Philosophies of Biomedical Engineering

By Mark Csoros

***Resolved: In the field of biomedical engineering, restraint ought to be prioritized over scientific advancement.***

Fundamentally, this resolution is about risk. We are asked to weigh the potential costs of slowed scientific advancement against the harms that could stem from advancing too quickly. That’s a deeply complicated calculation. so to perform it effectively, we need to have some tools at our disposal. We need to understand the philosophical frameworks that contribute to risk calculus, and we need to understand how those frameworks operate in conjunction and opposition with one another. This article is designed to help you navigate those frameworks, so that you can develop effective ways to analyze the ethics of this resolution.

**Epistemology**

There are two basic categories of risk: aleatory risk (the uncertainty created by random probabilities, and which cannot be reduced) and epistemic risk (the risk created by a shortage of knowledge, which can be reduced to an extent). Since we really can’t do anything about aleatory risk, we have to devote ourselves to the study of epistemic risk, which means we need an introduction to the philosophical field of epistemology. In simple terms, epistemology is the study of knowledge.

Encyclopædia Britannica, *Epistemology. Encyclopædia Britannica. https://www.britannica.com/topic/epistemology.*

“Epistemology, the philosophical study of the nature, origin, and limits of human [knowledge](https://www.britannica.com/topic/knowledge). The term is derived from the Greek epistēmē (“knowledge”) and logos (“reason”), and accordingly the field is sometimes referred to as the theory of knowledge.”

Perhaps the most important question in epistemology, and certainly the most relevant question for this resolution, is “how much can we know?”, which is closely tied to the question “how do we gain knowledge?” There is a plethora of philosophical systems designed to answer these questions, ranging from absolute skepticism (we can’t know anything and can’t gain knowledge) to solipsism (I know that I exist, but that’s all I can know) to relativism (we can’t know absolute truths, but we can gain knowledge within certain contexts) to empiricism (we can know what we can experience, and we gain knowledge through our senses) to rationalism (we know what we can deduce, and gain we knowledge through logic) to revelationism (we can know absolute truths, and we can gain knowledge through divine revelation). This is by no means a comprehensive list, since there are hundreds of variations within and in-between those categories, but it is a sampling of some of the most relevant epistemological schools.

If all those “isms” seem a little daunting, don’t worry. I listed them primarily because they’re interesting, and secondarily because they could be of some use to you in competition or in life, but not because I think you’ll need to memorize every epistemological framework before your first tournament. In addition, nearly every one of those schools of epistemological thought broadly agrees on two principles: that we can know some things with certainty, and that we cannot know everything with certainty. With very few exceptions, the disagreements between those “isms” are simply about degrees of knowledge and certainty, not about the existence of truths that we can know. As the Stanford Encyclopedia of Philosophy explains:

Stanford Encyclopedia of Philosophy, 2018.   
*“Risk.” First published March 13th 2007, substantive revision July 19th, 2018.* [*https://plato.stanford.edu/entries/risk/#Epi*](https://plato.stanford.edu/entries/risk/#Epi)“A major problem in the epistemology of risk is how to deal with the severe limitations that characterize our knowledge of the behaviour of unique complex systems that are essential for estimates of risk, such as the climate system, ecosystems, the world economy, etc. Each of these systems contains so many components and potential interactions that important aspects of it are unpredictable. However, in spite of this fundamental uncertainty, reasonably reliable statements about some aspects of these systems can be made.”

Why is this so important for this year’s resolution? Because the ethical questions surrounding biomedical engineering are predicated on limited knowledge. If we knew, with absolute certainty, that a breakthrough in gene editing technology would only be used for good and just outcomes by wise and careful people, then we would all enthusiastically support that scientific advancement. Unfortunately, we simply can’t be certain of those things, which is why we must have the sort of ethical debates that this resolution initiates.

In our quest to gain more certainty about possible outcomes, we have the potential to make two types of errors, which are, quite reasonably, called type I and type II. Type I errors are also called “false positives,” because they declare the existence of a threat, effect, or issue when there is none. Type II errors are also called “false negatives,” because they miss an existing threat, effect, or issue.

As you might guess, the two sides of this resolution each prioritize the avoidance of one of these types of errors. Advocates of restraint tend to be willing to accept some false alarms (type I errors) if that means minimizing type II errors, because they would rather be safe than sorry. Advocates of advancement would rather miss a problem (or commit a type II error) than stymie progress by committing too many type I errors out of an overabundance of caution. In the real world, just as in this resolution, there is an ongoing debate about which type of error is most harmful. Returning again to the Stanford Encyclopedia of Philosophy, we read that

Stanford Encyclopedia of Philosophy, 2018.   
*“Risk.” First published March 13th 2007, substantive revision July 19th, 2018.* [*https://plato.stanford.edu/entries/risk/#Epi*](https://plato.stanford.edu/entries/risk/#Epi)

“Many controversies on risk assessment concern the balance between risks of type I and type II errors. Whereas science gives higher priority to avoiding type I errors than to avoiding type II errors, the balance can shift when errors have practical consequences. This can be seen from a case in which it is uncertain whether there is a serious defect in an airplane engine. A type II error, i.e., acting as if there were no such a defect when there is one, would in this case be counted as more serious than a type I error, i.e., acting as if there were such a defect when there is none.”

I want to draw your attention to the phrase “the balance can shift when errors have practical consequences,” because that phrase points us towards some interesting questions. What consequences are practical? How do we measure their severity? What are our ethical duties regarding the avoidance of those consequences? These philosophical questions are highly relevant to this year’s resolution, which is why the following sections are devoted to various philosophical lenses through which to view those questions.

**Deontology**

Deontology is the first of those philosophical lenses. The word comes from the Greek “deon” (duty) and “logos” (which has a few meanings, but in this context means “study”), and so “deontology” means “the study of duty.” Because of its root words, deontology is often referred to as “duty ethics,” although most frameworks of moral philosophy are also concerned with ethical duties. The Stanford Encyclopedia of Philosophy writes:

Stanford Encyclopedia of Philosophy.  *"Deontological Ethics"; First published Nov 21, 2007, substantive revision Oct 17, 2016.* [*https://plato.stanford.edu/entries/ethics-deontological/*](https://plato.stanford.edu/entries/ethics-deontological/)  
“In contemporary moral philosophy, deontology is one of those kinds of normative theories regarding which choices are morally required, forbidden, or permitted. In other words, deontology falls within the domain of moral theories that guide and assess our choices of what we ought to do (deontic theories), in contrast to those that guide and assess what kind of person we are and should be (aretaic [virtue] theories). And within the domain of moral theories that assess our choices, deontologists—those who subscribe to deontological theories of morality—stand in opposition to consequentialists.”

The Encyclopedia Britannica describes deontology a bit more simply.

The Editors of the Encyclopedia Britannica, *last updated May 21, 2020. "Deontological Ethics"; The Encyclopedia Britannica.* [*https://www.britannica.com/topic/deontological-ethics*](https://www.britannica.com/topic/deontological-ethics)

“In deontological ethics an action is considered morally good because of some characteristic of the action itself, not because the product of the action is good. Deontological ethics holds that at least some acts are morally obligatory regardless of their consequences for human welfare. Descriptive of such ethics are such expressions as “Duty for duty’s sake,” “Virtue is its own reward,” and “Let justice be done though the heavens fall.””

In other words, deontologists believe that the morality of an action is determined intrinsically, not determined by the extrinsic consequences of that action. Therefore, deontologists are unwilling to do things they would consider to be wrong, even if the net outcome of that action is positive. For instance, a deontologist would likely oppose a morally questionable experiment on DNA editing, even if that experiment could lead to a better standard of living for millions of people.

When I think of deontology, I think of my very first NITOC, which was held at Bob Jones University. In one of my Team Policy rounds, there was a quote from Bob Jones Sr. painted on the wall directly behind the lectern: “It is never right to do wrong in order to get a chance to do right.” I used that quote to open my rebuttal speech, and so I probably remember it more for the nostalgia than for its level of philosophical reasoning, but the quote does encapsulate deontological ethics extremely well. Wrong is wrong, no matter the outcome, and the chance of a good outcome doesn’t justify bending the rules.

**Consequentialism**

On the other hand, consequentialist ethics argues that the best way to determine the morality of an action is by weighing the outcomes that result from that action. Consequentialists, as the name implies, say that we should determine the morality of an action based *only* on its consequences. The Stanford Encyclopedia of Philosophy writes:

Stanford Encyclopedia of Philosophy. *"Consequentialism"; First published May 30, 2003, substantive revision Jun 3, 2019.* [*https://plato.stanford.edu/entries/consequentialism/?PHPSESSID=8dc1e2034270479cb9628f90ba39e95a*](https://plato.stanford.edu/entries/consequentialism/?PHPSESSID=8dc1e2034270479cb9628f90ba39e95a)

“Consequentialism, as its name suggests, is simply the view that normative properties depend only on consequences. This historically important and still popular theory embodies the basic intuition that what is best or right is whatever makes the world best in the future, because we cannot change the past, so worrying about the past is no more useful than crying over spilled milk.”

The Encyclopedia Britannica once again comes in handy here, because it simplifies some things and gives us a nice segue into utilitarianism. The Encyclopedia defines consequentialism as:

The Editors of the Encyclopedia Britannica. *"Consequentialism"; No date.* [*https://www.britannica.com/topic/consequentialism*](https://www.britannica.com/topic/consequentialism)

“In ethics, the doctrine that actions should be judged right or wrong on the basis of their consequences. The simplest form of consequentialism is classical (or hedonistic) utilitarianism, which asserts that an action is right or wrong according to whether it maximizes the net balance of pleasure over pain in the universe.”

Consequentialism includes lots of other sub-philosophies (including the hedonistic utilitarianism example mentioned in the definition) so it’s very simple when viewed broadly and quite complex when you get into the details. I do recommend that you spend at least some time digging deeper into those details, because this resolution is policy-adjacent and results-focused. What does that mean? It means that, while this isn’t a policy resolution per se, it still asks us to set an ethical standard by which policy is created. The decision to prioritize restraint or scientific advancement impacts legislative language, judicial opinions, and ultimately the types and extents of biomedical innovations. In this arena of policy and policy-adjacent decision making, results matter. When it really comes down to it, citizens care less about whether their leaders intended to do the right thing and more about whether they produce the right results. Deontological philosophy is certainly a vital component of this resolution, but those who set public policy have an equally important duty to weigh the effects of those policies.

**Utilitarianism**

One method of weighing those effects is called utilitarianism, which we’ve already been briefly introduced to. Since we know that utilitarianism is classified under the conceptual umbrella of consequentialism, I think that we can get by with a single source’s definition of this philosophy. Oxford Dictionary defines utilitarianism as

Oxford Dictionary.   
*“Utilitarianism”* [*https://www.lexico.com/en/definition/utilitarianism*](https://www.lexico.com/en/definition/utilitarianism)

“1. The doctrine that actions are right if they are useful or for the benefit of a majority.

1.1 The doctrine that an action is right insofar as it promotes happiness, and that the greatest happiness of the greatest number should be the guiding principle of conduct.”

So, utilitarianism is a particular type of consequentialism, but where consequentialism stops short of defining which consequences make an action morally justified, utilitarianism states that an action is morally right if it creates the most good possible, for the most people possible. Different adherents to utilitarianism may disagree over how to measure that good, but they agree that an action’s morality should be judged based on its overall effect.

Utilitarianism and deontology are diametrically opposed philosophies, for obvious reasons. While deontological ethics is only concerned with the intrinsic rightness or wrongness of an action, utilitarianism is only concerned with the external results of that action, and assigns moral importance only to those net results. Lois Lowry’s award-winning novel *The Giver* provides a poignant—though quite slanted—illustration of the conflict between deontology and utilitarianism. If you haven’t read *The Giver*, I highly recommend that you do, and I won’t spoil it for you in this article, but the book is set in an apparently utopian utilitarian society. There is no pain or strife in the society, but that maximization of common good comes at the expense of deontological morality and some core aspects of humanity. By the end of the book, the author’s perspective on the costs and benefits of such a society becomes clear, and the extreme nature of this hypothetical lends credibility to that perspective.

**Conclusion**

In the real world, philosophical quandaries are much more nuanced than they are in Lowry’s imagined society. Our tradeoffs are murkier, our extremes less pronounced, and our choices more often between various tints of gray than between sharply delineated black and white. This resolution is a fantastic way to explore these philosophical conflicts, and to apply them to highly relevant issues with profound real-world impacts. I highly encourage you to squeeze all the knowledge you can out of this resolution, because investing that time and effort will yield enormous dividends in competition and in life. Best of luck this year!