires collaborative efforts from the scientific community, policymakers, and the public.

## 7. References

- Neusner, J. (2003). *Judaism and Science: An Historical Introduction*. Greenwood Publishing Group
- Gillman, N. P. (1997). *Sacred Fragments: Recovering Theology for the Modern Jew*. Jewish Lights Publishing.
- Maimonides, Moses. (1190). *Guide for the Perplexed*
- Kushner, H. S. (1997). *When Bad Things Happen to Good People*. Schocken
- Tendler, M. (2003). *Practical Medical Halacha*. Jason Aronson
- Wertheimer, J. (2008). *Faith Ed.: Teaching about Religion in an Age of Intolerance*.
- Waskow, A. (1995). *Down-to-Earth Judaism: Food, Money, Sex, and the Rest of Life*
- Feldblum, R. (2008). *The Right and the Good: Halakhah and Human Relations*
- Dorff, E. N. (2004). *Matters of Life and Death: A Jewish Approach to Modern Medical Ethics*
- Bleich, J. D. (1988). *Judaism and Healing: Halakhic Perspectives*
- Steinsaltz, A. (1994). *The Thirteen Petalled Rose: A Discourse on the Essence of Jewish Existence and Belief*
- Barbour, Ian G. (2000) "When Science Meets Religion: Enemies, Strangers, or Partners?" HarperOne
- Numbers, Ronald L. (2009) "Galileo Goes to Jail and Other Myths about Science and Religion." Harvard University Press
- Haarsma, Deborah B., and Loren D. Haarsma. (2011) "Origins: Christian Perspectives on Creation, Evolution, and Intelligent Design." Faith Alive Christian Resources
- Peacocke, Arthur R. (1993) "Theology for a Scientific Age: Being and Becoming—Natural, Divine, and Human." Augsburg Fortress
- Pope Francis. (2015) "Laudato Si': On Care for Our Common Home." Vatican Press
- Pope John Paul II. (1995) "Evangelium Vitae" (The Gospel of Life). Encyclical Letter
- Russell, C. Robert. (2014) "Transhumanism and the Image of God." *Christian Research Journal*, Vol. 37, No. 06
- Morris, Henry M. (1974) "Scientific Creationism." Master Books
- Moreland, J. P. (2014) "The Soul: How We Know It's Real and Why It Matters." Moody Publishers

- Ross, Hugh. (1989) "The Fingerprint of God." Promise Publishing Company
- Nasr, S. H. (1988). *Islamic Science: An Illustrated Study*. World of Islam Festival Publishing Company.
- Huff, T. (2003). *The Rise of Early Modern Science: Islam, China, and the West*. Cambridge University Press.
- Saliba, G. (1994). *A History of Arabic Astronomy: Planetary Theories During the Golden Age of Islam*. New York University Press.
- Al-Khalili, J. (2010). *The House of Wisdom: How Arabic Science Saved Ancient Knowledge and Gave Us the Renaissance*. Penguin Books.
- Shahid Athar. (2007) *Journal of Islamic Medical Association of North America* Vol. 39 No. 4
- Abdulrahman Helli. (2022) *Journal of Islamic Ethics* Vol 6, Pages: 173–209
- Emanuel, E. J., Wendler, D., & Grady, C. (2000). What makes clinical research ethical? *JAMA*, 283(20), 2701-2711
- Pimentel, D., & Raven, P. (2000). *Biodiversity and Pest Management in Agroecosystems*. CRC Press.
- Atlas, R. M., & Dando, M. R. (2006). The dual-use dilemma in biological research. *Science*, 312(5779), 1002-1003.
- Ioannidis, J. P. (2005). Why most published research findings are false. *PLoS medicine*, 2(8), e124.
- Max Tegmark (2017) "Life 3.0: Being Human in the Age of Artificial Intelligence"
- Brundage et al. (2018) "The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation"
- Resnik, D. B. (2016). The Pressure to Publish Pushes Down Ethical Standards. *EMBO Reports*, 17(10), 1393–1396. doi:10.15252/embr.201643115
- Bosch, X., & Casadevall, A. (2017). Financial Conflicts of Interest in Biomedical Research. *Mayo Clinic Proceedings*, 92(2), 279–283. doi:10.1016/j.mayocp.2016.11.006
- Emanuel, E. J., & Menikoff, J. (2011). Reforming the Regulations Governing Research with Human Subjects. *The New England Journal of Medicine*, 365(12), 1145–1150. doi:10.1056/NEJMSb1106942

Shamoo, A. E., & Resnik, D. B. (2009). *Responsible Conduct of Research* (2nd ed.). Oxford University Press.

Krimsky, S. (2006). The Ethical and Legal Foundations of Scientific Research: Why Codes of Ethics Have Limited Impact. *Journal of Information Ethics*, 15(1), 11–19.

Carson, R. (1962). *Silent Spring*. Houghton Mifflin Company.

National Library of Medicine, (2010), *The Four Pests* -

<https://www.nlm.nih.gov/exhibition/healthforthepeople/fourpests.html>