Ethicist-Scientist Interactions: Analysis of Current Methods and an Anthropological Account of the Life in the Laboratory

by

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ABSTRACT

Within ethics, a number of scholars advocate an interdisciplinary approach of combining the two traditionally different professions of science and philosophy with the confidence that this collaboration will be a mutually beneficial experience. Current ethicist-scientist interactions include embedded-ethicists and research ethics consultation services. Both methods are employed with the hope that they will reduce social and ethical problems that could arise from scientific research, and enhance the reflective capacity of investigative teams.

While much effort has been put forth in the endeavor of creating ethicist-scientist interactions, there remains opportunity to refine these new interaction models to make them more robust. There is need for ethicists to understand the context of ethical decision-making in the laboratory. By extension, before interacting with scientists in a research lab, research ethicists ought to have the ability to understand the science and also be familiar with the different factors that influence scientific research, such as funding, productivity requirements, time constraints, politics of laboratories and institutional reward structures.

Through literature review and the analysis of qualitative data obtained from the ethnographic study in a neuroscience laboratory, this thesis explores the strengths and weaknesses of ethicist-scientist interactions and aims to understand the culture, traditions and values of this community and their perspectives on their role as scientists and their relationship to ethics. This study shows that the quantity and quality of ethics discussions in the lab are limited and dictated by time constraints and minimal incentives. Other influencing factors are the researchers' perspectives on ethics and how they view their role as a scientist in relation to the public.

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Chapter 1

INTRODUCING ETHICIST-SCIENTIST INTERACTIONS

Within ethics, a number of scholars advocate an interdisciplinary approach of combining the two traditionally different professions of science and philosophy with the confidence that this collaboration will be a mutually beneficial experience. Ethicists suggest a particular type of interaction between ethicists and scientists: facilitating dialogue and maintaining reflective space (De Melo Martin, 2009, 40). Philosophers view this approach as valuable and advantageous because they can learn something about science and scientists can acquire reflexivity. Furthermore, philosophers can offer their skills to practice a more practical, helpful philosophy by contributing in setting the stage for discussions on the epistemological and ontological aspects of research and shaping the process and trajectory of projects which may or may not have ethical and societal implications.

Philosophers are formally trained in logical reasoning, reflexivity, analyzing the methods and results of research, exposing fallacies and assumptions and recognizing and addressing epistemic concerns (Robert, 2009, 287). These dexterous abilities that are also shared with other humanists and social scientists can aid the scientists to engage in a different way of reflecting on their research and potentially better the current and future state of their scientific endeavors. This ethicist-scientist interaction can also add to the role of a bioethicist as an active participant, rather than an observer of biomedical and scientific research.

In the early 1990s, Margaret Walker in "Keeping Moral Space Open" demanded a shift in bioethics from using abstract philosophical frameworks to incorporating context during conversations in clinical settings. Questions have been

raised regarding the practicality of using abstract frameworks and constructions of moral philosophy in real life situations. Because moral dilemmas are embedded alongside values, relationships, and the overall social situation, a narrative approach to thinking about moral problems is a viable option as opposed to applying the traditional rigid, code-like moral theories to individual cases (Walker, 1993, 35). Walker explains the importance of incorporating narratives during ethical discussions. Narratives are flexible enough to include not only the normative concepts used in philosophy but also the details of social context, personal values, relationships and responsibilities of that shape and guide individuals who are in a moral dilemma. Using narratives sheds light on the process of moral thinking and the role of the ethicists who are involved in the discussions.

According to Walker, a bioethicist not only should have analytical skills but also have a "nuanced understanding" that allows the ethicist to effectively engage in "critical, reflective and collaborative" discussions. An ethicist's role should not be to offer definitive instruction on how to solve moral dilemmas but rather act as a mediator who facilitates ethical conversations. This role as a moral "architect" will provide space for necessary conversations and recognize when to create moral space, identify the important questions being asked or that ought to be asked, and maximize the efficiency of this conversation while being mindful of external constraints and participating in the dialogue.

The ethicist's capacity to engage in assessing ethical problems and facilitating fruitful conversation is important especially because of the level of complexity in ethical problems. This ability to reflect creatively on all aspects of the problem can be applied to not only the downstream consequences of developed technologies but

also the upstream concerns such as "…social and political influences in research priorities, the reasons for prioritizing particular scientific and technological projects, and the evaluation of conceptual frameworks" (de Melo-Martin, 2009, 41). Also, the ethicists can examine not only the normatively related problems but also the epistemological problems that come with the study and design of the study (de Melo-Martin 2009, 41). By thinking about these concerns, the scientists will have an opportunity to ask questions and raise self-awareness of the ethical and societal influences of biomedical research projects. Also, by identifying and discussing not only the ethically relevant problems and the regulatory, compliance aspect of research, but the fundamental reasoning behind these policies may lead to designing research protocols that stave off potential ethical problems (de-Melo Martin 2009, 43). Even if the individual researchers cannot respond to these considerations due to the constraints of their environment, exposing scientists to this type of rumination is important because they play a role in science policy, grant reviews and public discourse.

In the last five years, humanists and social scientists have been actively experimenting with ways of interacting with research scientists that are interdisciplinary, moral space providing, and reflexivity cultivating. These interactions can produce progressive dialogue that may act as a prophylactic measure against ethical lapses during the course of a project. Rather than talking about moral dilemmas in retrospect, the collaboration between scientists and ethicists provides room to tackle these dilemmas in an upstream manner. This dialogue also paves the way to a much-improved public discourse that steps away from the currently

polarized, dichotomized approach to ethical and social issues of scientific development.

Of the various methods of ethicist-scientist interactions, this project focuses on lab engagements and ethics consultation services. These approaches for initiating dialogue across the various disciplines are explored to survey the potential outcomes of such interactions. The possible effects of ethical discourse are the creation of an environment that is more conducive and open minded to holding conversations about moral values, incorporating deeper reflection during decision making process, changing the trajectory of a research project due to ethical considerations and influencing the reward structure of institutional research. Both lab engagements and consultation services are employed with the hopes that they will reduce social and ethical problems from scientific research and enhance the reflective capacity of researchers.

A novel method for ethicist-scientist interaction is the lab engagement. It incorporates ethicists who are embedded in research laboratories. These embedded ethicists have ethical discussions with single or multiple researchers at a time in their lab spaces. The ethicists are in the lab anywhere from once every few weeks to a few hours a day, interacting with their participants. The aim of this method is to have an impact on scientists' way of thinking. Engagement programs focus on broadening the researchers' horizons so that they will reflect more on their decision-making processes and their decisions, and make these processes more transparent to the participants.

Ethics consultation services are also booming due to institutions increasing the opportunities for ethicist-scientist interactions. These programs are more

frequently seen in institutions with biomedical research and clinical trials for human subjects. The panel is typically comprised of researchers, ethicists, lawyers, policy makers and IRB members. Scientists can initiate a consultation with this committee via Internet. The members of the service collaborate with researchers to tackle ethical issues that surface during various stages of the research. These committees have a very issue-focused approach with the aim of promoting responsible research that maximizes benefits and minimizes harm to society and encourages collaboration between researchers and bioethicists.

Both methods have similar broad long-term goals of engaging scientists in dialogue with those in humanities and social sciences, proactively minimizing ethical dilemmas and influencing research and development outcomes. However, the strategic focus of producing these changes is drastically different for lab engagements and consultation services.

Lab engagements allow a direct dialogue between research scientists and bioethicists. They have the potential to provide an opportunity to explore not only ethical dimensions of research projects and technologies, but the social context of how the research question was developed, how these questions and projects were justified, the daily lab activities, and many other factors that play into the inner workings of institutional research. Lab engagements can generate productive and progressive conversations that lead to clarification and better understanding between scientists and bioethicists. However, whether these conversations can result in concrete changes or be necessarily beneficial and useful is very difficult to assess.

Consultation services, dial-an-ethicist if you will, have the ability to solve ethics and policy related questions that come up during research. Researchers have

the opportunity to determine the problem and seek advice on an as needed basis in real-time with their research. Consultants and consultees can meet in person, or use email as a mechanism for communication to solve these dilemmas with an expert. Researchers, not ethicists, are encouraged to identify the problems with an ethical undertone and outsource them to the appropriately trained consultants. This brings the questions of whether the necessary ethical problems are recognized and whether thoughtful consideration was given to the identified problems. Not unlike lab engagements, there are minimal empirical data on the efficacy and efficiency of this kind of service.

While much effort has been put forth in the endeavor of creating ethicist-scientist interactions, there remains opportunity to refine these new interaction models to make them more robust. Walker articulated the need for clinical ethicists to understand the context of ethical decision-making at the patient bedside. By extension, before interacting with scientists in a research lab, research ethicists ought to have the ability to understand the science and also be familiar with the different factors that influence scientific research, such as funding, productivity requirements, time constraints, politics of laboratories and institutional reward structures. Given this reasoning, the driving question for this project is "how do the current modes of ethicist-scientist interaction respond to the constraints of scientists' social context and how does that dynamic impact the kinds of ethical changes these interactions can produce?" The two examples of this interaction, namely the laboratory engagements and research ethics consultation services will be analyzed to inquire what types of changes they can bring to the level of scientists in the laboratory. More specifically, this project will be to understand the dynamics of the institutional

research environment, specifically the internal and external relationships that influence the way ethics is (or is not) discussed within the laboratory setting.

In order to tell a story that illustrates the culture of scientists, I conducted a participant-observer study for 24 weeks at a neuroscience laboratory. Both field notes and individual, semi-formal interviews were collected to understand the culture, traditions and values of this community and their perspectives on their role as scientists and their relationship to ethics. The account of accumulated experiences during the full immersion in this community and daily interaction with the participants are presented in a narrative fashion to convey the life in the laboratory. The physical environment of the researchers is portrayed, followed by the general research goals for this laboratory, researchers' daily activities, time constraints, their perspectives on ethics, and the few opportune moments to discuss the ethical and social implications of their research projects.

Having an awareness and appreciation for the work environment of scientists, or at the very least, being familiar with the laboratory customs is essential for any ethicist to provide applicable advice and create moral space, assuming that this is indeed useful and necessary within laboratories. The many valuable perspectives of 'is' and 'ought' that the philosophers, social scientists, policy makers, lawyers, physicians etc. bring to the interdisciplinary table that is bioethics allows the ethicists in the field to consider the normative issues in a more broad, versatile manner. These important constituents of bioethics can draw out aspects of the research arena that cannot be ignored when reflecting on the ethical issues that arises in this work environment. "The more knowledge one has about the various kinds of relationships and roles that exist among individuals in everyday life the better skilled

one will be in the exercise of practical judgment with regard to normative matters" (Gorovitz, 367, 1986). Aside from the divergent history behind social sciences and ethics that caused an intrinsic and constructed gap between the two fields and the nature of ethics being a normative, not descriptive area of study, pragmatic concerns of using empirical methods in ethics have been voiced (Borry et. al. 49, 2005). This claim is supported by the argument that "… a structural lack of background and knowledge to judge or criticize the research results of another discipline…" (Borry et. al. 2005, 54) will cause miscommunication. However, in order to approach scientists and engage in an ethical dialogue with them without considering their attitudes and values will be grounds for more irksome incidents of talking past each other. Cultural and social norms are relevant parts of applied ethics because these values are the basis of moral reasoning (Gordon, 2004, 73).

Because the goal of this project is to understand the norms, values and the overall laboratory environment and situation in which moral decisions are made and offering ways to improve the status quo of ethicist-scientist interactions, using social science research methods instead of the traditional methods for philosophy- based bioethics was deemed appropriate.

Mainstream bioethics is grounded in normative philosophy that aims to encourage logical reasoning free of external variables such as history, sociological culture (Borry et. al. 60, 2005). Some sociologists have painted the field of bioethics in an unflattering manner and have criticized it for promoting the application of universal framework for normative problems without giving due credit to the relevant social and cultural variables present in the given situation (Fox and Swazey 2005). It is also disparaged for being an "insular field of general principles and

decontextualised norms" (de Vries et al. 673, 2006). In order to "humanize" (Kleinman, 1995, 67) institutional research laboratories by exposing the social constraints and offer a richly descriptive perspective of scientists' daily activities, I chose a qualitative research method; a contemporary ethnographic study, to explore the everyday life of a research scientist in a neuroscience laboratory.

Qualitative research methods consist of a variety of methods that yield non-quantified data. It leaves room for open-ended questions and a quest for personal values, attitudes, perspectives and experiences of the research participants. On a practical note, qualitative studies, unlike quantitative studies can use a small sample size to gather data since the studies are not searching for statistical significance. This is ideal to carry out a master's level research project in an appropriate time frame. Several advantages of the qualitative methods include the possibility of carrying out the studies long stretches of time, and observations made in real time in the participants' natural environment provide a rich description of the circumstances and context in which these observations occur.

On the other hand, it is almost impossible to eliminate the subjectivity and observers' bias in the obtained data and the interpretations of these results. The presence of the observer in the studied environment undoubtedly affected the behavior of my research participants. The researcher almost has no control over the sequence of events or any variables that are influencing the behavior of participants. This study is not repeatable, which makes the project and its results difficult to validate. Another limitation is that the participant-observer techniques are also very time consuming. It takes the researcher some time to familiarize herself to the new culture, framing interview questions that are free of bias, and to build a relationship

with the participants. It is also time consuming to interpret the field notes, transcribe and analyze interviews. Of all the qualitative methods, I chose to take an anthropologic approach as a means to observing and interacting with the participants (Sugarman & Sulmasy, 2004).

Despite the limitations, ethnography was used because this method not only provides various accounts of participants' behavior in a specific environment but it also contextualizes this behavior, giving the audience a more vivid and accurate picture of the whole. It is used to challenge assumptions and stereotypes of the unfamiliar culture, explore and discover the beliefs and behavior of research subjects under the appropriate context of their natural environment. It exposes multiple layers of the community through a descriptive narrative and captures the minute details that define the participants' social norm. The prevalent attitudes on various issues that can be gathered through this sociological method can give more insight on the population that is being studied (Sugarman, 226, 2004). Cultural aspects of working in a laboratory and the inter, intra-relationships of the scientists and the institutional and governmental variables that control their profession is very much relevant to how they logically reason and justify their decisions. Using this method for bioethics allows philosophers to remove themselves from the decontextualised, abstract principles and theories and situate themselves in the shoes of scientists. Contextualizing ethical problems and the researchers' academic life to give a more detailed perspective can bridge the gap that lies between the pragmatic and 'real-world' oriented minds of researchers and the more abstract, framework based reasoning methods of philosophers.

Empirical research can be used to better inform and reform lab engagements and consultation services. It also can be a useful tool to evaluate and critique bioethical services (Sugarman, 230, 2004). However, one should be prudent in generalizing the subjects' behavior. The duties of a principle investigator and graduate students of a research laboratory are blatantly obvious, and I could have obtained this information by simply asking researchers or individuals who are very familiar with research or read publications on ethnographic studies of laboratories to get an idea of the workings in that specific environment. However, "… maintaining interdisciplinary competence… cannot be accomplished through a packaged set of presentations given by a series of lecturers…" (Fox and Swazey, 2005, 367) I wanted to personally be imbued in this culture and experience the daily work, rapport with lab members, relationships with professors, institutional policies and other general expectations that come with being a scientist. Taking a literary picture through the lens of a participant-observer, albeit subjective and interpretive, can be an expressive, flavorful snapshot of a culture whose story resonates with the audience.

An example of using ethnography to explore moral and ethical values in the context of human dimensions shines in Rayna Rapp's project on the various impacts of prenatal diagnoses, specifically amniocentesis. In her book Testing Women, Testing the Fetus: The Social Impact of Amniocentesis in America, Rapp discusses the population that uses prenatal testing, the role of healthcare professionals, the perspectives of patients and their supporters, the influence of socioeconomic background of those seeking this procedure, and the meaning of having this technology.

For four years the author spent one to four days per week at the Prenatal Diagnosis Laboratory, learning lab techniques and observing the geneticists, graduate students at the laboratory and patients. She also interviewed her participants, which included the laboratory staff, genetic counselors, families of down syndrome patients, over 80 women who underwent amniocentesis, women who opted out of getting this prenatal screening exam and 15 father of fetuses. Rapp sat in on counseling sessions at the hospital and noted the differences between the variety of ethnic groups and economic class and their response to reproductive technologies and outcomes.

The author delivers the voices and agendas of those involved in the prenatal screening process, which can lead to carrying out or terminating the pregnancy. She draws out the social, ethical, technological and policy related dimensions, essentially the complex social context, that is heavily involved in reproductive and genetic technology. Not only were the perspectives of clinicians and counselors, which are more overt to bioethicists discussed but the uncovered grounds of families' and communities' perspectives were made plain.

Other examples of empirical studies in clinical ethics, especially in reproductive technologies for assisted conception include Erica Haimes' study that provided much insight on how the patients reasoned through in vitro fertilization and dealt with its consequences. She analyzed the reasoning process, assumptions, contradictions that happened with families who used this assisted reproductive technology which grants people a chance to conceive, simultaneously leaving these people to face multiple ethical dilemmas. Haimes examined opposing arguments for and against informing children conceived through donated gametes about their

genetic origins. This study illustrates the complexity of the definition of family and the amount of priority given to biology in creating family units and family values (Haimes, 119-147, 1992).

Jeanette Edwards conducted an ethnographic study of donor insemination in a working class town in Manchester. She interviewed multiple families from this town to provide information on how the lay people think about social and ethical issues that come with donor insemination. Her subjects discussed these issues and based their reasoning on their relationships with family members or second hand stories about such relationships. Their reference point for discussing social issues were not on philosophical theories or the science behind reproductive technologies, but focused on their personal or others' experiences with complex family relationships (Edwards, 151-172, 1998).

Similar to these studies that shed light on the not so obvious sociological perspectives of other stakeholders in clinical ethics involving artificial reproductive technologies, I aimed to tell a story about researchers dealing with their daily routines, goals, aspirations and struggles, and how this shapes their views on ethics. Giving due consideration to the social structure, relationships the subjects have with each other and with society, group values, bureaucracy, institutional goals etc. leads way to a better understanding of the rationale behind the moral or immoral decisions being made within cultures. Looking at the greater picture of society and the moral problems that are embedded in this society as a whole can be done through empirical social science. Empirical research methods in the field of bioethics are used to provide descriptive facts that can support ethicists' claims and propositions (Haimes,

99, 2002). It can also encourage new questions and improve existing ethical concepts and claims.

Embedded ethicists and research ethics consultation services provide very different methods of ethicist-scientist interaction and serve different purposes while trying to achieve similar goals of minimizing potential ethical issues from research and encouraging a higher level of reflection on moral implications of scientific projects and developing technologies. Embedded ethicists target the thought processes of scientists by interacting with them on a more personal level while consultation services operate to minimize risk via offering advice on solving the existing problems in real time. Due to limited empirical data on both approaches of interaction between the two professions, it is difficult to assess their effectiveness and efficacy. Observations made during the ethnographic study are used to suggest refinements to the current models for ethicist-scientist interaction by better understanding the working environment and culture of the laboratory.

Chapter 2

EMBEDDED ETHICISTS

BACKGROUND

One of the models used by ethicists to interact with researchers in an embedded fashion is laboratory engagement. Laboratory engagements can be done in many ways, but the general concept is the same. The ethicists usually enter the laboratory to closely observe the scientists and engage in conversations. This participant-observer method can be done through the ethicist performing unstructured or semi-formal interviews, holding discussion sessions, or having other conversations with primary investigators, post-docs, graduate students and other lab members in their laboratory space. The amount of time ethicists spend in the laboratory can vary. Ethicists can hold bi-monthly meetings or spend several hours per week in the laboratory with the scientists while they are researching.

The laboratory space is selected as the interaction site because it is a place where most researchers carry out their daily professional lives. It can be appropriately inferred that researchers will feel more comfortable and open to discussion in the laboratory. There are also pockets of free time during the day when the researchers can not leave their work space. It is mutually convenient for both the researcher and ethicists to meet in the laboratory during this time rather than coordinating a meeting time outside of the lab. By being located in the scientists' lair, the ethicists can also learn more about not only the projects, experimental methods, and scientific knowledge but also the culture of institutional laboratories.

The goal of laboratory engagement projects is to expand the level of reflection scientists have on their research projects in hopes of avoiding ethical and

social dilemmas potentially raised by research and development of technologies. Laboratory engagements are cognitive focused and aims to have an impact on the way scientists think about their research projects and their potential ethical, legal and social implications. They shed light on the types of ethical and social questions the scientists ought to ask and conversations that must be held among the scientists and also between scientists and ethicists. The ethicists play the role of being an 'architect' directing and steering the dialogue to be constructive, mutually respectful and efficient for identifying and understanding moral issues.

Two examples of embedded ethicist activities from the literature are discussed in this section. The first is Joan McGregor and Jameson M. Wetmore's lab engagement study at an engineering lab here at Arizona State University. The second project is Erik Fisher's midstream modulation study at University of Colorado, Boulder. Lab engagements have the potential to impact the way scientists think about ethical issues through creating an environment that is conducive to holding conversations that explore the relationships between science and society and the moral dilemmas that can be produced from scientific endeavors. This can lead to a deeper reflection on ethics or making more ethical decisions during the course of conducting experiments. However, it is not yet certain whether this method can change the trajectory of research projects, or have an impact on the reward structures of scientific research.

LABORATORY ENGAGEMENT

McGregor and Wetmore conducted a laboratory engagement study at an interdisciplinary bio-optics laboratory at Arizona State University. This model of engagement has the potential to create and utilize the moral space within the lab to

foster a safe environment in which researchers can discuss ethical questions, but it may not provide enough incentive to bring changes to lab practice, trajectory of research and development, and reward structures of scientific research.

The authors crafted a moral space by holding group conversations with their participants. Through collaborations with the principal investigator of a bio-optics lab, they were able to create an atmosphere in which undergraduate students, graduate students, post-docs, and the PI could hold discussions on the mutual impact that science and society have on each other. These conversations were held during their lab meetings, which are approximately an hour long (McGregor & Wetmore, 2009, 21). Targeting lab meetings allowed the ethicists to meet with the participants in a fairly routine manner. This method also ensured that the ethicists were able to interact with most, if not all, of the laboratory members. By obtaining the principal investigator's consent and support, they created an atmosphere conducive to promoting an ongoing interdisciplinary collaboration between two very different fields to foster a trusting relationship.

McGregor and Wetmore's engagement activity featured group discussion of macro-level ethical concepts such as society's impact on science. The group discussed a different focus question for each hour-long session. The questions included: "Why did you become a scientist?", "How does science affect society?", "How does society affect science?" and "How can scientists more effectively communicate with the public?" (McGregor & Wetmore, 2009, 21). These questions were engineered to establish a foundation for a fruitful discussion on the relationship between science and society. The questions were very open-ended, which created opportunities for a wide variety of ideas and thoughts.

The lab engagement may not create enough incentives to change daily laboratory practices. Since the questions were not directed toward the participants' individual research, micro-level ethical questions were not addressed during these discussions. It is difficult to imagine that a discussion solely based on the four 'big picture' questions resulted in a change in laboratory practice or the trajectory of the research project. Starting an hour long conversation about science and society five times during the course of five months may not be an adequate amount of time for the researchers to develop reflexivity as a habit. Scientists are not only confined by their relative lack of philosophical reflexivity on their research project, but also by the concrete, practical limitations that comes with their work environment. There are many factors such as time, funding, goals of funding agencies, expectations from institutions and pressure to publish that may serve as a break between the researchers' reflection on moral dilemmas of their research and translating these reflections in to actions that would prevent or veer away from potential moral dilemmas.

McGregor and Wetmore claim that, at the end of the lab-engagement-related activities, students were better able to answer questions relevant to science's impact on society and society's impact on science. They also state that the ethicists themselves gained a better understanding of the technology under development in that lab and realistic social implications of that technology. However, the authors did not provide evidence or examples of these significant changes. Since the criteria of sophistication, the initial level of discussion, what the authors consider to be an adequate level of sophistication for the discussion was not presented it is difficult to determine whether the model achieved the desired outcomes.

The authors assert their belief that the researchers' recognition of ethical and social implications of their work "…will help ensure that we build a better future" (McGregor & Wetmore, 2009, 29) and yet it is not clear what a 'better future' might contain. These types of conversations with scientists, when done frequently under the guidance of an adept moral architect, may bring more reflexive insight into the laboratory life and reveal niches within the lab where such conversations about social implication of research can take place. Broad, macro-level reflection on science and society has potential to lead to discussions on the types of acceptable goals and justifications for research, which in turn can impact the reward structure of science. However, these outcomes were not observed in the McGregor and Wetmore study.

MIDSTREAM MODULATION

Midstream modulation is another type of lab engagement carried out by Erik Fisher at the Mechanical Engineering Department's Thermal and Nanotechnology Laboratory (TNL) at the University of Colorado, Boulder (Fisher, 2007, 157). This model of engagement has the potential to change laboratory practice but it is not geared to create spaces to have ethics discussions, change the trajectory of the research project or the reward structures of researchers.

Midstream modulation is a model for engagement in which ethicists enter the laboratory to interact with the researchers during the research and development phase of the project. Fisher views this period as a crucial opportunity for determining the implementation of research and development agendas. Ethical and social implications of research have been conventionally addressed either during the 'upstream' or 'downstream' stages. The former can be characterized as research policy and authorization of research and the latter as adaptation and regulation of

research. While both stages are important and necessary to address, the 'midstream' stage should also hold importance because upstream is too early to discuss concrete societal implications while downstream may be too late to have such discussions. Midstream modulation, by contrast, can tackle the process of research and development that has progressed enough to be less ambiguous than upstream, but less concrete than downstream. It also offers an opportunity to work "in accordance both with existing constraints and dynamics but also with broader societal goals, considerations or influences" (Fisher, 2006, 492).

Fisher deems the approach of modulating the process and progress of research to be beneficial in many ways. Raising questions about interactions, decision making processes, and internal and external outputs of a research lab to the key players within the laboratory should enhance their reflexivity. This ability in turn will enable them to astutely asses their role as scientists in society. Fisher states that this modulation will empower the researchers' with a "logical precondition to do things differently" (Fisher, 2006, 492).

Fisher's model is not geared to create spaces to have ethics discussions but rather to make the decision making process more transparent to the researchers. Fisher spent 2.5-5 hours a week for 12 weeks in the laboratory interacting with 3 engineering graduate students one-on-one. In an attempt to map the continual decision making processes during research and development, the author used a protocol to analyze the students' decision making, which structured and broke down the decision process into four different categories--opportunity, considerations, alternatives and outcome (Fisher, 2007, 158). The protocol defined opportunity as the occasion that characterizes the decision to be made, consideration as the internal

and external constraints, alternatives as the other available options for decisions and outcome as the decision that was made. These four components of the decision making process were also discussed with the participants in order to make the thought process more visible to the participants. The author did not explicitly mention ethical issues but rather let the participant discover these issues and let them manifest in a way that was parallel to the participant's personal concerns.

This modulation has the potential to have an influence on everyday laboratory practices. For example, Fisher's ethicist-scientist interaction led to a student's decision to use a more environmentally friendly catalyst. This case study briefly shows a detailed narrative of a participant's thought process that arrives at the environmental and health risks of using Ferrocene through engaging with the author and reflecting on the 'alternatives' prompt. The participant, 'K', was in the process of designing experiments to grow tubes within a nanotube and needed to decide between using Ferrofluid and Ferrocene as the catalytic ingredient. Instead of using Ferrocene which is established as standard protocol, the participant chose Ferrofluid which is less messy with decreased potential for epistemic and environmental problems. However, the participant did not opt for Ferrofluid until the trial run with Ferrocene failed (Fisher, 2007, 160).

Fisher provides evidentiary support of an ethicist-scientist interaction having an impact on the decision making process and the outcome during the course of a scientist's research. He also demonstrates the researcher's ability to shape the trajectory of the research through the decision model. The many reflections and weighing of constraints and opportunities of 'K' and his ultimate choice to use a more environmentally friendly chemical is an important evidence of the value of

ethicist-scientist interaction, especially since there are not a lot of empirical studies of this type of interdisciplinary interaction. This engagement practice demonstrated an increase in reflexive technical and social awareness of the participant. However, much of this success is derived from the student's pre-existing interest in social considerations and his wish to try a different catalyst once the first choice had failed. Fisher was able to show that, due to the ethicist's inquisitive role in the laboratory, the participant changed his behavior during the decision-making process. This is important since researchers are not always aware that they make decisions with these kinds of downstream implications, and this enabled his subjects to reflect more on the decisions that they were making.

K's scope of considerations was broadened in terms of material use and direction of the research project, but considerations did not involve typical ethical issues, such as the justification of the need for the research, resource allocation, possible epistemic problems, and potential use of research products, various societal consequences of producing such a technology or nano-product, and so on. The different prompts that required the student to think about the different stages of his decision making process mainly involved the technical aspects of the research rather than the ethical aspects. Fisher's project had a very specific focus on intervening and engaging an individual researcher during his decision making processes. It has a technical focus by emphasizing micro-level decisions made such as which catalyst to use and which research agenda to pursue. Because this method was narrowly focused on the specific decision- making process during the course of research, it did not create an ample space to discuss the macro-level social implications of research and the role of science on society.

The scientists' role is crucial in influencing the reward structure of research. The ability to think broadly and prospectively is necessary not only to successfully carry out research projects, but also to anticipate the influence these research projects will have in society. In order to accomplish this, researchers must ask macro-level questions that encompass an extensive array of potential problems that may come in tow with the use of certain products or technologies. Since the reward structure involves many different factors and researchers have to work within this environment, the goals of not only the researchers themselves but of funding groups and institutions ought to be addressed.

Fisher's piece did not explicitly discuss the social context of research. However, it illustrates the different type of influences through the narratives. Time and convenience are the influencing factors for the participant. For example, the participant was reluctant to use Ferrofluid, which was deemed to have less environmental impact than Ferrocene, because he would have to travel to a different facility or depend on another researcher to bring it to the lab. The PI and publications also influence the participant's decision making capacity. The participant received different advice from various faculty members on which of the three projects to focus on, which was further affected by the discovery of other research groups who have conducted and published on similar projects (Fisher 2007). This project shows the complexity of the decision making process for researchers and the limiting components of their environment. While midstream modulation can have an effect on daily lab practices, the exclusive focus on lab practices may not give enough room to broadly affect the reward structures of researchers.

CONCLUSION

The two examples of embedded ethicists provide valuable interaction between ethicists and scientists. It has a cognitive focus that aims to have a significant impact on changing the way scientists assume their role in regards to science and society and justifying the decisions that they make during the course of research. This collaboration can be the foundation for a more interdisciplinary approach to research. While McGregor and Wetmore aimed for macro discussions on an occasional basis, Fisher aimed for both macro and micro level discussions on an ongoing embedded basis. McGregor and Wetmore's study showed the potential of utilizing the moral space in the laboratory to create a friendlier atmosphere for scholars of various disciplines to gather and discuss the ethical, social and legal implications of research. They addressed the macro-level topics regarding science and society and encouraged the lab members to develop a deeper level of reflection on these topics. Fisher's study on the other hand, was focused more on the micro-level technical issues that are addressed during designing and performing experiments. Through his midstream modulation Fisher was able to show how the ethicist-scientist interaction facilitated the participant's more ethical decision on opting to use a more environmentally friendly catalyst.

Scholars claim that engagement can produce scientifically well-informed ethicists and reflexive scientists. An organized ethicist-scientist interaction may be sufficient to spark some level of reflection but it may also end there without fruitful understanding of a new technology's potential social impact or the importance of discussing ethical issues. While these interactions are an integral part of creating a

more ethical practice of science, it may not be enough to change the trajectory of research or change the reward structures of institutional research.

Chapter 3

RESEARCH ETHICS CONSULTATION SERVICES

BACKGROUND

As another approach of increasing dialogue between ethicists and scientists, various forms of Research Ethics Consultation Service (RECS) were adopted by schools as a result of grant agencies taking measures to avoid bioethical discussion that only comes after the development of a new scientific technology. The awareness of the importance of addressing ethical conflicts and societal impacts can be seen in the 'broader impacts' criterion for NSF grants and National Research Service Award (NRSA) training grant requirements for graduate students to take ethics classes. In 2002 the National Institutes of Health (NIH) gave funding for human subject research enhancement programs that aimed to "strengthen the oversight of human subject research" (National Institutes of Health, 2002). The NIH's Clinical and Translational Science Awards (CTSA) added research ethics component as a requirement, which lead to various schools involved in clinical research to adopt a form of RECS. Unlike lab engagements that are structured to meet a few hours a week or once every few weeks in the laboratory, RECS are services researchers can voluntarily contact when in need of ethics consultation.

Some ethicists argue that ethics consultation services may be used to deconstruct the myth that ethics will impede the development of research and detach the assumed link between research ethics and research compliance. Without a deep ethical analysis of current policies and regulation, erroneous assumptions and conclusions may be made about inherent ethical questions. Ethics consultation service is an improved way to tackle classic issues such as informed consent, risk-

benefit analysis, and conflicts of interest. Ethicists' input is invaluable because they are specifically trained to critically evaluate problems from a different approach than of researchers. These programs can not only lead to more policy compliance from the researchers but also to stimulate ethical discussion and analysis of why they ought to comply with the regulations. (de Melo-Martin et. al. 2007, 901).

Johns Hopkins, Stanford and Cornell are a few of the many schools that have developed RECS. Each school adopted slightly different versions of RECS with multifaceted, nuanced goals. The scope of consultations, qualifications and backgrounds of the consultants, eligibility requirements for accessing RECS, consultation process, confidentiality and ways of addressing conflicts of interests are similar, with subtle differences, for each institution. They also target different types of research with varying research subjects. While Johns Hopkins and Cornell direct their services exclusively to clinical researchers involved in human subject research, Stanford is opening their service up to both clinical and non-clinical researchers. Most importantly, these programs, unlike the lab engagements, acknowledge the social context of researchers and are designed to accommodate their laboratory lives. While lab engagements set aside a wide range of time to directly interact with researchers in their spaces, researchers contact RECS with questions about specific, current projects and use the services at their discretion. Unlike the lab engagements' cognitive focused approach, consultation services are geared to be more issue focused. They serve to provide ethically well informed advice for very specific problems or cases, which researchers present to the consultants. The underlying goals of these services are to foster a relationship between ethicists and scientists, to minimize potential harms of new technology by addressing immediate ethical

concerns in ongoing research while putting forth an endeavor for a scholarship in ethics.

This model of interaction changes how the researchers handle specific ethical problems in the context of laboratory practice, mainly for clinical research. However, there is nothing prompting the researchers to create a moral space in the laboratory and change their relationship to ethical issues, to change the trajectory of research and development, or to restructure the reward system of science.

JOHNS HOPKINS

RECS at Johns Hopkins Bloomberg School of Public Health (JHSPH) was established in 2005 as a tool to increase protection and to promote the patient participants' rights after receiving funding from the NIH in 2002 for programs that enhance the protection of human subjects involved in clinical research.

The ethics consultation service model incorporated at JHSPH provided real time guidance on ethical issues to researchers who needed expert advice. The authors reported on over 76 consultants during the course of 34 months (Taylor & Kass, 2009, 11). The service made it clear that it does not offer guidance on regulatory questions and it especially discourages investigative teams from seeking advice for editing the protocol or consent forms prior to IRB submissions.

This program holds consultations with the scientists and gives ethics guidance through the consultants, which are two members of the JHSPH's IRB. Members of the IRB are familiar with both ethics and science policies relevant to research and have the expertise to assist investigators with ethical issues. Consultees are researchers who have a School of Public Health e-mail address. This is a web-based service which the researchers can voluntarily contact during any time of their

research. These researchers could reach RECS through the internet and a consultation request confirmation email is sent within 24 hours. They are required to give name and contact information and some basic details about their research. Appointments and interviews can be conducted through email, telephone or in person. Once the consultation is over the summary of the meeting and additional suggestions for resolving the ethical dilemma is entered into that consultation's specific web based interface (Taylor & Kass, 2009, 12).

This consultation service addresses a wide scope of ethical dilemmas during all aspects of the research process. According to their data, 81% of consultation services involved research ethics questions while the rest involved regulatory and compliance questions (Taylor & Kass, 2009, 12). The regulatory questions were answered quickly with the suggestion that the requester should contact the IRB. The most common topics for ethics-related consults are experimental population, consent process, risk-benefit assessment and study designs. The service is most frequently contacted during the development of study and data collection (Taylor & Kass, 2009, 13).

Despite RECS' efforts to offer real time advice to researchers, one factor may deter the researchers from utilizing this program. The service is set up so that the summary notes of consultation are sent directly to the IRB office in order for the IRB to be aware of the RECS faculty involvement with the research protocol. The details of the consult can be shared with consultants' colleagues as long as no identifiable details are discussed about the case and IRB for active studies. This is to allow for the consultants to be able to discuss the general aspects of the cases with their colleagues. Also, upon discovering any misdemeanor or violations the RECS

consultants must notify the authorities. These consultations are otherwise confidential and RECS is an entity completely independent of the IRB (Taylor & Kass, 2009, 10).

RECS at JHSPH successfully provided real time advice to a broad range of ethical questions that came up during various research stages. This study is significant mainly because RECS is a relatively young program with very little empirical data. It provides statistical data on who is most likely to seek help for which kinds of ethical topics, which can provide insight for other RECS on what type of questions to expect from consultees. This information can be the foundation for designing an effective consultation service catered to give proficient recommendations and guidance to scientists who are seeking solutions to ethical problems.

STANFORD

Stanford's program grew out of a pilot study funded by NIH and US DOE as a part of a Center for Excellence in Ethical, Legal and Social Implications Research (CEER) in early 2000s. It expanded through being a part of the planning grant for CTSA in 2005. Cho et al were interested in fusing the theories behind individual consultation and group consultation that can address broad issues while involving investigators who are actively involved in projects. The ethics consultation model they implemented at Stanford carried the goal of "maximizing the benefits and minimizing potential harms of research to society" (Cho et. al., 2008, 6). This will be achieved by "considering the risks and benefits of research to researchers, research subjects, institutions and the general public" The short term goal was to offer advice to researchers so that they can "identify and incorporate ethical and

societal considerations into their research" (Cho et. al., 2008, 6). This example shows the early stages of forming an ethics consultation group and the unresolved factors such as scope, core competency, role and purpose of the group.

Stanford's version of the consultation service coined Benchside Ethics Consultation Service (BECS) is similar to that of JHSPS. It provides real-time guidance on ethical issues to researchers to address the goal of minimizing potential harms. This service is available for not only clinical researchers, but also researchers from basic science laboratories. 20 consults were successfully executed with BECS from the program establishment in 2005 to now.

BECS supplies well informed ethical advice to the consultees through highly skilled members of the consultation service. The service has two groups of consultants with the expertise to address ethical issues. The core group of BECS includes three academics trained in philosophy, law, biology with knowledge of research ethics. There also is a broad group that is involved on an as needed basis, and it includes experts in neuroscience, genetics, epidemiology, clinical and research ethics. For the consultants, the authors suggest appointing those with ethical assessment skills, background knowledge about biological systems, methods and terminology. They do not require ethicists to be formally trained in science because specialized knowledge in one area of science is not necessary for the more relevant skill that requires one to understand and apply basic scientific principles to new and emerging research and development. The authors also state that familiarity with the daily life of the laboratory is necessary (Cho et. al., 2008, 10).

The BECS offers immediate guidance on normative concerns to not only Stanford investigators and IRB members, but also to researchers from other

universities, grant agencies such as the NIH, and various research companies. The process of consultation starts with the request for advice by a research team or team member. The case is triaged and determined whether the issue can be resolved with a single consultant or need multiple consultants with not only the core group but both the core and broad group's collaboration. If meetings are necessary, they are held with the researcher as soon as possible and a written report is composed within 48 hours of the meeting (Cho et. al., 2008, 8). All consultations remain confidential except in the case of discovering illegal or unethical conduct.

The consultation service offers a wide range of ethics and social impact related assistance due to the undetermined scope of BECS' expertise. Unresolved boundaries bring the potential to address a variety of micro and macro issues and invite a bigger group of scientists to utilize the consultation service. However, the authors make it clear that this service does not address misconduct or responsible conduct issues, such as authorship or intellectual property. In addition to this limit, "researchers are also informed that there are limits to the confidentiality if, for instance, illegal or clearly unethical behavior by researchers were observed by consultants. In these cases, we would point out the behavior and also would be obligated to report it to the appropriate authorities" (Cho et. al., 2008, 8).

The topics of discussion during the consults are limited to the specific problem or ethical issue that has been identified by the researcher. Because of this prerequisite, the extent of the consultation is unlikely to include the broad macro-level discussions. While addressing very specific ethical issues identified the researchers during the course of research can reduce a greater dilemma in the future,

it does not create room for deep reflection on the possible ethical consequences the research project and developed technology can bring to society.

CORNELL

The model of ethics consultation program at the Weill Medical College of Cornell University was formed by the University Research Ethics Advisory Committee (UREAC). It was implemented for a year with the goal to "develop innovative strategies to foster human subjects' safety, maintain investigators' integrity and protect the reputation of the university" (de Melo-Martin et al. 2007, 902) and to "create an ongoing and dynamic collaboration between researchers and bioethicists and to encourage active scholarship in research ethics and the ethical aspects of scientific investigation" (de Melo-Martin et al. 2007, 902). UREAC was created to make sure clinical research at Cornell met high ethical standards after highly publicized scandals in clinical research conducted at multiple high profile research institutions. Similar to JHSPH, the consultation committee at this institution is focused on offering services to investigators involved with human subject research.

This consultation service offered a very limited assistance for real-time ethical issues to researchers. It allows scientists to voluntarily seek advice when they encounter an ethical dilemma so that it could be remedied in a prophylactic manner but it is only available to them prior to IRB protocol submission. This excludes all potential ethical problems and opportunity to discuss and reflect on equally, if not more compelling moral concerns that arise while the scientists are gathering data and interacting with the research subjects.

Cornell's UREAC offers limited assistance by having its services exclusive to the formal process in another voluntary service for researchers. Eight months after

launching the consultation program, UREAC in this institution became a part of Institute for Clinical Research (ICR), which is a service that researchers can opt to utilize as an aide with the contract process, protocol writing, budgeting etc. for clinical trials. Researchers must use ICR, which does not offer aide for moral problems, to have access to the Cornell UREAC. Researchers send complete protocols, consent forms to ICR and ICR members send them to UREAC ethicist before setting a meeting (de Melo-Martin et al. 2007, 903). Going through the ICR reinforces limiting the availability of UREAC to prior to initiating the actual research project.

During the UREAC meeting post ICR process, ethical concerns are discussed. The scope of Cornell's UREAC includes any ethical concerns and compliance issues relevant to writing protocols and consent forms, which is very limiting since research ethics can cover a vast range of topics that serves as a foundation to engaging in a more profound and sophisticated discussion of the ethical and social implications of science on society.

CONCLUSION

The idea of 'dial an ethicist in case of an ethical emergency' is a good one in the sense that the researchers will have those equipped with the appropriate tools to think through moral problems to offer guidance in what for the researcher may be an uncharted territory. This program is vastly different from the lab engagements because those who designed the service to fit into the researchers' environment fully understand the constraints of that environment. They realized that researchers would seek their advice on an as needed basis, and used this to pave the way for researchers to interact more with ethicists.

Despite the consideration of the scientists' social context and availability of the service to the researchers' convenience, the consultation services have a very limited impact on the level of ethical reflection scientists can have through this engagement. The researchers' ability to identify the most ethically compelling problems is questionable due to their lack of training in ethics and their thinking environment which is vastly different from that of a non-scientist. The close relationship between normative problems and policy compliance issues seen in research projects also complicates scientists' distinction between the two different topics.

The constraints of laboratory life do not hinder the researchers from using the services but the services likewise do not change the environment in which the researchers work under, nor does it change their relationship to ethical issues. RECS was designed to be used at the researchers' convenience and outsource the problem to the ethical experts. The presented problems may also be time sensitive in nature, which limits the consultation to address the specific problem without further contemplation of and discussions of ethical issues. This model of ethicist-scientist interaction does not initiate significant change in the scientist' reflexivity on ethical issues nor does it motivate them to create room to explore ethical issues on various levels. The focus on micro-level of ethical issues does not give room for considering the macro-level questions to ask about the goals of the research project, its potential impact on society, prioritization of resource allocation for different projects and other upstream ethical questions. Without addressing the upstream ethical questions, changing the reward structure of researchers is unlikely.

The interactions with the RECS consultants may not foster reflexivity or the ability to analyze and critically assess moral concerns because each time the investigators and consultants interact, they are discussing a very specific issue pertaining to a particular situation. This is not sufficient to minimize ethical dilemmas and adverse social implications from developed technologies. However, the use of these services may serve as a foundation which the scientists can use to approach other questions and problems in the future.

Chapter 4

ETHNOGRAPHIC STUDY

The focus of embedded ethicists and research ethics consultation services have been to intervene during the gradual process of research in order to have an impact on the researchers, targeting both level of reflection on ethics and solving ethical issues. Both methods of interaction strive to limit potential negative consequences that can arise from developing technologies or research projects by intervening during various stages of research. By anticipating social implications of research via difficult conversations about relevant normative values of society, these ethicists are aiming to be at the very least, a catalyst that initiates ethical reflection in laboratories.

When ethicists enter a laboratory to hold these discussions, they are launching themselves into a culture with unfamiliar terrain and different social norms. The lab researchers are generating both funding to support their research and publications that will retrieve funding by conducting numerous research projects and generating papers. This cycle of life in the laboratories must be understood so neutral and mutual ground needs to be found for ethicists can find times where they can effectively engage scientists in conversation and use knowledge of scientists' daily obligations to realistically ground ethical conversations. In order to have fruitful interactions, the ethicist ought to be familiar with laboratory life and the various political and social norms of science. Understanding the environment in which the scientists exist and determining whether this environment is conducive to holding ethics discussions is crucial to the efficacy of various types of ethicist-scientist interactions. This insight leads to the question, what are the inputs, outputs and

constraints that influence the level of ethics discussion in the laboratory space of the researchers and how can this information is used to make ethicist-scientist interactions more robust?

In order to delve deeper and identify various factors that influence the level of ethics discussion in the laboratory space of the researchers, and to use this information to make current ethicist-scientist interactions more robust, I opted to conduct an ethnographic study. Rather than reading about laboratory life or hearing about it through a third party, I decided to experience it and interact with scientists as both participant and observer in a laboratory. Spending time in scientists' work space allows more opportunities to learn about not only the science and research projects but also the dynamics and relationships between the lab members, complexity of developing research proposals, mundane research practices and administrative work that is not often portrayed to the public when depicting scientific research.

In this chapter, I describe the ethnographic study design, daily life in this particular laboratory, structural inhibitions to discussing ethics, opportunities to discuss ethics and the scientists' perspectives that limit their engagement with ethics. The researchers' greatest limiting factor in ethical reflection is time constraint due to their responsibilities. However, I observed sporadic discussions on social implications of their research and other ethics-related conversations during the discussions on writing grant proposals, lunch breaks, reflections on their ethics course requirements and activities required to comply with institutional policies. The participants held two views on science that lessened their ability to reflect on ethics:

the views that the act of seeking new knowledge can be neutral and that the majority of scientists start their research with the best intentions.

Study Design

The information gathered from the ethnographic study was collected during the fall semester of 2010 and spring semester of 2011. As a participant and observer, I spent approximately six hours a week for 24 weeks at a neuroscience laboratory at Arizona State University. After the first 11 weeks I interviewed participants individually in a semi-formal fashion and all participants were asked identical questions. Originally six people worked in this lab- the Principal Investigator (PI), four doctoral students and a post-baccalaureate physics student who specialized in data analysis. However the semester before I started the study one of the doctoral students switched projects and left the lab and another doctoral student departed for a personal leave of absence a few weeks before I started my study. All of the remaining personnel in the lab agreed to participate in my ethnographic study. The participants include the PI, two doctoral students and one post baccalaureate data computer specialist. To preserve confidentiality, the two doctoral students will be called 'B' and 'G', the post-baccalaureate student 'X'. The students were in their last year of their degree programs and PI took a new position and moved this lab to another institution mid year.

This particular lab was chosen for this project for many reasons. First of all, I already had established a solid relationship with these individuals. I took a neurobiology class from the PI of this lab. The following semester I started shadowing two different doctorate students and learned a broad spectrum of

laboratory techniques relevant to not only neuroscience but for molecular-cellular research. I participated in this pseudo internship for an academic year. The rapport and friendship I maintained with the students were advantageous since the bulk of the work as an ethnographer is to build trust and maintain a relationship with her participants. Had I not had the PI's trust, or any interest and knowledge in neuroscience research, I would not have been able to sit in his lab as a bioethics student. Being familiar with the PI and doctoral students facilitated conversations during the study as well as the interviews. On the other hand, the familiarity with my research participants undermined the objectivity of my presence in the lab. The students occasionally articulated potential ethical problems that may arise with the commercialization of their neurotechnology and included certain phrases during casual conversations, such as "… but of course, it is not *ethical* to let the mice feel too much pain" or "… and of course, we also have to think about *ethics*". It is reasonable to speculate that the participants started injecting some of the more ethics-related comments into their dialogue because they knew that I would be interested in such discussions but also, because they knew the topic of my project and wanted to humor their participant-observer and friend in a non-condescending manner. However, I am strongly convinced that because this familiarity allowed a less guarded demeanor from the participants, which permitted them to start conversations and answer interview questions with openness and frankness.

Second, this lab was ideal for my study because it was at the initial stages in developing a technology that could stimulate the brain in multiple ways. On a fundamental level, the researchers were trying to understand the functions of the nervous system by learning how to control the activity of neurons. On molecular,

cellular, genetic, and behavioral levels, the researchers studied how neuronal networks change in an experience dependent manner and how these changes produce behavioral adaptations to increase survival. Another layer of their research was "mind-control"- controlling behavioral responses and neural circuits by eliciting changes in neuronal activity through noninvasive brain stimulation. The numerous research foci and multifaceted projects provided segues to ethics related discussions that concentrated on both micro and macro level of ethics and social implications of research.

As a method of controlling neural circuits, this laboratory studied ultrasound stimulation of the brain. Ultrasound is a sound wave that can be transmitted through long distances while using little energy. It has a long history of use in medicine for both diagnostic imaging and therapeutic purposes (Tranquart et. al., 1999, 889). It is used as a diagnostic tool for imaging the abdominal and pelvic area for any abnormalities. It can also be used to image the extremities for emboli, the chest area for emboli and abnormal masses. Obstetric sonography is used to visualize the fetus during the course of pregnancy for routine and diagnostic uses. It can also be utilized to guide needles or other medical equipment through tissue during medical procedures. Ultrasound also has therapeutic uses such as breaking down calculi in the gallbladder and kidneys, penetrating the blood brain barrier to deliver drugs to the brain, ablating tumor cells and minimizing muscular pain. One of ultrasound's greatest assets is that it is a noninvasive diagnostic and therapeutic tool. The current methods of neurostimulation and modulation for various neurological and psychiatric disorders, such as deep brain stimulation (DBS), can be very invasive. DBS requires surgery to implant electrodes and an external transmitter that adjusts

the amplitude and frequency of the current (Coffey, 2009, 211). The few noninvasive methods of treating brain disorders such as transcranial magnetic stimulation for depression and schizophrenia (Hallet, 2007, 196), electro convulsive therapy and vagal nerve stimulation for depression (George et. al., 2007, 252) can have low spatial resolution and the negative side affects of harming the healthy tissue around the targeted treatment area. This opens the window of more complications and widens the exclusion criteria for patients who are seeking these treatment options. This laboratory was in the process of studying the methods of a noninvasive transcranial Doppler. It showed great potential for influencing brain activity because it could stimulate the sodium and calcium channels in neurons that are responsible for neuronal excitation and the subsequent synaptic transmission.

The students were in the process of discovering the functional mechanics of this technology and its potential uses for brain stimulation. These experiments were still in the early stages and done on the level of rodents and many years away from translational application to human subjects. This developing technology has potential uses in not only medicine but also military related projects and the entertainment industry. Despite the fact that it would be years before this technology is in wide use in public, the students in this lab have shown openness in discussing the potential social implications of their research, because of the wide range of potential practical applications of this technology and its implications on society.

Daily Life in the Lab

The laboratory is located on the third floor of one of many science buildings of this institution. It is a quiet, dim, windowless floor with the occasional echoes of

elevator bells and footsteps in the hallway. Upon entering the correct key code and stepping in to the laboratory, one can smell the faint scent of ethanol and food pellets for the lab mice. The first thing that comes into sight under the fluorescent light is a large lab bench to the right and a smaller lab bench with a sink to the left. There are giant tanks of carbon dioxide for euthanizing the mice leaning on the larger lab bench and an array of clean surgical tools next to the sink. Both lab benches have an organized mess of pipettes, scales and lab notebooks. There are also various chemicals in white bottles with red caps slapped with biohazard signs, syringes, paper towels and other apparatuses. After taking a few steps into the lab the PI's office comes into view on the left side of the laboratory, behind the lab benches. In front of the PI's office is a separate area from the lab benches that serves as a 'living room' and a quasi- kitchen. It is furnished with a large table, a couch, microwave and a cabinet with chipped mugs and an entire box of Monster energy drinks. Behind the table is a desk lined up against the wall with four computers and haphazard piles of textbooks and articles. The white washed walls hold colorful posters of neurons, cellular pathways and article clippings of the PI. There is a whiteboard leaning against the wall with student contact information, a list of equipment that needs to be ordered and a long standing inside joke- the face of Albert Einstein with his tongue sticking out, licking a quantum dot. There are two rooms located in the right corner of the laboratory. One room holds a confocal microscope with a transducer hooked to a computer for data collection and analysis. The other room serves as a space for surgery and video recordings of the research. There is a refrigerator and a freezer on this side of the room strictly for housing chemicals, cell cultures and mice carcasses. Next to the refrigerators is a mannequin

wearing a society for neuroscience t-shirt, lab coat and a helmet prototype who we fondly named 'Guillermo'. The students of this lab also conduct experiments in a small cell culture room next door and in a 2 photon microscope room in the sub-basement of the same building.

I could always expect most of the participants to be in the lab around 1:00 in the afternoon. The fluorescent light seeping through the glass of the door was a good indicator that some of the students were in the lab. The students usually came into the lab any time between 8 am to noon and left between 7 pm and midnight. Everyone had very different class and teaching schedules. Some students stayed later than others, early morning students usually left early but everyone interacted with each other almost every day. I was typically greeted by music selected by Pandora and the typical "hey what's up" or "why weren't you in yesterday?" if my appearance was followed by a day of absence. Any time a student walks in the lab there is a small ripple of casual conversation and mild gossip before everyone goes back to their work.

The lab is usually fairly quiet with music playing in the background and occasional expletives as a result of blurry cell images, mistakes during cannulation, mouse bites and other experimental mishaps. Around 1:00 or 2:00 in the afternoon the students would quickly finish up their tasks and take a short lunch break together. We usually stayed close to campus and went to places that fit graduate student budgets. The lab favorite was a little hole in the wall restaurant near campus that was known for their massive burgers and cheap draft beer. Every once in a while we brought our lunches back to the lab, especially on the days when the students were running a time-sensitive experiments.

The semesters during my participant-observer study in the laboratory, the students were almost finished with their research and data analyses and preparing for their dissertation defenses. However, I was able to observe a few experimental trials that involved studying the effects of ultrasound stimulation to intact brain circuits in mice. B first acquired the mice from animal housing facilities on campus. He jokingly warned that I should stop naming the mice since it is easier to develop emotional attachments to them. After injecting a mouse with ketamine, an anesthetic solution, he gently cut away and trimmed the soft hair between the mouse's ears. He then placed the mouse on the platform to stimulate its motor cortex with ultrasound. He placed a guard in its mouth and a type of head gear in both ears to stabilize its head. He then put gel on top of the shaved head and a little bit over the eyes. This was done in order to focus the sound waves and also to keep the mouse's eyes from drying out during the procedure. After the trial was over, B gently placed the mouse in a large chamber with a heating pad. Anesthesia prevents the mice from regulating their body temperature and he wanted the subject to be as comfortable as possible while the drug wore off.

I was also able to witness G sectioning brains for her study. The mouse was sacrificed in a spherical carbon dioxide chamber and decapitated promptly. The brain was quickly extracted and put in an aerated solution. Thin coronal sections were made by G on a vibratome, a laboratory instrument that allows the user to make thin slices of a tissue sample. These sections can range anywhere from 10-500 micrometers. The brain sections were very delicate and thin, floating in the solution like tentacle-less jellyfish. These sections were then mounted on slides and stained green and magenta. They were observed under the confocal microscope to examine

the density of cells, density of synaptic vesicles, spatial distribution of activity and other neuronal characteristics that points to neuronal activity post ultrasound stimulation.

A new student 'K', who works for a different neuroscience PI started occupying a small bench space in this laboratory in November. K had a tense relationship with her lab mates, which resulted in finding a different work area for her research. Personality conflicts are not uncommon in laboratories, especially when graduate students and post docs who are incompatible with each other share the same work space and time for their projects.

I spent most of my time either sitting on the table or the couch taking field notes on my laptop while the participants were also on their computers writing papers, studying for classes, analyzing data and taking care of personal matters. It is also around this table that the students had their lab meetings. Lab meetings became less frequent as the students were getting close to finishing their programs and as everyone's schedule became increasingly more difficult to coordinate. On Fridays we attended 'Brown Bag', which is a university funded, informal meeting for all School of Life Sciences graduate students. Each meeting was an hour long and provided a space for budding scientists to present their work and improve their public speaking and presentation organizing skills. If this was not incentive enough, students at the very least, showed up for the free pizza and the opportunity to socialize with their colleagues and make plans for the weekend.

During winter break I did not spend as much time in the lab with the participants. Most of the participants, including the PI went out of town or out of

the country to see their families. This break was also a convenient time for me to meet with each participant individually for their semi-formal interviews.

The following spring semester brought many changes to the laboratory. There was a slight commotion of excitement when we received the announcement email regarding B's PhD dissertation defense for April. B was also offered a post-doc position at a prestigious institute to start working in mid-April, so he started preparing for his defense and researched housing options for his move. There was also another crucial change which impacted everyone in the laboratory, especially the graduate students. The PI formally accepted a faculty position to an institution that had more access to research facilities for higher mammal and clinical studies. He relocated to the new institution in February and announced that he would be taking the laboratory equipment in late June or early July, which created the pressure for G to finish up her experiments and data analysis so that she could graduate in the summer. We always found her in the lab, even during weekends, with various assortments of coffee and tea drinks with an eclectic file of podcasts and foreign music playing incessantly. B was usually found in the PI's old office with both screens of the giant MAC computer turned on, an energy drink, and a bag of Cheetos. X was also found on one of the lab computers searching for a job as he was no longer employed at the laboratory as a data analyst. A new but familiar face, Z, started appearing at this lab more often. Z was another neuroscience doctoral student working under a different PI but needed some of our lab equipment for his research. He obtained the PI and G's permission to work with the microscope for a few hours each week. He was in one of my neuroscience classes during that spring semester so we would often study together and have casual conversations about our

class, classmates and the pros and cons of behavioral research. Our days fell back to a familiar pattern of working, taking a much needed breaks for lunch and coffee then working again.

The rest of this chapter focuses on three different topics- - time constraints, opportunities to discuss ethics and scientists' perspectives on ethics. During my time in this laboratory as a participant observer, I identified the main limiting reagent for extensive discussions on ethics and social implications as time constraint. Because of the pressure to publish and receive funding for their labs, scientists focus most of their energy and time on their research projects. I also discuss the occasions in which these discussions took place and opportunities to discuss ethics. It was during our short escapades to scrounge for food when most of the interesting ethics and social implication of science related conversations happened. Students and PIs are also forced to think about ethics when filling out IACUC protocols, submitting grant proposals and taking ethics courses. Finally, I examine my participants' perspectives on ethics. Their opinions had a broad range that spans from giving scientists the responsibility of reflecting on social implications of their research to casting that responsibility to ethicists and policy makers. They also held the contradicting views that science is both neutral and for the greater good.

I deemed these three categories as important because these are the topics that shed more light to scientists themselves and their environment. One can glean more information on scientists' goals, institutional goals, motivations, the daily problems they face that go unnoticed or cast as trivial by bioethicists. Being privy to these kinds of information allows ethicists and those sitting on ethics committees to better understand the status quo of ethics-related discussions, or lack thereof, in the

laboratory. It empowers them to be on the same dimension as the scientists and helps steer and construct ethics related conversations sans insensitive or ignorant comments. It also potential of engaging in conversations that is more relevant to scientists

Structural inhibitions to discussing ethics – Time constraints

Time constraints limit room for ethical discussions among scientists or between scientists and ethicists. Graduate students spent most of their time conducting experiments, data collection and interpretation, reading and preparing for talks (poster presentations, oral comps) and performing teaching assistant and research assistant duties. The PI spent most of his time applying for grants to fund his students, performing company related tasks and administrative work for the laboratory.

Graduate students are required to multitask and wear an assortment of hats as students, instructors and scientists. They have to meet course requirements, conduct their own experiments and, if on a teaching assistant stipend, teach a laboratory section for classes or assisting the lecture professor. The fall semester I started the ethnographic study was both G and B's last year as PhD students. At the end of October they were busily preparing for their oral comprehensive exams, or simply 'comps'. The participants spent most of their hours during the day poring over papers that were of any relevance to their field of study. One of B's committee members was quite notorious for "grilling people for hours" along with "picking apart your entire project within minutes" by asking difficult questions. B claimed that

even the PI will throw unexpected curveballs that were never discussed in prior meetings.

After successfully passing their comps, both B and G spent hours speaking with the PI about various post-doc options. While B opted to remain in the U.S., G fervently researched options for international programs in Asia and Europe.

During this time of the year the students were also preparing for the Society for Neuroscience (SfN) conference in San Diego. SfN is the largest neuroscience society in the world that invites scientists and physicians each year for informative and educational meetings. The conference is about 5 days long and takes place in major cities where about 30,000 neuroscientists gather to present, learn, network and "have fun". Going to SfN is almost a tradition and requirement for all neuroscience students and presenting at the conference is laudable and "a great thing to write on your CV". B stated that preparing for the SfN presentation was quite stressful, but he was confident with his project and the material he would be questioned on because he had given the same talk before.

I found the week after SfN to be very sobering. The conference was held in mid November of each year and after the conference students quickly realized that Thanksgiving week is coming up and the end of the semester is right around the corner. The students were tying loose ends to various papers, projects, data analysis before leaving town for winter break. B and X spent hours on evaluating data and making figures for a manuscript they were trying to publish. They stated that it can take anywhere from a few hours to an entire day to create journal-quality figures. B was also prepping for another presentation to give in Boston in early December. Those who were taking classes also started studying for finals and writing term

papers. As teaching assistants, participants had a huge influx of student emails and students coming to office hours. There were also end of semester lab reports and 10-page long lab finals that had to be graded before the start of lecture finals.

Unlike the graduate students, the PI was rarely seen in the laboratory. After the lab published several seminal papers on a novel method for brain stimulation earlier in the year, there were more days when the PI was traveling and giving talks in various major cities of the United States and European countries than when he was in his office. The days he did spend in the laboratory he would stay in his office for hours applying for grants and perfecting the text and figures for the next paper to publish. The PI also had other duties as a professor for the undergraduate neurobiology course. "For every 2 hours of lecture that you give you spend about 10 hours preparing the lecture, even if you've given it before because you have to look through it again and update the information". He also managed graduate students and trained them if they need to learn a new technique for their studies, looked over their students' projects, taught them to teach themselves, and completed the required administrative tasks. He is also highly engaged in entrepreneurial activities with his company that has the license to the patents he wrote during his time at this institution. His phone rarely stopped blinking with email notifications and alarms for numerous meetings. He usually communicated with his students via email since it was very difficult to for them to locate him in person.

Acquiring funding for the laboratory is absolutely essential for the participants to sustain their research projects. Applying for funding took up a great deal of time for the PI. The application process through the NIH proved to be an "obstacle". The PI submitted 7 grants for translational studies to take his technology

from benchside to bedside during the four years he was employed at this institution. All grants had been 'triaged' by the NIH, which essentially means that the project will not receive funding. The NIH only scores the top 50% of grants and the rest of the proposals are cast aside. Most grant proposals have a page requirement of 10-15 pages and require enough detailed information that can be used as a making of a paper. Writing out the grant proposal can take anywhere from a few days to few months, depending on the type of grant and the project.

It is not feasible to deliver an idea to a funding agency without having supporting evidence that the experiment is capable of producing significant data. The preliminary data from pilot studies and an outline of the future goals and experiments are sent to the grant agencies. This is imperative in the process of applying for grants because any person can construct an innovative or novel idea for a research project to propose to these agencies without showing remote feasibility of that experiment. Researchers need the means and experience of doing these experiments to look more attractive to the agencies. Professors on the tenure track have to produce data and write because writing means getting publications, which conveys to the agencies the ability to conduct experiments and produce data. Having a PhD is a pre-requisite to submitting a grant proposal. The application also needs to include a curriculum vitae, introduction, background information of the project, research and academic history of the PI, the PI's experience in that specific field, potential impact on the community, budget outline, materials, methods and backup plans in the event of the experiment failing or obtaining unexpected results. The grant proposal is submitted by the institution because the agencies need to know which institution they are funding. Because of this, the proposal is sent to the

university administrative office a week prior to the grant deadline so the admin personnel can add additional paperwork of their own to the application. The PIs can get help from post-doc and lab members in writing the proposal, or collaborate with other professionals.

Opportunities to discuss ethics

Reward structures offer maximum incentive for scientists to think about policy compliance and minimal incentive for deep, philosophical discussions. There is a positive feedback loop that encourages and pressures participants to publish for future funding and job security and to secure funding to finance projects in order to publish more articles on their research. Labs also have to meet the standards of institutional oversight organizations in order to avoid fines and suspensions. Because science policy and ethics are not two separate entities but interlaced with each other while being dovetailed to institutional bureaucracy, scientists at one point have to think about research ethics during the course of their career. The few moments in the laboratory that served as an opportunity for ethical reflection included stating the purpose of the project and justifying their research question with funding agencies and institutional oversight committees. Lunch breaks and occasions for casual conversations, ethics classes and after Institutional Animal Care and Use Committee's (IACUC) routine inspections also brought sporadic ethics-related conversations. Due to the nature of these fleeting discussions and the researchers' understanding of ethics, the level of ethical reflection was far from abstract and more pragmatic. Most ethically relevant considerations were contained and limited to a

casual, almost facetious conversations about social implications and policy compliance.

Funding agencies and groups encourage scientists to set goals that match their research objectives, which do not allow much room for ethical reflection. For example, the 'broader impact' section of an NSF grant proposal, or 'societal impact', its equivalent in the NIH proposal, does not encourage reflection on the potential negative consequences of a research project. As an unspoken rule, researchers have to include how they would engage in community outreach projects and educate young students with their research. X stated that researchers are forced to expand on educational and outreach programs because the broader/societal impact sections are built into the grant applications. He stated that this section forces applicants to justify their research not only in terms of answering a specific scientific question for science but also how this knowledge can be applied for the betterment of society. However, researchers typically do not write about the possible ways the public can abuse or misuse the technology and other potentially negative consequences because they are trying to sell their project to the funding agencies. The broad societal implications of the project is generally not discussed because most of these scenarios are far fetched, at least for the pulsed, low frequency ultrasound that is being tested by this lab. "The purpose of grant agencies funding a particular study is to see if the experiment works, how it can benefit society and science. Funding agencies are not there to think about what it means to have a certain type of new technology". The participants asserted that the funding agencies are there to look at the feasibility of research projects and to determine the best professionals who have the ability to do the research. X vehemently declared that the broader impacts section was not

helpful, that it was even deceitful because everyone is forced to "come up with something" and then some to add fluff to their application. This depends on the goal of each funding agencies but for the most part researchers are coerced to make a positive connection between their research and society, usually on a health benefit level. Some researchers note the potential risks of the outcome of their research projects, but this is mainly to show the agencies that they are thinking about all avenues their projects could lead to and potential solutions to these tentative problems. The stated potential problems are more science and project oriented, including but not limited to the researchers' backup plans in the case that they are not able to collect significant data, obtain unexpected data, or come across serendipitous incidental findings.

Spontaneous conversations about ethics were rare but the few that happened provided a glimpse into the minds of these scientists. The participants were required to take two ethics classes during the course of their doctorate program. There were mixed reviews on our institution's ethics courses and the topics discussed during these classes. G claimed that the classes are useful, but she already knew enough about plagiarism and academic dishonesty. At this point in her academic career these issues bordered on common sense and good judgment. The main topics covered in their ethics courses included conflicts of interests, research code of conduct, falsification and fabrication of data, plagiarism and authorship. Violations relevant to these topics have been heard of, but they do not occur frequently in my participants' daily lives or their fellow colleagues. These major transgressions that make national news and diffuse to the general public are rarities. These types of research malpractice are perhaps the Huntington's of genetics disease. Many students have

heard of this disease and it is used as an example in bioethics classes to discuss genetic disease and ethical issues that range from disclosing incidental findings of the Huntington's gene to the patient to personalized medicine. However it is one of the few rare diseases that involve a single gene mutation, which is not common among genetic based diseases. Therefore, it is a poor example for discussing the complex ethical issues that come with genetic based disease. This is because more often than not many different genes are involved in the phenotype of a disease, not to mention environmental influence and the person's natural susceptibilities. This analogy is applicable to the topics that are covered in research ethics courses. Examples using extreme cases of human subject abuse, academic dishonesty and financial conflicts of interests are useful in making a point in bureaucratic bioethics and ethics related topics picked out by bioethicists for a class curriculum. Discussions of these topics and case studies help students identify unethical mishaps and why these mishaps are unethical, but they don't cover the grounds that cultivate the environment that influence scientists to make the mistakes nor the complexities of meeting institutional goals and maintaining relationships with colleagues. Unfortunately some of these discussions in class were not very relatable to student scientists who are more concerned about the mundane ethical issues such as abiding to too many 'senseless' rules and policies, pressure to publish, pressure to bring in money to the lab and grad student-PI relationships.

Outside of the classroom and inside the lab, B claimed that the participants have conversations relevant to answering questions such as 'what does this project mean scientifically or to the individual?' 'How can someone manipulate this to better themselves or on a larger scale?' 'How is this experiment affecting the rodent model

and how do you minimize its pain?' 'Why isn't NIH or NSF funding certain research projects?' These questions address both small and large scale lab ethics ranging from animal care to translational use in humans. All of these steps are necessary and these types of questions are answered while filling out protocols in order to justify their project to institutional boards and funding agencies. However, in class he learned that scientists need to be able to convince others and justify their beliefs and values in order to not only carry out their research but also to create new policies and laws. "Every other sentence was the whole ELSI acronym… [Ethics] was talked about but it was a little more tailored to policy because we learned more about whole funding agencies but it definitely had ethics aspect to it as well because you can't really get away from it with policy". For the participants, these discussions were new, different and difficult. However because they were exposed to these conversations for the first time, the participants were more able to remember them and inquire about other issues during follow up conversations. My participants think and talk about ethics, but in a more policy and compliance oriented manner that is relevant to their profession. There is no carved out space for deep philosophical discussions to dissect the fundamental reasons behind currently enforced policies or the potential impacts their developing technology could have on multiple layers of society.

Talking about the new Leonardo DiCaprio movie Inception fueled a conversation about how different the world would be if the ultrasound could be used to influence people's dreaming patterns. This quickly veered into a conversation about mind control and the public's unnatural expectations and fears for this technology. The participants expressed their amusement on how people worried about the most far fetched ideas of reading minds or controlling other people's

behavior with brain technology and neural implants. They claimed that this is not even remotely feasible, especially with the research that they are personally involved in since the ultrasound technology is still in the very early stages of development. The students claimed that one could stimulate the brain to induce addictive behavior but that is about as far as it goes for the hyped up talks of mind-control. The PI expressed aversion to the fanatical ideas and concerns about creating cyborg soldiers or virtual realities. "That is so far out of this world and not possible. We wish we were that intelligent, and we're not! We're not even close to being that intelligent. We don't have a clue what the neural codes or time constants are to take control of someone's brain".

An event that sparked an interesting conversation was IACUC's routine inspection. The students busily wiped down the lab benches and threw the spare copies of articles and other printouts into the recycle bin. "I swear they always choose the worst time to show up." Muttered a student as the emergency lab cleanup ensued. They rearranged some of the mouse cages that were placed by the gas tanks and threw away the empty potato chip bags and unused napkins that were strewn across the table. IACUC had notified the PI via email a week before the inspection date and the responsibility to be present during this event fell onto the graduate students since the PI was going to be out of town. About 7 IACUC personnel came in the lab. There were 5 females and 2 males between the ages of early forties to late fifties. They took time to look around our benches, different rooms and the office. As soon as they entered the room the atmosphere changed. Our lighthearted chit chat stopped abruptly as we watched the people slowly walk around the room and scrutinize the table with our Starbucks coffee drinks that were dripping

condensation. They asked us about the research project and made other small talk. Each person had a clipboard in their hands and was occasionally taking notes. The participants watched the IACUC personnel nonchalantly with a hint of disdain. A tall lady with curled, silver hair and horn rimmed glasses told us that the empty mice cages needs to be returned back to the animal care facility and that they were long overdue. G stood up and agreed to take care of the empty cages while B acted as the mouthpiece for our group. They also asked other questions regarding the location of the Material Safety Data Sheets, our chemical cabinets, made a few comments about the labels of our different chemicals and lighting for the mice. The inspection felt like an invasion of privacy, almost like an encroachment into our territory. When the personnel left there was a collective look of relief on my participants' faces and we reached for our coffees. There were a few off handed comments about inspectors and everyone else went back to their spaces to resume an otherwise normal workday in the laboratory.

There are many rules to follow regarding the placement of these mice cages, the number of mice that are allowed in the laboratory, proper ways to handle the rodents etc. In order to be certified to handle laboratory animals, the students must read through training modules for each group of animal and pass the quiz administered at the end of the modules. There are also handbooks of animal use guidelines provided for researchers, although my participants claimed to have forgotten most of the material presented in the handbook. The conversations about care for animals did not extend to topics of whether it is ethical to use animals, the current justifications of animal use in research or the selection process of the type of animals to use for these studies. It revolved around the micro-level discussions on

the ethical treatment of animals inside the laboratory. The students claimed that they knew why the oversight committees must exist but they did not think the "nitpicky, petty rules" were necessary to make the research or the treatment of animals more ethical. During another conversation, the PI expressed frustration at the IACUC. It can take more than 6 months to get a protocol approved by the IRB in the case for traumatic brain injury studies. He stated that this is an impediment to furthering our knowledge and making new discoveries, and perhaps more credit should be given to researchers with 20 years of experience in the laboratory and trust them to know how to properly handle animal subjects, use appropriate techniques for necessary surgeries, inflict minimal pain and sacrifice them in a painless and humane way.

Considering options to make the most 'ethical' decision is built into the system of institutional research. Ethics and research policy is blended into a mélange that is nearly impossible to separate, consequently, researchers think about ethics. It is not the way philosophers discuss ethics but more tailored to their research project and institutional policies. It is inadvertently limited to what they are required to do through IACUC protocols, grant applications, class requirements and meeting the standards and being compliant to research policies.

Scientists' perspectives on ethics

Scientists' basic beliefs about the nature of science and the responsibilities of scientists in respect to the outcomes of research deter scientists from thinking that it is necessary to hold ethical discussions about the trajectory of their research. Scientists think of science as neutral or setting out with the best interest for humanity. Another stream of thought is that by following IACUC's rigid guidelines,

the scientists are being ethical. They also claim that they are not responsible for the outcome of the use of a certain technology and express a certain amount of helplessness by stating that they do not have much control over regulation of a technology- this is a job for policy makers and law enforcers.

Participants expressed mixed sentiments and contradictory ideas on the act of science and scientists' intentions. While they claim that the act of seeking new knowledge and learning about the brain on cellular, molecular levels and how this translates to behavioral adaptations to add to the already growing literature of neuroscience is neutral, participants also assert that most scientists start their projects with the best intentions.

Outlandish theories about controlling one's mind and taking man-machine interfaces to the level of science fiction and the discussion of these possibilities by sociologists were not a topic that was stimulating to the participants. A central theme that was present was that science is either neutral or not done with the intention of bringing harm to the general public. "Scientists are not these madmen in lab coats set out to create some technology that will destroy the world" B said, when discussing the common misunderstanding for 'brain control' and brain-machine interface. The PI believed that as a scientist, he is furthering knowledge about brain circuits and how one could stimulate various areas to produce different effects or behavior. Instead of merely publishing papers, he aims to make useful discoveries that could impact the masses. "I make discoveries and figure out how to make these discoveries useful. I try to understand things and dissect problems in such nauseating details most people don't care about". The participants mentioned that doing research is for the sake of knowledge and they aim to use that knowledge to benefit people and

society in some way. With the ultrasound, the participants were interested in seeing how far they could push that device to have different effects on brain circuits. They wanted to test the limits and learn more about its function on both cellular and behavioral level of a rodent. The research also has to be catered to the goals of the funding agencies so the considerations for future direction and application of the research has been guided towards the more medical and military use. While the participants maintained the scientists' good intentions behind conducting their research projects, there were some mixed feelings about the research trickling down to the general public and being commercialized. B claimed that because he is still a "newbie" in the field, he has not been jaded or experienced any level of corruption in his professional field. "The scientists are set out for the best interest for science and people. But when you start going into the private sector or the federal sector those motivations may be altered."

Another common response to ethical consideration was that scientists do not have much control over how their technology will be used and that the responsibility to discuss these issues and regulate the technology mainly lies with policy makers and ethicists. "Interpretation of certain science is up to the more federal level". The researchers agreed to the importance of thinking about social implications and potential ethical complications that may arise from their research. However, they deemed the policy making and the discussion of these social issues to be left in charge of the sociologists. The PI acknowledged that the researchers have a responsibility to educate and notify people of the potential problems of a given technology. "Scientists have the responsibility of informing the appropriate policy makers. I encourage these people to write about and expose the issues with my

technology. As a scientist, this is my responsibility." However he claimed that he did not have the proper training or the expertise to go beyond that to make ethical or policy oriented decisions on the use and regulation of his technology. It would be outside his scope of expertise to manage the social aspect of scientific discoveries so it is more appropriate to outsource solving ethical dilemmas to professionals of this field. Some participants shared the opinion that a committee of people from various backgrounds would be necessary to reflect and make ethical decisions and policies about developing technologies. "Student who needs to be trained on how to think about these things to the policy makers and channeling through the whole institution with the PI, study sessions and lobbyists. If it is built with a committee involving all of these people it will be beneficial. It needs to involve people from all levels of science. Educators, researchers, policy makers have different input to ethics so the progress might be slow but it is valuable to have different perspectives. I can't give a well rounded opinion on it because I'm looking at it as a student. PI can't because he is focused on the science and policy makers are not worried about the science or education as much as they are with the social implications of that study."

When asked about the opportunity to engage in lab engagement activities or using the research ethics consultation services, all participants deemed the consultation service to be useful. B commented that it will be almost comforting to know that any given potential ethical problem will be addressed and resolved with the help of the experts. When asked about participating in lab engagements, the students and PI were hesitant to agree that it will be of benefit to them. The PI asserted that he would be open to engaging in ethics discussions with professionals from other fields but he would not do it every week on a regular basis due to time

constraints. B was more open to the idea but he claimed that there has to be some incentive for researchers to voluntarily participate in laboratory engagements. "To get a grad student to do anything you have to involve food or the PI has to make them do it. It has to be appealing somehow for the student to learn and be involved. For example, say that 10 years from now you will be out of the loop and you will not be able to get funding if you don't do this". This raw statement beautifully captures the nature of graduate students and the potential incentives for them to willingly engage in conversation with ethicists. Currently there is no tangible reward for engaging in reflection on social implications of one's research project that is similar to the current reward structure for scientists. "There are intrinsic rewards to a) behaving ethically and b) for not violating ethical policies… you are rewarded when you behave ethically and punished when you don't. It's an intrinsic reward of doing something good".

The roles of scientists and their influences on the public, science policies and politics have been subjected to scrutiny and numerous discussions among those in humanities and social sciences. This anthropological account of life inside a laboratory reveals not only the full routines of mundane practices of scientists, but the way they identify, regard and perceive their roles in their community as well as the foreign territory of ethics and policies.

Scientists on occasion, hold discussions that involve social implications of their work and snippets of relevant topics that include but may not be limited to previous ethics training, research ethics classes and adhering to institutional policies. The quantity and quality of these discussions are limited and dictated by time

constraints and minimal incentives. Other influencing factors are their perspectives on ethics and how they view their role as a scientist in relation to the public.

Chapter 5

CONCLUSION

Ethicist-scientist interactions and an anthropological account of laboratory life were explored through literature review and an ethnographic study. Of the different types of interactions, embedded ethicists and research ethics consultation services were discussed, followed by my perspective on the life as a neuroscience graduate student as a participant-observer who spent a few months in the laboratory.

Embedded ethicists, particularly those involved in lab engagements have shown to provide a time and place within the laboratory for researchers to comfortably hold a conversation about science and society. Implementing midstream modulation showed a change in the participant's laboratory practice. More specifically, McGregor and Wetmore's laboratory engagement focused on macro-level, big-picture discussions about the impact science and society has on each other and the role of researchers in public discourse. Fisher on the other hand, sought out a more micro-level focused protocol that was designed to make the decision making process during a research project more transparent to the researcher. The embedded-ethicists were striving to bring a cognitive change to the researchers, to initiate and mediate a more deep reflection on social implications of research.

Research ethics consultation services had a very different approach to minimize potential ethical dilemmas that would result from a research project. This model was entirely issue-focused, allowing the researchers to voluntarily contact this committee with ethically-relevant questions. This model allows the scientists to identify the moral problems and outsource it to the appropriate professionals with expertise in offering advice for such predicaments.

Embedded ethicists and research ethics consultation services have the potential to greatly diminish potential moral dilemmas and negative social impacts caused by scientific development. Tackling both micro and macro level concerns through consistent conversations with the researchers can establish a foundation for increased reflexivity and even interest in such discussions. By introducing the social aspects of science and extending this acquaintance by maintaining relationships and conversations, the ethicists are able to create moral space in the laboratory. Consultation committees can lend their advice and expertise in real time during the process of research to willing ears. Both methods of interactions have different strengths and weaknesses and they are useful for meeting different goals.

The interaction I had with my participants allowed me to have a better understanding of the microscopic world inside the laboratory. It was very different from the way laboratories are portrayed to the public- the benches were not surgically clean, no one wore lab coats while conducting experiments and there were no colorful chemicals gently brewing in a glass beaker. The work can be tedious, somewhat morbid given the decapitation and brain extraction of mice that is involved, messy and bloody due to the nature of animal research. 90% of the time the students were trouble shooting malfunctioning equipment, low quality antibody serums or a dull blade on the cryostat machine. Data analysis could take months and there was always pressure to obtain significant data, publish in high impact journals, receive funding to buy various equipments and to be compliant with institutional policies.

There are a few ways to increase collaboration between scientists and professionals from humanities, social sciences, law and policies. I think this can be

done by creating institutional policy or 'recommendations' for interdisciplinary collaborations, monetary incentives to seek out professional help from bioethicists, and through educational classes and seminars in bioethics as well as history and philosophy of science.

Having knowledge on the various constraints that comes with laboratory life and the researchers' perspectives on ethics is a useful tool for making the current ethicist-scientist interactions more robust. Targeting IACUC/IRB applications and grant proposals is a way to initiate a conversation about social implications of one's research. Collaboration on this section between a social scientist and natural scientist can achieve both macro level discussions about the interactions and influences between science and society and it can also lead to micro level discussion relevant to that particular research protocol. Broad societal impact of the trajectory of one's research can be discussed during the course of justifying why a research project is important and useful. Accomplishing this feat may be quite difficult due to timing issues since the ethicist may be introduced to the lab after they have already submitted their grant proposals. An institutional push for this collaboration may be the necessary driving force to catalyze this interaction.

Monetary incentives and requirements or recommendations for ethicist scientist interaction by the grant agencies or institutions can facilitate combining the two traditionally different professions of science and philosophy. On a more subjective note, the personality and interests of the ethicists are also important in building and maintaining a long-term relationship with the scientists. In order to successfully be integrated into the scientific community as a member of the laboratory and promoting effective communication and rapport, there ought to be a

common ground between the ethicist and scientist. I find this point to be crucial because it would be easier for both ethicists and scientists to spend a significant amount of time conversing and trying to make these conversations as meaningful if they got along with each other. This compatibility factor in the ethicist is certainly not mandatory, but researchers would be less reluctant to share their laboratory space and moral space of their work environment with a person whom they can establish an amicable relationship.

Perhaps the most efficient way of increasing ethicist-scientist interactions and embedding the importance of ethical, social and policy issues in science is through educational training. Undergraduate students are strongly recommended to have science backgrounds and research experience to be a competitive applicant for graduate programs. Adding courses on science and society, history and philosophy of science, and bioethics in the curriculum of highly recommended classes will prime the students for the path of more rigorous training in research and the normative issues that come in tow.

Current graduate students are required to take ethics courses for their degree completion. Extending the requirement to taking one class per semester will also maintain consistent exposure to ethics, social and policy issues in science. Taking a class, perhaps a one credit hour course, once a semester is important because it has the potential to not only maintain continual exposure to the many dimensions of science, but provide an opportunity for the researchers to get in the habit of deep ethical reflection and discourse. The instructor, or instructors, for this class can facilitate discussions and address the nature of science, scientific assumptions, and theories, research methods, conceptual frameworks and implications of science for a

more interdisciplinary, multifaceted engagement that adequately cultivates a foundation in which a deeper normative discussion can be constructed.

Contemplating and designing various means to approach an incentive for scientists to engage with ethicists begs the question of whether this is 'better' or 'good'. It hashes out an implicit underlying question of whether it is absolutely necessary that scientists think about all the ethical dimensions of their project while wearing a philosopher's hat. It is important for scientists to value the collective moral perspectives of the public and think about what it would mean to have their projects in our society. This is because these scientists can move on from laboratories to engaging in science policy, education and public discourse. It is unclear whether ethicists ought to change the way scientists think through lab engagements and consequently, change the way they set their research goals and conduct experiments, especially on the level of the laboratory unit. These discussions can be adequately developed in classroom settings with a greater interaction among students of different scientific branches with instructors with a diverse background in philosophy, history of science and normative philosophy.

Ethical discussions, or reflections, are currently happening in the laboratories. Existing policy creates moral spaces because they require researchers to think about how certain costs are outweighed by benefits, how they can minimize the use of animals for both ethical and practical reasons, justify why their research question is important- to put it bluntly, answering the question of 'So what, why should anyone care about your research project?'. The detailed questionnaire that is built into project protocols and grant proposals, the institutional policies to which researchers are compliant have already embedded ethical discourse into the system.

It does not explicitly flash 'ethics' nor does it they necessarily speak the language of normative philosophy, but nonetheless, the lab environment is not morally neutral nor void of ethical discourse. It merely follows a different moral mapping sketched by different incentives and goals than that of normative philosophers. Now, whether these discussions are 'right' or 'adequate' is a different question.

The researchers themselves are machines functioning as a part of a greater self-supporting machine that generates knowledge that is needed to fund more ideas and projects of both budding and mature scientists. They have been trained, or are going through extensive training to maximize their performance in this culture. Ethicists must enter this closed system with an enticing reason for the researchers to critically reflect on social implications and aptly justify their projects that would satisfy not merely the funding agencies but the large body of bioethicists who are concerned about not only the technology itself but what it means to allow a certain technology to diffuse into our society. With early educational training in philosophical and social dimensions of science, and with the help of institutional incentives, I hope to see more thoughtful scientists with a willingness and appreciation of the importance in engaging in ethical, social and policy questions.

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