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Moral Authority in Scientific Research

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Abstract

This paper addresses the issue of applying moral guidelines to modern scientific research and who or what should have the authority to do so. It examines the role of morality in scientific research, and makes the argument that moral authority over scientific research should come from the scientific community. This argument is based on two premises: (1) that the scientific community is of sufficient moral character to guide the direction of scientific research and (2) that the scientific community has sufficient expertise to make informed moral decisions about scientific research.

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1. INTRODUCTION

"Philosophy of science is about as useful to scientists as ornithology is to birds." This statement comes from physicist Richard Feynman, who is best known for his status as a Nobel laureate and his work on the Manhattan Project during World War II. These words may seem to be an odd opening for an essay on philosophy of science, but I chose them because they demonstrate an important point. Feynman may have said these specific words, but the sentiment they contain is not unique. Though philosophy is arguably the oldest area of study in academia, the place it holds in modern, western society is a far cry away from its former prestige. Particularly in the scientific fields, but also within other realms of academia and society in general, philosophy is not seen as something that is relevant or useful. Some might argue that philosophers themselves are at least partially to blame for this, since many philosophical works tend to profess lofty ideals and extreme abstractions that are difficult to apply to actual, everyday life. My purpose here is to present a philosophy of science that is relevant to current issues and can conceivably be applied when dealing with them.

To begin, let's consider the following events:

(1) In August of 2001, American president George W. Bush implemented a policy that restricted federal funding for research involving human embryonic stem cells to cell lines that were already in existence. This was a crushing blow to the nation's stem cell researchers since it meant that they had to rely on private contributors to fund any attempts to start new cell lines or investigate newly developed cell lines. Though he acknowledged the potential of such research to help in developing treatment for a wide

variety of diseases, Bush's reasoning behind the ban was based on the idea that it involved the destruction of human life, as the extraction of stem cells invariably results in the death of the embryo. In his address on the decision, he said that, "[at] its core, this issue forces us to confront the beginnings of life and the ends of science" and cited concerns that such research could lead to the devaluing of human life.[1]

(2) In May of 2013, Jason Richwine, a social scientist with a PhD from Harvard University, resigned from his post at the Heritage Foundation, a conservative public policy think-tank based in DC.[2] This occurred after his analysis of an immigration reform bill brought to light the subject of his doctoral dissertation, which makes the argument that, on average, Hispanic immigrants are genetically predisposed to be less intelligent than non-Hispanic white Americans. This revelation sparked a storm of opposition and condemnation throughout the nation, not the least of which was a petition signed by over 1200 Harvard students to investigate the approval of the thesis and ban any further research on racial superiority.[3] The Harvard student body also circulated an open letter signed by 23 student groups that contained the following passage:

> We condemn in unequivocal terms these racist claims as unfit for Harvard Kennedy School and Harvard University as a whole. Granting permission for such a dissertation to be published

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[1] George W. Bush, "Federal Funding for Stem Cell Research" (speech, Crawford, TX, August 9, 2001), Weekly Compilation of Presidential Documents Volume 37, Number 32, https://www.govinfo.gov/content/pkg/WCPD-2001-08-13/html/WCPD-2001-08-13-Pg1149.htm

[2] David Weigal, "Jason Richwine Resigns from the Heritage Foundation," Slate Magazine, May 10, 2013, accessed January 02, 2019, https://slate.com/news-and-politics/2013/05/immigration-reform-jason-richwine-resigns-from-the-heritage-foundation.html

[3] Meghan E. Irons, "Harvard Students Erupt at Scholar Jason Richwine's Claim in Thesis - The Boston Globe," BostonGlobe.com, May 18, 2013, accessed January 02, 2019, https://www.bostonglobe.com/metro/2013/05/17/kennedy-school-students-demand-inquiry-into-immigration-thesis/6Izovn4svIW6jvlm7VSDFO/story.html

> debases all of our degrees and hurts the University's reputation … *Even if such claims had merit,* the Kennedy School cannot ethically stand by this dissertation whose end result can only be furthering discrimination under the guise of academic discourse.[4]

At first glance, these events appear to be quite unrelated. The mechanics of George W. Bush's exercise of political power are vastly different from those of the societal and academic reaction to Jason Richwine's dissertation, and the subject matter in question (i.e. stem cell research and race-based differences in intelligence) belongs to separate and distinct fields of study. They are temporally separated and most likely involved few to none of the same people. However, I've called attention to these cases because, despite all the circumstantial differences, they alert us to the same philosophical issue.

To explain, when President Bush restricted federal funding for stem cell research, he cited moral rather than factual reasons. His argument is based on the idea that the destruction of human life is wrong, and, therefore, any research that involves the destruction of human life is also wrong. He used his authority and power to impose a moral directive on the pursuit of science. The case of Jason Richwine shows a similar pattern. In it, the moral objections of the Harvard student body to the racially-oriented subject of Richwine's dissertation led them to call for a ban on any research involving a similar subject. Of particular importance here is the phrase "even if such claims had merit…" within the students' open letter, which acts as a clear indicator of the moral rather than empirical basis of their judgment. Their argument is based on the idea that

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[4] Andrew Sullivan, "Race And IQ. Again," The Dish, May 15, 2013, accessed January 02, 2019, http://dish.andrewsullivan.com/2013/05/14/is-christopher-jencks-a-racist/

racism is wrong, and, therefore, and scientific research that could promote racism is wrong. Just as in the case with President Bush, the Harvard student body attempted to impose a moral directive on the pursuit of science.

Moral Authority

In these examples, both President Bush and the Harvard student body took on or attempted to take on the role of a *moral authority* over scientific research. A moral authority is, to define it simply, an individual or institution that determines what is good, important, or has worth. In this definition, I am using a descriptive rather than normative conception of morality, since it refers to what people think is right rather than what is really and truly right. With regard to scientific research, a moral authority is one who designs and applies moral directives that guide the course or direction of research. These guidelines can come in two forms: method-based and content-based. As the name would suggest, a method-based moral directive assigns a value judgment to an area of research based on how the research is conducted. We can see this type of guideline in the example involving President Bush. His opposition to stem cell research was not because he thought the subject was morally wrong. He establishes this quite clearly when he notes the potential benefits of such research and maintains federal funding for existing cell lines. Instead, his moral qualms had to do with the fact that the area's methodology required the destruction of human embryos. The moral guidelines implemented by President Bush were based on this particular step in the stem cell research process, thus making this a method-based guideline. This is in contrast to the idea of a content-based moral guideline, which assigns a value judgment to the subject of a research project rather than its methods. This is the type of moral judgment that is found in the case of Jason Richwine. In that example, the Harvard student body petitioned for a ban on all research into racial differences or superiority based on the idea that the subject itself was wrong. This judgment came from the idea that such research would promote discrimination, which they considered morally wrong, and had nothing to do with how the research would be conducted or whether there was any merit to pursuing the topic. This allows the moral directive here can be classified as content-based.

Morality in Scientific Research

Though these cases are clear examples of the application of moral values to direct scientific research, I have yet to address its core issue: what is the role of morality within scientific research? Both within and without the scientific fields, there is little consensus about how to answer this question. Based on my own experience interacting with those within those fields, this is because many are proponents of what I would like to call "value-free science". The term "value-free science" refers to the objective pursuit of science. Essentially, this is the idea that morality should be left out of scientific research. This is because morality is considered a quality of human perception rather than an inherent attribute of what is perceived, thus meaning that moral claims are subjective. Proponents of value-free science claim that the purpose of scientific research is to obtain facts, which are objective. Therefore, in order to achieve this purpose, research must be kept completely free of values and any other subjective influences. Moral judgments threaten the integrity of scientific research because they affect its objectivity. While this is a logically valid conclusion, the premise upon which it rests is false because, in practice, scientific research cannot be purely objective. As Dr. David Resnik claims in his article *Scientific Autonomy and Public Oversight*, "Science will always be inundated by social values, and attempts to eliminate some values will only succeed in introducing others."[5] What this means is that the social environment in which research is done has strong influences on how and what is actually done. It shapes what is considered valuable research, what methods are best for each particular project, and what types of technologies should be developed from such information. In fact, methods that are more efficient or effective may be passed up for the sole reason that they are considered morally wrong. This is not to say that research should not endeavor to be objective. Controlling research to minimize the influence of subjective factors is one of the fundamental doctrines of scientific practice and determines the accuracy and precision of any results gathered. I am merely pointing out that it is impossible to account for and control every possible variable. Objectivity in research is an unreachable goal; it will always have some level of subjectivity. It is for this reason that I claim that morality is an inherent aspect of scientific research and must not be ignored. Rather, it is the responsibility of those involved in scientific research and the scientific community as a whole to be aware of and consider the moral aspect of their decisions.

Given this conclusion, there is an important clarification that I would like to make before I continue to the next section. In his essay in *Ethical Impact of Technological Advancements and Applications in Society*, Evandro Agazzi claims that "moral

[5] David B. Resnik, "Scientific Autonomy and Public Oversight." *Philosophy of Science* 5, no. 2 (June 1, 2008): 220-38.

judgments are mandatory because of the social impacts of science and technology, that may be beneficial or harmful to humans."[6] This represents another common philosophical position on morality in scientific research. While it is reminiscent of what I said above, there is an important difference. When Agazzi states that moral judgments are mandatory, he is saying that they must be incorporated into the decision processes within the scientific fields. He is highlighting the importance of considering the moral implications of decisions within the scientific fields. I find this is unnecessary; the people within those fields make moral judgments all the time, often without even realizing they're doing it. Morality is already present in these decision processes. Instead, the important issue here is to identify who and/or what should have the authority to determine upon which moral judgments to act.

This is the problem that I will attempt to resolve throughout the course of this paper. In other words, who should have the authority to impose moral directives on the scope of scientific research? At this point, I would like to note that this is not the same as asking what makes an area or type of scientific research moral or immoral. Whereas the second question refers the nature of the moral system and how it may be applied in specific situations, the first refers to the authority by which that system is determined. I will argue that the moral authority to which scientific research adheres must come from within the scientific community itself. This argument relies on two main premises: (1) that the scientific community is of sufficient moral character to guide the direction of scientific research and (2) that the scientific community has sufficient expertise to make informed moral decisions about scientific research.

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[6] Rocci Luppincini, *Ethical impact of technological advancements and applications in society*. Hershey, PA: Information Science Reference, 2012.

2. MORALITY WITHIN THE SCIENTIFIC COMMUNITY

When considering the idea of giving moral authority over scientific research to the scientific community, one of the first questions that comes to mind is how we know that members of that community will act morally. What if they don't have the best interests of society at heart? What if the morals that govern scientific practice conflict with those of the rest of society? What if they're just a bunch of evil mad scientists that are plotting to destroy the world? While that last question is a bit ridiculous, the point is, in giving moral authority to the scientific community, we are putting faith the moral character of its members. For those who are not within that community, this is a matter of trust and that trust needs to be justified. However, before I can talk about why the scientific community deserves the trust of the public, I need to clarify what is meant by the term *scientific community*. I'll begin by discussing science itself, since this is at the heart of what it means to be part of the scientific community.

Science

Science (from *scientia*, that Latin word for knowledge) is the study of natural phenomena.[7] Its roots can be traced back over two-thousand years to the writings of Aristotle and his peers. Science is commonly characterized in one of two ways: (1) an organized and systematic body of knowledge that includes statements of observations, laws and hypotheses that assert regularities, theoretical statements that connect laws, and

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[7] Jeffrey C. Leon, *Science and Philosophy in the West* (Upper Saddle River, NJ: Prentice Hall, 1999).

statements that are confirmable through experimentation and deducible from laws and (2) a discipline that uses logical inference from empirical observations.[8] The first concept focuses on the actual information contained within the scientific body of knowledge and highlights its order and cohesiveness. It leaves out any mention of who gathered the information or what actions were performed and focuses on the *knowledge-oriented* or cognitive view of science. In other words, science is a collection of facts that transcends any one researcher or contributor. In a sense, it can be thought of as a specific a way of viewing and understanding the world. The second concept looks at science as a discipline, and highlights the actual practice or method of doing science. This is the *praxis-oriented* view of science, and it centers around the application of the scientific method to gather and interpret information.

Most children learn the basics of the scientific method in grade school, and it is generally explained as some variation of the following steps: (1) Make an observation, (2) ask a question, (3) form a hypothesis, (4) conduct a controlled experiment, and (5) analyze the results. Though, in reality, these are closer to guidelines than concrete steps, they adequately convey the gist of the scientific method. Of particular importance to this method is the idea of controlled experimentation. This is because, when scientists conduct an experiment, it is generally to determine the relationship between different variables. The more variables are involved, the less certain the results will be. To demonstrate, let's consider the following hypothesis: if I dump a gallon of pesticides into a pond, all the fish will die. In testing this, I would be attempting to determine the relationship between the variable of the pesticides and the variable of the state of the

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[8] Christopher Morris, *Academic Press Dictionary of Science and Technology* (San Diego, CA: Acad. Pr., 1996).

pond's fish. However, what if an algal bloom occurred at the same time as the experiment and reduced the pond's oxygen levels? Or if a plague of parasites was infecting the pond's fish? Each of these events is a variable that affects the result of the experiment. The point of a controlled experiment is to minimize confounding variables like these in order to better understand the effects of a single variable.

In practice, controlling every possible variable is close to impossible. This is especially true in the social sciences, where experiments are generally unable to be conducted with the same level of control that can be found in the hard sciences. These fields also rely more heavily on observational methods of gathering data, which involving observing events without directly manipulating their variables. Since data acts as the basis for any scientific conclusion or explanation, both of these methods involve a strict definition of what constitutes as scientifically relevant data. In their book *The Game of Science*, Garvin McCain and Erwin M. Segal identify three main criteria that allow events to be classified as data:

> (1) The event, described by a datum, must actually occur. Data are symbolic representations of singular events. Interpretations and generalizations given to these events are not themselves data. (2) The event must, in principle, be available for public scrutiny. It does not necessarily need to be sensed by more than one person, but it must be of a type that could be sensed by more than one person. (3) The description of the event should be such that different individuals

> can know, as specifically as is reasonable, what the event was that is being described.[9]

These qualifications allow scientists to be confident both in their own findings and in those of other scientists by ensuring that data is as reflective of real and confirmable events as possible.

Before I move on, there is one more aspect of scientific practice that is worth noting. This known as the principle of falsifiability, and it applies to scientific explanation and theory. Essentially, it states that the truth or falsity of a scientific explanation must be testable; there must be some data that, if found, would prove the explanation false. If an explanation has no conceivable way in which it can be disproved, it is scientifically useless. McCain and Segal write that this is because an explanation or a theory must be a "conceptual schema that organizes and extends the data."[10] In other words, a scientific explanation can't just be able to explain current data. It must also be able to extend that data into the future. These two attributes are known as explanatory and predictive power, and they determine an explanation's usefulness in science. An explanation that can't be falsified has neither explanatory nor predictive power, and thus can tell us nothing about the world.

The Scientific Community

[9] Garvin McCain and Erwin M. Segal, *The Game of Science* (5th ed. Pacific Grove, CA: Brooks/Cole, 1988), 50.
[10] McCain and Segal, *The Game of Science*, 54-55.

Most of us have, at some point, heard reference to the scientific community. This may have been in a political debate, a journal article, a class discussion, or one of the myriad of other mediums of discourse with which we come in contact throughout the day. Despite this familiarity with the term, it is surprisingly difficult to nail down exactly what it means to be a part of the scientific community and who gets to be a member.

Let's begin by considering in more detail what it means to be included in the scientific community. What common feature binds people together in this group, and why is this group distinct from the rest of society? This appears to be a simple question, but it is actually a rather thorny issue to tackle. This is because the scientific community is made up of a vast array of diverse people with a variety of backgrounds and interests. Most belong to several other communities in addition to the scientific community, such as a church or a club or an online chat group. Other than their involvement in the sciences, many of these people are likely to have very little else in common. Even within the scientific fields, there is massive variety of fields of study, specializations within fields, topics within specializations, and more. Some fields might overlap, and their members might share some of the same specialized knowledge, but many do not. For example, a physicist is unlikely to know the procedures used in cloning mutant mice, and a molecular biologist probably isn't familiar with the physics involved in launching a rocket. Given all these differences, is it even possible to bring together the large and varied collection of people found within the scientific fields into a single community?

Clearly, I think it is. What defines the scientific community and distinguishes it from other social or societal groups in not the interests they share or the specific jobs they do at work. Rather, it is a particular way of viewing the world. This is the scientific paradigm. The concept of a scientific paradigm was first popularized by Thomas Kuhn in his book *The Structure of Scientific Revolutions*. McCain and Segal summarize it in the following passage:

> [Scientific paradigm] refers to the total complex of a science. It includes the language, conceptual framework, theories, methods, and limits of the science. It determines which aspects of the world scientists study and the kinds of explanations they consider. Most important, it includes the way scientists see the data, laws, and theories of their science.[11]

To put it more simply, a paradigm is a worldview that guides and organizes the gathering, sharing, and importance of information. It exists both within single disciplines of science and science as a whole, and is generally shared by the people within those fields. As stated by McCain and Segal, the scientific paradigm includes everything from the technical jargon for which scientific journals are infamous to the protocols for sorting data. To demonstrate, let's first look at the specific paradigms that exist within different fields. Consider a scenario in which a man is seen pulling up weeds in his garden. A physicist might observe this event in terms of the force being applied to the weeds or the angle at which the man pulls, while a biologist might be more interested in the species of the weed and the bugs living on it. Though both are observing the same event, each gathers a completely different set of data or information from it. The physicist is concerned primarily with the physical aspects of the event while the biologist is concerned with its biological aspects since these are the aspects that are scientifically

[11] McCain and Segal, *The Game of Science*, 80.

important to them. Essentially, they viewed the event from within the context of their specific paradigm and what it designates as important or valuable information, thus causing them to come to different understandings of its significance. In this way, we can see that those who are familiar with a paradigm, who live within it, view the world differently than those who are not privy to or do not accept the paradigm.

The same principle applies to the general scientific paradigm, which is shared by all members of the scientific community. Rather than focusing on the values or goals of a specific field, it places particular importance on the principles and components of science itself. As was outlined in the previous section, this includes the application of the scientific method, controlled experimentation, constant tests of falsification, and reliable data gathering. These principles are highly valued across all scientific fields, and guide how those within the community conduct themselves in scientific situations. One aspect of this paradigm that is especially important to cementing the scientific community is the use of scientific language or terms to discuss or convey information. Since it generally takes either years of instruction within the paradigm or an excessive amount of time with a dictionary to understand concepts that are communicated in scientific terms, this form of communication is, for the most part, reserved only for those within the paradigm. This exclusivity is what binds those involved in science into a distinct community, since it differentiates them from the rest of society.

Now that we've established that the scientific community is held together by their shared scientific paradigm, we can move on to identifying who actually makes up that community. Of all the members, the actual scientists are by far the easiest to identify, since they make up the most important part of the community. Scientists are those who actively participate in the discipline of science. Their understanding of science is, for the most part, consistent with the praxis-oriented view outlined in the section above. This means that they employ the scientific method to conduct research and use that data to draw conclusions about the world. Though their focus is in the active practice of science, their work allows for the expansion of the scientific body of knowledge within their particular field. In this way, scientists make use of or affect both of the common conceptions of science.

There are many academic fields that make use of the scientific method and, thus, employ the services of scientists. The "hard" sciences, otherwise known as the *natural sciences*, are probably the best known to the public. One could think of these as the quintessential scientific fields, since most have a relatively long history of study, and they tend to involve a greater reliance on data and mathematical expression. Fields like physics, chemistry, biology, astronomy, geology, and meteorology are generally considered the major hard sciences. On the other hand, the "soft" sciences or *social sciences* tend to deal with more intangible subjects and are unable to incorporate the level of exactitude found in their harder counterparts. They involve the study of topics such as human nature and animal behavior, and are more difficult to isolate and control in a laboratory setting. Fields like psychology, sociology, anthropology, and some aspects of archaeology make up the main components of the soft sciences.[12]

Scientists may belong to any of these areas of study, as well as a myriad of more specialized fields that I haven't mentioned. Because of their integral part within the scientific community, it is commonly thought that the whole community is made up of

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[12] Anne Marie Helmenstine, "What Is the Difference Between Hard and Soft Science?" Thoughtco, accessed January 24, 2019, https://www.thoughtco.com/hard-vs-soft-science-3975989.

scientists. However, this is not the case. A significant portion of the group consists of people who are not scientists but nonetheless subscribe to the scientific paradigm and are involved in the sciences. As I stated above, a scientist is one who actively participates in the scientific discipline. To do this, the scientist must employ the scientific method, and this is generally done in a research setting. In other words, a scientist must do science, and this leaves out anyone who is not currently active in the field. What about teaching professors or graduate students working under a researcher, or even just lab grunts? In these cases, and many other similar situations, the subject has the necessary training to adopt the scientific worldview, but is not conducting their own research. They cannot be called scientists, but they also cannot be excluded from the scientific community. The same verdict applies to those lazy or distracted souls that have the necessary credentials to be a scientist but choose not to pursue it. Membership in the scientific community is not about what the individual does in the world, but rather the principles by which he/she understands the world.

Moral Characteristics of the Scientific Community

At the beginning of this chapter, I pointed out that allocating moral authority over scientific research to the scientific community requires a degree of faith or trust in the good moral character of that community. Now that we have a better understanding of the nature and composition of the scientific community, we can begin to explore whether or not this faith is justified. The first step in doing this is examining what sort of moral values we can expect to find within the community, and to what degree they are present.

What, if anything, distinguishes the moral values of the scientific community from those of the rest of society? Since this paper is designed to apply to a western and specifically American context, I will consider this question as it relates to American society.

The scientific community exists within society and, as such, its moral character is generally reflective of the values that are present within that society. This is because, outside of their professions, most members of the scientific community are relatively normal people. They go to the grocery store, pay their taxes, shop for clothes, take their kids to school, work out at the gym, get frustrated when their cable goes out, curse out other drivers on the road, and generally act like all the other normal people within that society. Rather than thinking of them as a group that is separate from the rest of society, they should be considered a subgroup within society. This is an important distinction since it emphasizes that the members of the scientific community are also members of society and, on average, they reflect the same spectrum of moral values that are found throughout the rest of society. They are not foreign entities holding entirely unfamiliar values and ideals, but are simply specialists that, in just about every area but their specific fields, are very similar to the layperson. I emphasize this point because it affects how we go about examining morality within the scientific community. Thinking about the scientific community as a subgroup within society means that we can bypass the exhaustive task of enumerating every moral value that the members hold and instead focus only on what distinguishes them from the rest of society.

Perhaps the most well-known way in which the morality of the scientific community appears to differ from that of the rest of society is with regard to its religious values. While the popular conviction that science and religion are at constant odds may not be entirely accurate, scientists and other members of the scientific community do tend to be less religious than the rest of the population. In a statistical survey, Rice University sociologist Elaine Howard Ecklund found that about 64 percent of the respondents from the scientific community described themselves as atheists or agnostics, compared to only about 6 percent of the general public.[13] Though this in itself is not indicative of any difference in moral character, many people worldwide intuitively view religious belief as the basis for morality. This trend was demonstrated in the 2017 study titled *Global evidence of extreme intuitive moral prejudice against atheists*, which concluded that "people perceive belief in a god as a sufficient moral buffer to inhibit immoral behavior."[14] Atheists are perceived worldwide as the group most likely to be morally depraved and dangerous. This means that, because such a significant portion of the scientific community identifies itself as atheist, the community itself is also perceived as less moral than the rest of society. However, it should be noted that the perception of morality is not equivalent to actual morality. Though the scientific community may be seen as less moral than the rest of society because of their nonreligious members, this does not indicate any difference in their values.

In addition to upholding most of the general social morals, the scientific community also embodies a set of values that are specific to its role within society, which I will refer to as *scientific values*. These values are not exclusively present within the scientific community, but they are considered especially important within that community and in the context of scientific research. In his article *Scientific Autonomy*

[13] Peter Lopatin, "What Scientists Believe," *The New Atlantis* 29 (Fall 2010): 119-26.
[14] Will M. Gervais et al., "Global Evidence of Extreme Intuitive Moral Prejudice against Atheists," *Nature Human Behaviour* 1, no. 8 (2017): 0151, doi:10.1038/s41562-017-0151.

and Public Oversight, Dr. David Resnik defines scientific values as "the goals and norms that govern the conduct of scientists." The norms of science are what shape and justify the rules, methods, and behaviors that are present within the scientific community, and the goals of science are what determine the direction of scientific advancement. Together, they influence just about every aspect of scientific research, including hypothesis generation; experimental design; recording, storing, sharing, analyzing, and interpreting data; peer review; publication; collaboration; credit allocation; interactions with the media; and intellectual property. [15] Essentially, these values are the guidelines for moral behavior within the scientific community.

Let's consider what sort of goals guide the scientific process. The most common answers to this question tend to be along the lines of helping people or acquiring truth. However, Dr. Resnik rejects the idea of science having an overarching goal. He states that the goal of a member of the scientific community is dependent on his/her respective profession.[16] Despite this, it is possible to identify some necessary components of these goals. As a rule, a scientific theory in any profession must have two components to be accepted: explanatory power and predictive power. Explanatory power refers to the ability of the theory to explain the available facts, while predictive power refers to the ability of the theory to make specific and true predictions of future events. The presence of these two factors is what allows scientific knowledge to be applied to the world in an effective manner. Regardless of the specific discipline in which research occurs, it can be

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[15] David B. Resnik, "Scientific Autonomy and Public Oversight." *Philosophy of Science* 5, no. 2 (June 1, 2008): 220-38.

[16] [16] David B. Resnik, "Scientific Autonomy and Public Oversight." *Philosophy of Science* 5, no. 2 (June 1, 2008): 220-38.

assumed that, to some extent, its goal is to increase both the predictive and explanatory power of that discipline.

With this understanding, we can now begin to explore the norms within the scientific community. In his article *The Impact of Moral Values on the Promotion of Science*, Hassan Zohoor writes that members of the scientific community "strongly abhor fraud, error, and pseudoscience, while they value reliability, testability, accuracy, precision, generality, and simplicity of concepts."[17] Though most of these norms have to do with epistemic rather than moral values, the scientific community's loathing of fraud is demonstrative of one of their most important moral values: honesty. Honesty is fundamental in maintaining the integrity of the scientific fields and, while it is generally valued throughout all of society, it occupies a position of special importance within the scientific community. Scientific fraud, also known as misconduct, generally occurs in the form of either lying or stealing and, if found out, can result in the expulsion or ostracizing of the perpetrator from the scientific community. In science, lying refers not to the little fibs we tell each other on a regular basis, but rather to the act of knowingly misrepresenting data. This can be done through forgery, omitting key data points, or a variety of other methods. Lying in the scientific community is considered such a serious offence because it both inhibits and destroys trust in the scientific process. It can lead to research being done on the basis of false premises, and wastes significant time, funds, and other resources in the process. Stealing, in the scientific community, involves taking credit for the work of another. Though it is still a breach of academic honesty, it is

[17] National Research Council (US) Committee on the Experiences and Challenges of Science and Ethics in the United States and Iran, and Hassan Zohoor. "The Impact of Moral Values on the Promotion of Science." Current Neurology and Neuroscience Reports. January 01, 1970. Accessed January 29, 2019. https://www.ncbi.nlm.nih.gov/books/NBK208723/.

considered less dire than lying since it has less of an impact on the scientific process; it is more important that data be real and reliable than to know the source.[18]

As a whole, the moral characteristics of the scientific community can be considered an amalgam of the morals held by general society and the morals that apply specifically to practices within the scientific community. While they do not guarantee that every single member of the scientific community will act morally in every situation, these characteristics demonstrate that moral conduct is highly valued within the community. This is an important component of establishing public trust in the moral character of members of the scientific community.

Moral Accountability in the Scientific Community

While the moral characteristics that I outlined above are essential in establishing the good moral character of the scientific community, there is one final issue that I must address. As I mentioned above, the high value for moral conduct within the scientific community does not guarantee that every member will act morally, especially during the research process. There are a variety of incentives that might motivate someone within the sciences to deviate from the shared moral code, particularly for those who actively participate in the pursuit of science as scientists. These incentives can include financial gain, recognition from peers, promotions within a field, and many more. Given this potential for wrongdoing by those within the scientific community, it is essential to understand what sort of checks and balances are in place to prevent this from happening.

[18] McCain and Segal, *The Game of Science*, 144.

How does the scientific community ensure that its members act morally, and how does it deal with those who don't? In other words, what sort of moral accountability exists within the scientific community?

Let's begin by considering the following two cases:

(1) Dr. Scott Reuben (b.1958) was an anesthesiologist at Tufts University School of Medicine and Baystate Medical Center in Massachusetts, where he conducted research on pain control. Funded by grants from drug companies, his primary work involved conducting clinical trials for pain management drugs. However, in 2010, it was revealed that Reuben had faked much of the data from the clinical trials and published their results without actually conducting the studies.[19]

(2) In 1932, the Public Health Service began a study on the natural progression of syphilis titled "Tuskegee of Untreated Syphilis in the Negro Male." The study involved 600 black men as test subjects, two-thirds of whom were infected with syphilis. Under the pretense of treating their condition, researchers observed the subjects over the course of 40 years and recorded the progression of the disease. This continued despite the development of an effective treatment for syphilis in 1947, which was never offered to the subjects.[20]

Though they occurred almost a century apart, both of these cases clearly demonstrate actions that violate the moral values held by the scientific community with

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[19] "Scott S Reuben – Anesthesiologist Who Went to Prison for Faking Pain Control Trials," Dr Geoff, November 20, 2017, accessed February 27, 2019, https://drgeoffnutrition.wordpress.com/2017/11/19/scott-s-reuben-anesthesiologist-who-went-to-prison-for-faking-pain-control-trials/.

[20] "Tuskegee Study - Timeline - CDC – NCHHSTP," Centers for Disease Control and Prevention, accessed February 27, 2019, https://www.cdc.gov/tuskegee/timeline.htm.

regard to scientific research. However, there are some very clear differences in what makes the actions in each case are immoral. As a general rule, immoral behavior within the scientific community can be classified into two main types, which I will refer to as *scientific misconduct* and *general misconduct*. As the name would suggest, scientific misconduct involves a breech in the moral values that apply specifically to scientific practice. Otherwise known as fraud, this sort of action violates the integrity of scientific research, and occurs in the form of either lying or stealing. Since Scott Reuben lied about the results of his research, his behavior can be classified as scientific misconduct. General misconduct, on the other hand, involves a violation of the moral values that the scientific community shares with society as a whole, primarily with regard to humans. It involves the mistreatment of human beings during the research process, as was seen in the Tuskegee study. In that study, the researchers mistreated their subjects by misleading them about the purpose of the study and by withholding treatment. Though the Reuben and Tuskegee cases are just two examples of immoral conduct during the research process, they highlight the importance of accountability within the scientific community. Its moral character doesn't just depend on the moral values shared by its members, but also on its ability to uphold those values in action.

The scientific community relies on two systems to uphold its moral values in research: institutional review boards and peer-review. According to the US Food and Drug Administration, an institutional review board (IRBs) is "an appropriately constituted group that has been formally designated to review and monitor biomedical research involving human subjects." In the United States, an IRB must have a diverse membership, with representatives from a variety of disciplines and vocations. Within its specific institution, it has the authority to approve, require modifications (in order to approve), or disapprove research.[21] The purpose of an IRB is to protect the rights and wellbeing of human subjects during scientific research. One of the main ways that it serves this purpose is in ensuring that there is informed consent among all human subjects in a study. Informed consent in research means that the subject agreed to participate based upon a clear understanding of the purpose, process, and possible consequences of the study. Essentially, an IRB acts to prevent the occurrence of general misconduct during scientific research. Though not all members of an IRB are connected to the sciences, this is mediated by the board's narrow focus. Since the scientific community and general society share a moral concern for human rights, the IRB still acts to uphold the moral values of the scientific community.

The peer-review system is the other major way in which the scientific community is able to hold its members accountable for their moral actions. It refers to the process by which the validity and quality of a manuscript is assessed by other members of the scientific community, both prior and post publication. When it occurs before publication, peer-review involves a formalized process in which a journal editor sends a submitted paper to a small number of qualified peers—experts in the relevant field. After reviewing the paper, the referees return it with detailed criticisms and a recommendation on whether to reject, accept with revisions, or accept the paper into the journal. This pre-publication process is the most common conception of the peer-review system. However, the peer-review that happens after publication is just as, if not more important to quality control in

[21] Office of the Commissioner, "Search for FDA Guidance Documents - Institutional Review Boards Frequently Asked Questions - Information Sheet," U S Food and Drug Administration Home Page, accessed February 27, 2019, https://www.fda.gov/RegulatoryInformation/Guidances/ucm126420.htm.

science. This sort of peer-review refers to the reading and critiquing of a paper by the general scientific community, and is more likely to catch any manner of mistakes or scientific misconduct. Though it is not a flawless process, and has been described as a "system full of problems but the least worst we have," it plays an important part in maintaining the integrity of scientific research.[22]

At this point, we can finally return to the question I raised at the beginning of this chapter: how do we know that members of the scientific community will act morally? In order to give moral authority over scientific research to the scientific community, we need to have faith in the moral character of its people. To this end, we must recognize that it is not possible to account for every potential instance of misconduct or immoral behavior within the scientific community. Every community has its share of bad apples, and there are more than a few incentives in scientific research to act against the moral norms. However, the incorporation of institutional review boards and peer-review ensure that, as a whole, conduct within the scientific community is generally reflective of the values held by its members. In this way, it is neither demonstratively more nor demonstratively less moral than the rest of society. From this, we can conclude the scientific community is morally capable of guiding the direction of scientific research.

[22] Brenda Wingfield, "The Peer Review System Has Flaws. But It's Still a Barrier to Bad Science," The Conversation, September 05, 2018, accessed February 27, 2019. https://theconversation.com/the-peer-review-system-has-flaws-but-its-still-a-barrier-to-bad-science-84223.

3. SOURCES OF MORAL AUTHORITY

I demonstrated in the previous chapter that the scientific community is morally capable of guiding the direction of scientific research. However, this alone is not justification for according them moral authority. To say that the scientific community is morally capable is equivalent to saying that they are able to make moral judgments equally as well as the rest of society. However, this does nothing to distinguish the scientific community as the group that should have moral authority over scientific research. Why should we choose them and not some other group to take on this role?

Alternative Sources of Moral Authority

Up until this point, I have made little mention of any possible moral authorities outside of the scientific community. There are a variety of other institutions and leaders to whom we may turn for moral guidance in scientific research, and it is necessary to consider their relative merits within this role. Unfortunately, because there is very little hard data about this subject, this section with necessarily contain a degree of conjecture. For the sake of organization, I have divided these potential sources of authority into two categories: social and religious. These categories were chosen because both society and religion have a historical claim to the position of moral authority. However, it should be noted that these categories are very general, and most real moral authorities will have specific attributes and dimensions to their authority that I will not address. The bulk of this section will be devoted to analyzing society as a source of moral authority, since its moral values have the largest degree of influence. In fact, religious moral systems can, to an extent, be considered subsystems of the social morality, since they exist within society rather than separate from it. For this reason, I'll first address social sources of moral authority, before moving to religious moral authority.

For most people, social morality, or rather the moral system that governs society, is their default moral system. Since this moral system is inextricably connected to society, I will describe and refer to it using both the terms social and societal. Because humans are raised in social environments and taught the norms of their society, their individual moral systems tend to be, to some extent, reflective of the societal moral system. It is for this reason that many people automatically favor applying societal moral systems in situations such as this, where a system needs to be established. However, despite our natural orientation towards social morality, allowing it to hold authority over scientific research would actually prove a detriment to the field and to society as a whole. Though this is a bold claim, its rationale lies in what society sees as the moral goal or purpose of science.

When dealing with moral issues involving science and research, the foundation of the social moral system is largely composed of the principle of utilitarianism. This is the most popular idea of science in the public sphere: that it must produce a practical benefit to society, where the "common good" is served.[23] It encourages a pragmatic approach in which scientific research is directed in whatever way benefits the most people, and relies on the idea that scientific research is a tool of the people. In a way, this is a viable point

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[23] Péter Hartl, "Michael Polanyi on Freedom of Science." *Synthesis Philosophica* 54, no. 2 (2012): 307-21.

of view. Since modern society is so heavily reliant on science and technology, most people are only familiar with those areas in the context of how it benefits them. Members of society who aren't in the scientific community interact with the field in very limited, restricted ways; they only hear about specific research and scientific progress when it is either especially important or unusually dangerous. They have very little familiarity with both the research process and the steps that allow knowledge gained through research to be applied to making new technology. Instead, they generally only come in contact with the technological applications of research. With that and the common allocation of tax resources to the sciences, this means that the people are quite literally paying for the progression of science. While this is undeniably self-interested, the vast majority of individuals would naturally expect some form of personal benefit when they give up their hard-earned money to a cause. The result of this is that the majority of people think that the overall goal or purpose of the practice of science is to research ways to improve their lives. Essentially, it is a tool for the betterment of humanity. As was stated before, this is a popular idea, and for good reason. However, it is based on a limited view of the purpose of science; it relies on the assumption that the value of scientific knowledge is its application, thus meaning that the purpose of science is technology, and the purpose of technology is to help people.

At this point, one might ask his/herself why that assumption is regarded as problematic. After all, many of the people who enter or would like to enter the scientific community do so out of the desire to help people. Actually, the issue with that assumption is rooted in its paralyzing effect on the actual practice of science. In the context of moral authority, scientific utilitarianism means that research goals and technological development would be considered moral if and only if it had prospective benefits towards the public, with its inherent morality proportional to the value of its perceived benefit. Similarly, the immorality of scientific research would be proportional to its prospective harms towards the public. However, what is truly unsettling is that, under that logic, research that had no prospective harms or benefits might still be considered immoral as it constitutes a use of resources without quantifiable return. This is especially problematic when we consider how a great deal of scientific knowledge ends up having unforeseen and generally unexpected applications. One of the best examples of this point is the field of quantum mechanics. Quantum mechanics has been studied as a subsection of physics for roughly a century, and is still thought by many to be an arcane and abstract field with no practical applications. This is the case despite the fact that much of the technology that exists in the modern world relies on the application of quantum physics to function. This includes smartphones, computers, MRI machines, atomic clocks, GPS, and a variety of other technologies that have a huge impact on everyday life.[24] These applications have come decades after quantum physics began to be studied. If scientific research were judged as valuable based only on its foreseeable or intended application, this field would have never been able to give us this technology. Given a system where this type of social morality was authoritative, the direction of scientific progress could be tailored to alight with what is deemed most favorable to the majority of people. However, because these decisions come from outside the scientific

[24] Chad Orzel, "What Has Quantum Mechanics Ever Done For Us?" Forbes, August 13, 2015, accessed January 29, 2019, https://www.forbes.com/sites/chadorzel/2015/08/13/what-has-quantum-mechanics-ever-done-for-us/#1177af314046.

community, their application requires that the structure of the community be hierarchical: it requires centralized control and planning.

While, in some cases, a centralized system can work as a functional and efficient method of community organization, its application in the scientific fields would be to their detriment. Michael Polanyi makes this point by arguing that the scientific community requires a level of self-direction that is not possible in a system of *centrally directed coordination*. In other words, this is a system or community in which a hierarchical authority directs the actions of individuals within the system. Polanyi's claim is that centralized systems are only effective in situations where one can clearly identify the end result and central direction, such as military operations.[25] However, in situations where there is no central direction or predetermined steps, like tasks involving puzzles or problem-solving, efficiency relies on *self-coordination*. This means that each member of the group must be able to make decisions for themselves as well as keep an eye on their colleagues, thus allowing a level of cooperation in which further steps can be considered in light of other's progress or advancement. Essentially, maximum efficiency is achieved through maximum collaboration within the ranks of the community and, similarly, the progress of the community is halted when the members are unable to adjust and direct themselves in accordance with others. Polanyi concludes from this that:

> "You can kill or mutilate the advance of science, you cannot shape it. For it can advance only by essentially unpredictable steps, pursuing problems of its own, and the practical benefits of these advances will be incidental and hence doubly unpredictable."[26]

[25] Péter Hartl, "Michael Polanyi on Freedom of Science." [312-313]
[26] Péter Hartl, "Michael Polanyi on Freedom of Science." [312]

While I think this conclusion is much too extreme, it helps to illustrate how the application of centrally coordinated system would affect the progression of science. Polanyi's point here is that the only effect of attempting to direct scientific progress is to slow it down or halt it. He thinks that, because the end result is ultimately unknown, it is impossible for an authority to plan science based on what is considered most beneficial. I'd contest that, while it is impossible to entirely shape the advance of science, it is possible to shape it to some extent. This is particularly apparent when one considers how money is invested into certain research areas, though this is not the only way to influence the sciences. Fields that are allotted a large portion of funds tend to attract more researchers than those with less funding, which increases the rate at which those fields grow. This effect can also be seen with regard to certain scientific questions. Questions that are considered especially important or provide a significant incentive for answering them also attract more researchers than those that don't offer as much. The more resources are dedicated to answering a question, the quicker that question tends to be answered. However, Polanyi's conclusion does bring up an important point: that scientific inquiry has an inherent element of chance. This does not mean that it is completely unpredictable, since the direction scientific advancement is relatively dependent on how and where resources are applied. However, no area of research can guarantee significant results, and when research does yield results, they can be quite different than what was expected. It is not uncommon for promising fields to yield little more than dead ends, and the most unlikely thing to end up being incredibly important. To see this phenomenon, all one need do is consider Alexander Fleming's accidental discovery of penicillin in 1928.[27] This discovery completely transformed medicine and has saved countless lives, but ultimately occurred because Fleming left an uncovered petri dish near an open window, and it happened to get contaminated by a mold of the *Penicillium* genus. What this shows is that, no matter how much preparation or research or money one invests into a project, scientific discovery still has an element of chance to it.

It is this element of chance that makes up one of the main premises of my argument against directing scientific research according to what society deems most beneficial. Attempting to guide science in this way assumes that we can know how the results of scientific inquiry will affect us, but this is nothing more than arrogance. Additionally, social morality designates the ultimate ideal or moral value of scientific research as the pursuit of the maximum benefit to society and the people that exist within society. If that ideal held authority, the practice of science would be at the mercy of the whims of general society. The efficiency and functionality of the field would be significantly decreased, and the incredible advancement that humanity has witnessed in recent past could begin to slow or even grind to a halt. However, it is the implication of this reduced output that is especially terrifying. Should the visible and accessible benefits of scientific research begin to decrease, the social perception of its value as an academic pursuit would decrease as well. Allowing science to be the tool of society could mean the end of science itself, or at least humanity's care for the subject. The main issue in using societal sources of moral authority over scientific research is that they tend to see

[27] S. Y. Tan, and Y. Tatsumura, "Alexander Fleming (1881–1955): Discoverer of penicillin." *Singapore Medical Journal* 56, no. 7 (July 2015): 366-67.

benefiting society as the moral purpose of scientific research.

Now that we've explored how society can act as a moral authority over scientific research, let's consider how religion can fill this role. Defined simply, religion is the belief in and worship of a superhuman controlling power, often thought of as a personal God or gods. For this argument, I will address only organized or institutional forms of religion, as they tend to occupy more authoritative roles in society. Religion is arguably the oldest source of moral authority in society and has been a constant fixture in human life for almost all of recorded history, with one of its main functions being to prescribe proper or moral human behavior. The authority of a religious moral system comes from the divine, since it is by divine mandate that right and wrong are determined. It is the traditional source of moral authority, and that means that many people look to it for guidance when a moral system needs to be established. However, despite religion's historical occupation of the role of moral authority, allowing it to exercise this authority over scientific research would be to the detriment of the entire discipline. This is because a religious worldview is based on faith, while a scientific worldview is based on reason.

To understand why this presents such a problem for the scientific community, we must first consider what is meant by the terms 'faith' and 'reason.' These two concepts and how they relate to each other have been the subject of philosophical and theological debate for millennia. Reason generally refers to the principles used in a methodological inquiry. It determines the truth of a claim based on whether or not it can be demonstrated by the process of this inquiry. Faith, on the other hand, refers to a position on a claim that is not demonstrable by reason. In a religious context, faith is further characterized as coming from a transcendent or supernatural source by manner of revelation. Revelation is the source of authority for religious faith, and can occur directly, as an infusion from the source, or indirectly, from the testimonials of others.[28] Both faith and reason serve the same epistemic function in that they act as justification for knowledge or belief. In the scientific community, reason acts as the primary justification for knowledge. It provides the foundation for the entire structure of logic underpinning both scientific research and the organization/integration of data into the scientific body of knowledge. In this way, reason forms the backbone of the scientific paradigm, which, as I discussed in an earlier section of this paper, refers to the general worldview shared within the scientific community. Conversely, faith acts as the primary justification for knowledge in a religious worldview. This is because any religious knowledge must be revealed in the form of revelations from a divine source. They make up the foundation of a religion, and are usually described and interpreted in sacred decrees that are backed by some kind of divine authority.

Now that we have a better understanding of the roles of faith and reason, we can begin to explore why they present a problem in assigning moral authority over scientific research to a religious source. To put it simply, the worldview created by religious faith conflicts with that of scientific reason. I stated in the previous paragraph that reason underpins both scientific practices and the scientific body of knowledge. The entire field of science is constructed based on the principles of reason, and this encourages the people within the field to adopt a similar perspective. The heavy use of reason gives rise to a worldview that bases its conceptions on reason as well. For example, a devoted member

[28] James Swindal, "Faith and Reason," Internet Encyclopedia of Philosophy, accessed February 24, 2019, https://www.iep.utm.edu/faith-re/#H3.

of the scientific community would accept that the Earth was billions of years old based on the substantial geological evidence. Because this belief is based in evidence, it demonstrates that reason produces a dynamic rather than a static worldview. It is very different from the one created by a strong reliance on religious faith. In a religious community or organization, members view the world as existing in accordance with religious doctrine. Therefore, a devout Christian would accept the claim that the earth is around 6000 years old as true because of its basis in the Bible. This demonstrates how religious faith serves to build a conception of the world that is founded in religious doctrine and, as such, must be accepted as true. The implication of such faith is that it requires the natural world to be viewed as static and unchanging. As long as religious doctrine is accepted as truth, any understanding of that world must be as consistent with that truth. These views are strikingly different from the dynamic and ever-expanding view of nature that is provided through scientific reason. In this, it is quite clear that science and religion employ two distinct methods of acquiring knowledge that, when applied to the same subject, product very different results. In fact, the use of religious faith as a method for understanding the world contradicts the very essence of the scientific discipline, reason. It is because of this fundamental contradiction that assigning moral authority over scientific research to religion would be to the detriment of the scientific fields.

Though there are a variety of ways in which a religious moral authority over research could damage the scientific fields, there is that I think is particularly important. The incorporation of faith into the sciences could increase the prevalence and acceptance of pseudoscience. Pseudoscience is fake science; it refers to a belief system or methodology that wears the all trappings of science, but is not actually scientific. It is the result of defective scientific reasoning. Since religion is justified by faith rather than reason, allowing it to direct the goals and practices of science can result in pseudoscience. Scientific creationism is a prime example of this. Originating in the late 20th century as a reaction against the theory of evolution, this movement claims to offer scientific support for the Biblical account of creation.[29] It argues that evolution is insufficient to explain the origin of species, and that any geological evidence for it was actually just created by God. This example demonstrates a form of defective scientific reasoning that is particularly relevant to religion: irrefutable hypotheses. It is defective in that there is no evidence or state of affairs that, if attained, would cause the hypothesis to be abandoned. Thus, if a supporter of scientific creationism can explain away any conflicting evidence by claiming that God created it, it cannot be considered a scientific hypothesis. In this way, religious involvement in scientific research detracts from its reliability.

Expertise as Moral Authority

Though it could probably go without saying, the level of scientific knowledge is largely what distinguishes the scientific community from other groups or individuals that could take on the role of moral authority over scientific research. The scientific community is, almost by definition, the group that has the greatest understanding of both

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[29] Daisie Radner and Michael Radner, *Science and Unreason*, Belmont, CA: Wadsworth, 1982: 6.

the practices and the systems of knowledge that are present within the scientific areas of study. It is this knowledge and expertise that justifies why they are the group that should have moral authority over scientific research. However, it should be noted here that I am not arguing that scientific expertise alone provides any sort of moral insights. Someone can have plenty of scientific knowledge or expertise without knowing anything about what is moral. Scientific knowledge is descriptive; it makes statements about what is. Moral knowledge, on the other hand, is prescriptive; it makes statements about what ought to be. As David Hume famously argued in his *Treatise on Human Nature*, one cannot logically draw conclusions about what ought to be based solely upon what is.[30] Instead, I am making the claim that scientific expertise is necessary to make justified moral judgments about scientific research. To understand why this is the case, we must first explore what it means to have expertise and how it relates to authority.

Though most people tend to consider the idea of expertise in the same light as knowledge, it is actually a far more complicated concept. In their paper, *Expertise as Argument: Authority, Democracy, and Problem-Solving*, Madjik and Keith define expertise as a type of argument, or method of argumentation, rather than a level of knowledge. They write that:

> "The argumentation that constitutes expertise does not reside in the knowledge or experience of the arguer (thus argumentation is not simply a tool for asserting expertise), but relative to a problem;

[30] Charles Pidgeon, "Hume on Is and Ought," Philosophy Now: A Magazine of Ideas, accessed January 28, 2019, https://philosophynow.org/issues/83/Hume_on_Is_and_Ought.

> expertise invokes not a relationship to specialized knowledge but to the ability to respond appropriately to problems."[31]

This means that the level of expertise on a subject determines the extent to which an individual can effectively respond to a problem; a solution to a problem proposed by an "expert" would have a greater likelihood of success than one proposed by an amateur. However, it should be noted that, especially in areas like the sciences that require a significant amount of schooling, expertise is generally reliant on a certain level of knowledge. For example, someone would not be able to respond appropriately to a problem in microbiology unless they knew a significant amount of information about microbiology. Though expertise and knowledge refer to different concepts, in science, they are inextricably linked to one another.

Expertise is often a source of authority. However, as a general rule, it is usually seen as a theoretical authority rather than practical authority. The Stanford Encyclopedia of Philosophy defines a theoretical authority in a field of intellectual inquiry as one who is an expert in that field. Theoretical authorities operate primarily by giving advice to laymen, which the layman is free to either heed or disregard. [32] Their decisions or judgments can be thought of as giving people reason to believe something. One common example of the exercise of theoretical authority can be seen in the relationship between a doctor and a patient. Though a doctor can give advice about the best treatment options or health plans for the patient, the ultimate decision still rests on the patient. This is different

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[31] Zoltan P. Majdik and William M. Keith, "Expertise as Argument: Authority, Democracy, and Problem-Solving," *Argumentation: An International Journal on Reasoning* 25, no. 3 (July 26, 2011): 372-373.
[32] Tom Christiano, "Authority," Stanford Encyclopedia of Philosophy, July 02, 2004, accessed January 28, 2019, https://plato.stanford.edu/entries/authority/.

from the effect of a practical authority, which can be thought of as giving people reason to act. Rather than just informing one's decisions, a practical authority guides one's actions. In according moral authority to the scientific community based on their level of expertise, I am giving expertise a dimension of practical authority in addition to its theoretical authority. This is because a moral authority in research acts to implement actual, practical guidelines for moral conduct and practices as well as give general moral advice. It can determine a type or method of research to be morally wrong, and, to some extent, keep the scientific community from engaging in it. To use expertise to create and legitimize a moral authority means that it also has a level of practical authority.

I made the claim that scientific expertise is a necessary component in making justified moral judgments about scientific research because science, more than any other area in society, is a highly specialized enterprise. Specialization occurs when a discipline matures and expands to the point that the amount of information contained within is too great for any one person to master. One of the most dramatic examples of this can be seen in the field of microbiology, which is itself a subdiscipline of biology. Due to the massive array of microbes that have been identified, the field has been divided into the subdiciplines of bacteriology, mycology, and parasitology. Within these fields, many researchers further specialize in a specific microbe, meaning that there are communities dedicated to studying mycobacteria, staphylococci, chlamydia, candida, and malaria, along with a myriad of others.[33] Though this is an extreme example, specialization is present throughout both the scientific body of knowledge and its practices, and is constantly growing. This growth is because science builds its knowledge base

[33] Arturo Casadevall, and Ferric C. Fang, "Specialized Science," Infection and Immunity, April 01, 2014, accessed January 29, 2019, https://iai.asm.org/content/82/4/1355.

cumulatively, with the result being that it always knows more today than it did yesterday.[34]

The vehicle of growth is research, and it necessarily occurs on the fringes of each discipline—the line between what is known and what it unknown. The sheer mass of information, complexity, and specialization within each scientific discipline means research into anything unknown is usually incredibly specific. For example, a research project in the field of biochemistry might involve attempting map a specific section of a version of a protein that occurs within a single organ within a species. In order to truly understand the implications of this sort of project, it is necessary to have a high level of knowledge in biochemistry, both with regard to the actual mechanics of the field and the language used to describe it. The same is true when assessing the moral character of the project. To demonstrate this point, consider a scenario in which two people are asked to make a moral judgment about this research project. They have the exact same moral values, but one of them is trained in biochemistry and the other is not. Whose judgment would be more closely aligned with their moral system? Naturally, the answer here is that the person with biochemical training would be able to produce an answer that is more consistent with their morals than the person without training. Their knowledge of the field allows them to have a better grasp of the methods and potential effects of the project. This means that, even though both subjects have the same moral goals, the one with more knowledge is better able to assess whether the project fits those goals. The scenario shows the exercise of scientific expertise to effectively answer a moral problem, since it was the subject's scientific knowledge that allowed him to make a better

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[34] Yuval Levin, "The Moral Challenge of Modern Science," The New Atlantis, accessed January 29, 2019, https://www.thenewatlantis.com/publications/the-moral-challenge-of-modern-science.

judgment. If we apply it to the entirety of scientific research, it allows us to conclude that the responses to moral dilemmas relating to scientific research that come from within the scientific community would be more effective than those that originated outside the community.

Madjik and Keith also make the argument, in addition to its role as the "exercise of well-informed reason," expertise also functions as the "justification of a judgment."[35] This adds further support to the claim that a moral judgment that is grounded in expertise is more likely to be a *better* judgment than one based solely on morals. (Better, in this context, means that the judgment more accurately reflects the moral ideals, either in its results or how it is applied.) This is an important point to consider when regarding the idea of moral authority over scientific research coming from a source outside the scientific community. Without scientific expertise, an outside moral authority cannot make justified moral judgments to direct the course of scientific research. The extreme complexity and specialization that characterizes most modern scientific research means that, in general, anyone without some level of scientific knowledge has an incomplete or even erroneous understanding of the situation in question. A moral judgment that is based on an understanding of the situation that is misinformed or lacking key information is hardly more than a guess. The possible consequences of this could be severe, especially when one considers the massive effects that scientific advancement has on society and the world as a whole.

One of the most dramatic examples of this is the controversy begun by Andrew Wakefield and his colleagues in 1998, when they published a paper linking the diagnosis

[35] Madjik and Keith, "Expertise as Argument," [374]

of autism in children to the MMR (measles, mumps, and rubella) vaccine.[36, 37] Though the design of the experiment detailed in the paper was poor and the conclusions were speculative at best, the paper received a large amount of publicity, thus causing many parents to refuse to vaccinate their children. As a result, several measles outbreaks (most notably in 2008-2009) occurred in the United Kingdom, Canada, and the United States that were attributed to the lower vaccination rates. However, almost immediately after the appearance of Wakefield's paper, several epidemiological studies were conducted and published results refuting the proposed link between autism and the MMR vaccine. Eventually, it was revealed that the results presented in the article were fraudulent, causing Wakefield to lose his medical license. The key point to this issue and the reason that it is highlighted here is that, despite the rock-solid scientific proof that vaccines are not connected to autism, there is still exists a community of people who continue to back Wakefield.[38] While this example involves moral judgments being applied more to medical practice than scientific research, it is important in that it demonstrates the sort of damage that a single erroneous idea can cause when that idea is allowed to be acted upon. It is an example of a situation where a misinformed understanding of science actually has power and effect, and the disastrous consequences that can occur. Parents who deny the MMR vaccination to their children out of fear of autism are not doing so out of any deficiency in their moral character; they are trying to protect their children, which most

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[36] Stanley Plotkin, Jeffrey S. Gerber, and Paul A. Offit, "Vaccines and Autism: A Tale of Shifting Hypotheses." *Clinical Infectious Diseases* 48, no. 4 (February 15, 2009): 456-61.
[37] T. S. Sathyanarayana Rao, and Chittaranjan Andrade, "The MMR vaccine and autism: Sensation, refutation, retraction, and fraud." *Indian Journal of Psychiatry* 53, no. 2 (2011): 95-96. doi: 10.4103/0019-5545.82529
[38] Laura Eggertson, "Lancet retracts 12-year-old article linking autism to MMR vaccines" [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2831678/]. *CMAJ: Canadian Medical Association Journal* 182, no. 4 (March 9, 2010): E199-E200. doi:10.1503/cmaj.109-3179.

people would consider a moral goal. Despite their good intentions, these parents end up exposing their children to potentially fatal diseases and needlessly endangering both the children in question and the community as a whole. This is because lower vaccination levels mean increased chances of someone getting infected as well as increased chances of them spreading the illness to another person. All of this damage comes from the fact that the parents do not have the appropriate level of knowledge on the subject to choose the option that actually reflects the morals that they are attempting to express. In other words, they don't have the level of scientific expertise required to respond to the problem.

Though the vaccine controversy involves only a small minority of the population and relates to medical practice rather than scientific research, it models the potential effects of having the power to act on erroneous judgments. The danger of a moral authority outside of the scientific community comes from the possibility that that this authority might hold a misinformed moral judgment and thus have to power to act in accordance with it. There is some scientific research that, through either its promotion or inhibition, has a much greater potential for harm than one vaccine, and giving an outside source moral authority over it puts that entire potential at the hands of a group that, in all likelihood, does not have the expertise to effectively handle it.

This concept of expertise is what sets the exercise of moral authority in scientific research apart from basic moral norms or moral authority. As stated before, Madjik and Klein defined expertise as an argumentative technique that depends on one's ability to respond effectively to a problem.[39] The extreme complexity and specialization of

[39] Madjik and Klein, "Expertise as Argument," [372-373]

scientific research means that assessing its moral implications requires a level of expertise and relevant knowledge that is far above that needed to make moral judgments in general society. When this is coupled with the fact that scientific research has the potential to impact the world in both a dramatic and long-lasting fashion, it becomes clear why it is so necessary for moral authority over this research to belong to the scientific community. In situations involving moral issues relating to research, those in the scientific community would be best equipped to effectively solve these problems. This is not because the members of the community are morally superior to the rest of society but rather because they are the only group that has the ability to make well-informed moral decisions. The scientific community's knowledge of their fields and practices means that they are able to enact guidelines for research that, both in theory and in practice, align with the moral system upon which they are based. Given these points, I must conclude that the scientific community is significantly more justified in exercising moral authority over scientific research than any other group or institution.

4. CONCLUSION

As I already mentioned in my introduction, the modern world doesn't seem to care much for philosophy. Though I am making this statement based on my own limited experience, I don't think it's very far off the mark. Many of my peers consider the majority of philosophy to be far too abstract to make any in-depth study of it worthwhile, since it would be difficult to realistically apply to one's life. Despite these sentiments, I think it is vitally important for them and the rest of the modern world to seriously consider the philosophical issues relating to morality in science, especially with regard to moral guidance of scientific research. The purpose of this paper is to demonstrate that moral authority over scientific research should belong to the scientific community. Over the course of the previous two sections of this paper, I have presented two major premises in support of this claim. The first is that the scientific community is of sufficient moral character to guide the direction of scientific research. This does not mean that they are morally superior to the rest of society, but rather that they are not morally deficient. The second premise is that the scientific expertise of the community means that they are the only ones who can make well-informed moral decisions regarding scientific research. Given that the scientific community is both moral and well-informed in the sciences, they should have moral authority over scientific research.

However, despite the time and paper that I have devoted to exploring this issue, this paper is not exhaustive. There are a variety of further directions in which this philosophy may be taken, as well as several potential objections that must be addressed. I could probably write another entire thesis to this subject, but I will provide a brief overview of these issues here. To me, the most important direction in which this philosophy should be expanded is its application. The first step in doing so would be to address the differing levels of expertise that are required by different disciplines. One could argue that, while hard scientific fields like molecular biology require the high degree of expertise that enumerated above to make informed moral decisions, softer scientific fields such as sociology do not require that level of expertise. This is mainly because, in many of the softer sciences, the language of the paradigm is much more similar to the ordinary language used within general society. One may need less scientific training in order to understand the issue at hand, and thus make an informed moral decision. This is related to another important issue: that certain scientific fields may have more moral weight than others. Fields like genetics are particularly relevant to the moral systems held by general society in that their research deals with subjects of specific moral importance. Research in genetics may involve subjects like cloning or genetic engineering, about which many people have very strong moral convictions. This may be contrasted to fields like astronomy, which generally don't inspire the same level of moral qualms. Both this issue and that issue of varying degrees of expertise between fields must be further researched before any application of my philosophy can take place. Rather, what I have done in this paper is provide a general outline or template for how moral issues in the sciences can be addressed, and who has the ability to address them. Ultimately, my hope is that this philosophy can help in laying the foundation for a new dynamic between society and science that is tailored to the modern world and its unique issues.

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