Applications

By Mark Csoros

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

This year’s topic area allows room for hundreds, maybe even thousands, of applications. As in every resolution, both the affirmative and negative will have extreme, outlier examples at their disposal, and both sides will have opportunities to access those more nuanced, middle ground applications that could support either side. There are, however, two key differences between the applications of this resolution and those of previous years: first, the sheer number of applications available, and second, the amount of background knowledge needed to expertly approach them.

For comparison, consider the Stoa resolution for 2017-2018, which was about preemptive war. No one (at least that I knew of) was already an expert in preemptive war, but everyone was familiar with the concept of war, understood how it works, could easily infer the meaning of “preemptive war” from a dictionary definition, and could quickly grasp what such a war would look like. The applications for that resolution were quite limited, so by the second or third tournament of the year, nearly every debater had a comprehensive list of which conflicts qualified as preemptive and which did not.

This year, no debater will build or acquire a comprehensive list of applications, because it simply isn’t possible. Every single advance, potential advance, experiment, breakthrough, and failure of biomedical engineering is a potentially relevant example for this resolution. Moreover, the ins and outs of this year’s applications aren’t nearly as self-explanatory as the details of previous year’s applications. Understanding and explaining probable threat is much simpler than understanding and explaining gene splicing, 3-D bioprinting, or the workings of microscopic nanorobots.

Therefore, I won’t use this article to give you a laundry list of applications that you might end up using in a case. Rather, I want to give you some background information on two key types of applications that you—and your opponents—will use during this year of competition.

**Unethical Experiments**

On the affirmative side of this resolution, the most straightforward applications are those that showcase how a lack of restraint can create disastrous results. From the horrific “research” performed in World War II concentration camps, to the CDC/U.S. Public Health Service’s Tuskegee Experiment, to the CIA’s covert experimentation during MKUltra, there are plenty of vivid—if extreme—examples of grossly unethical acts committed in the name of scientific advancement. I won’t go into detail about those applications here, partly because that isn’t the purpose of this article and partly because some of those details are highly graphic, and I ask that you exercise caution and good judgement if you decide to research or implement these applications. Instead, I want to focus on how we measure and determine ethics in the field of biomedical engineering. To run (or refute) applications that center around biomedical wrongdoing, you need to have a good grasp of the practical principles that govern the operations of biomedical engineers.

By far, the most influential system of biomedical ethics comes from two highly renowned philosophers named Tom Beauchamp and James F. Childress. Beauchamp and Childress quite literally wrote the book on the principles of biomedical ethics, and fittingly entitled it *The Principles of Biomedical Ethics*. Since its first publication in 1977, *The Principles* has been republished seven times (the eighth edition just came out in 2020), and has become and remained the foundational treatise on the ethical standards for biomedicine. Unfortunately, the book is behind a paywall, so I can’t quote directly from it, but the Stanford Encyclopedia of Philosophy effectively sums up the authors’ key point:

Ph.D. Jennifer Flynn, in the Stanford Encyclopedia of Philosophy, November 2020.   
*(Flynn holds a Ph.D. in Philosophy from the University of Virginia, and is a widely published bioethicist. She is currently an Assistant Professor of Bioethics at Memorial University of Newfoundland.) “Theory and Bioethics”; Stanford Encyclopedia of Philosophy. https://plato.stanford.edu/entries/theory-bioethics/*  
“Beauchamp and Childress’ four principles are:

1. the principle of autonomy (the value of self-direction regarding one’s life and choices),
2. the principle of beneficence (the value of enhancing the welfare of others),
3. the principle of nonmaleficence (the value of avoiding imposing harm on others), and
4. the principle of justice (the value of according each person her due)”

Autonomy, beneficence, nonmaleficence, justice. Those four principles might seem a bit foreign and conceptually abstract (especially the third one), but they give rise to very practical standards of conduct that are fairly familiar to us. Let’s walk through them.

**Autonomy**

At its most fundamental level, the principle of autonomy requires that patients have ultimate control. If you’ve heard the term “informed consent” before, you already have some familiarity with one of the rules stemming from this principle of autonomy. Ethical biomedical practice requires that patients agree to participate in any procedures or studies, that they have the necessary information to make an informed decision, and that they are not coerced in any way. If you come across a situation wherein patients lack full autonomy, it’s safe to say that this ethical standard is being bent, and the situation is likely to be an example of scientific advancement being prioritized above restraint.

**Beneficence**

This principle simply means that it is the job of biomedical professionals to do good. The principle is sometimes broken down into smaller specifications, but we don’t need to delve into those specifics. The core of this principle is one that nearly everyone would agree with: if your job is to take care of people and improve their lives (as is the case for those in the field of biomedical engineering), then you have a duty to actively do and promote good. Of course, things get tricky when it comes to defining what “good” really means. Beauchamp and Childress are careful to note that there can be legitimate disagreements as to how beneficence should be measured and attained, and acknowledge that abiding by this principle may mean acting differently under different sets of circumstances.

**Nonmaleficence**

This is the most pompously-worded of the four principles, but in its simplest form, it’s just a restatement of what is commonly called the Hippocratic Oath: “first, do no harm.” Technically speaking, the Hippocratic Oath is significantly longer than that one phrase, and doesn’t actually contain the words “first, do no harm,” but the technicalities have been ignored for so long that the distinction really isn’t important. What is important? The fundamental duty of caretakers to avoid harming those entrusted to them. Applications in which the nonmaleficence principle is violated are likely to be examples where restraint is sacrificed in favor of advancement.

**Justice**

Just as with the principle of beneficence, it’s easy to say that the justice principle requires treating everyone with fairness, and difficult to articulate exactly what that looks like in practice. Even Beauchamp and Childress fail to provide an exact standard for upholding this principle, and are quite willing to admit that no single theory of justice is perfectly adequate. But, even with some blurring of the line between just and unjust, this principle can still help us systematically approach applications. For instance, when there are more people who need a ventilator than there are ventilators available, how do we justly decide who receives life saving treatment? Is it first-come-first-served? Do patients with better insurance coverage get to jump to the front of the line? Should we prioritize those who are most at risk? What if the most at-risk patients have a 99% chance of dying even with the ventilator? Should we just draw names out of a hat? There may not be a perfectly just solution, but it seems clear that some of those methods are more just than others.

**Takeaways**

The risk of running extreme applications is always in relating them back to the real world in which we live. We tend to recoil from these types of illustrations, which helps with persuasion, but we also tend to think that such ethical violations could never occur in our modern day society. So, use the four principles to add structure and legitimacy to these types of applications, and always be sure to keep your examples grounded in the values of your case.

**Commonplace Advancements**

While the go-to Affirmative applications highlight the potentially extreme repercussions of unrestrained advancement, the most apparent Negative applications focus on the vast benefits—which are often taken for granted—that stem from scientific advancement in the field of biomedical engineering. Smallpox killed 300 million people in just the 20th century, and cost innumerable lives in the centuries before. Polio used to kill or paralyze hundreds of thousands of people, mostly children, every single year. Now, we only speak about those diseases in the past tense, because advances in biomedical engineering effectively eradicated them. Today, when our joints hurt, we take some ibuprofen and go get an X-ray or an MRI. We no longer die of diphtheria, tuberculosis, or gastrointestinal infections. Influenza, a virus that has caused up to eight separate pandemics, can in most cases be fully cured with nothing more than chicken soup and widely available, over-the-counter medication.

To achieve these stunning results, those in the field of biomedical engineering had to prioritize advancement over restraint. Edward Jenner, the 18th century British physician credited with inventing inoculation (the precursor to vaccination), performed his very first human trial not on a fully consenting adult, but on an eight-year-old boy named James Phipps. Shortly after inoculating James with cowpox—a virus similar to, but less dangerous than smallpox—Jenner intentionally exposed the boy to large doses of smallpox, so as to find out if the inoculation actually worked. Increasing the risk even further, Jenner’s theory was supported only by anecdotal evidence, since the underlying biological principles had yet to be discovered:

Veteran science journalist Richard Hollingham, writing for the BBC September 2020.  
*“The chilling experiment which created the first vaccine”; BBC Future*

<https://www.bbc.com/future/article/20200928-how-the-first-vaccine-was-born>  
“Although the experiment worked, by today’s standards it was ethically problematic. “It really wasn't a clinical trial and the choice of who they vaccinated really makes you uncomfortable,” says Sheila Cruickshank, professor of immunology at the University of Manchester. Nor did Jenner know the science underlying the discovery. There was no understanding that smallpox was caused by the variola virus, and the functioning of the body’s immune system was still a mystery at the time.”

Almost a century and a half later, the emphasis on advancement had remained essentially unchanged. In the midst of World War II, the very first flu vaccine was in its final stages of development. At this point, scientists had a much better understanding of how biomedicine worked, but still maintained a rather cavalier attitude towards the ethical restraints that we consider commonplace.

Award-winning historian James Tobin, March 2020.  
*(Tobin holds a Ph.D. of History from the University of Michigan and has been a journalism professor at the University of Miami (Ohio) for over fifteen years. He was awarded the 1998 National Book Critics Circle Award for biography and was twice nominated for a Pulitzer Prize during his twelve years of reporting for The Detroit News.) “The First Flu Shot”; The University of Michigan Heritage Project. https://heritage.umich.edu/stories/the-first-flu-shot/*   
“In 1942 there were no standard protocols, much less laws, requiring medical scientists to obtain the informed consent of people participating in trials of new medicines. Such rules were put in place only after World War II, when it became known that German doctors had performed medical experiments on defenseless Jews and other prisoners in Nazi concentration camps. In the United States of the 1940s, it was still standard practice to test new drugs on institutionalized patients without their consent. So on the eve of flu season in the fall of 1942, the Commission on Influenza took its vaccine to test on 8,000 psychiatric patients at two hospitals — the Eloise Mental Hospital operated by Wayne County west of Detroit, and Ypsilanti State Hospital.”

But, even as norms of biomedical ethics became more and more binding, the need for rapid scientific advancement consistently outweighed the importance of restraint. During the U.S. polio epidemic of the 1950’s, massive amounts of time, money, and manpower was dedicated to developing a vaccine as quickly as possible. The investment paid off. Dr. Jonas Salk, one of the great medical pioneers of history, managed to produce a distribution-ready polio vaccine in just four years, an incredible biomedical feat.

Ph.D. and pediatric disease specialist Jonathan Carapetis, March 2006.

*(Carapetis is the Director of Telethon Kids Institute, one of Australia’s leading medical research institutes. He is a widely published researcher, holds separate qualifications as a medical practitioner, a specialist paediatrician, a specialist infectious diseases physician and as a specialist public health physician.) “The Cutter Incident: How America’s First Polio Vaccine Led to the Growing Vaccine Crisis”; The British Medical Journal. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1410842/*

“The vaccine was highly effective and safe. It was licensed the next day thanks to political pressure, and during the next two weeks, five companies distributed about five million doses. Thirteen days after the first doses were administered, there were reports of cases of polio in immunised children. All of these initial cases had received vaccine manufactured by one company—Cutter Laboratories (although vaccine made by Wyeth also caused some cases of polio). In the end, at least 220,000 people were infected with live polio virus in Cutter's vaccine (including 100,000 contacts of immunised children), 70,000 developed muscle weakness, 164 were severely paralysed, and 10 died. Offit outlines a series of events that contributed to vaccine containing live virus being released from Cutter Laboratories. These included the use of a highly virulent strain (Mahoney), deficiencies in the inactivation of vaccine virus, inadequate safety tests, and poor communication with other scientists and the government. However, Cutter Laboratories was doing all that the licensing authority required of it.”

**Takeaways**

When push comes to shove, we’re usually willing to accept higher levels of risk for a better overall result. These applications shouldn’t make you callous towards the human and moral cost that sometimes accompanies scientific advancement, but they should make you (and the judges) think about the cost of the things that we take for granted. Biomedical engineering has given us a far better standard of living than humans have ever enjoyed up to this point. To continue to progress, we sometimes have to loosen our restraints and prioritize advancement.

**Conclusion**

I hope that this brief overview has given you a clearer picture of this resolution’s landscape, and that it’s sparked your desire to research further and reason deeper. I’m a little jealous that I can’t debate this resolution, because it’s such an exciting and relevant topic, but I can’t wait to see what y’all do with it. So go start prepping, and have a great time this year.