Presidential Commission
for the Study of Bioethical Issues

TRANSCRIPT

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DR. GUTMANN: Thank you for coming together. This is our roundtable even though it's a square table. It is a table that brings together a group of people who really represent a wide range of what this Commission is going to grapple with as we move forward on the BRAIN Initiative. And I'd like to simply start off the roundtable with a question that I often ask at our roundtable. It's a question that requires you to prioritize and just hone in on one single issue that you think is most -- in greatest need of the Bioethics Commission attention as we consider the ethics of neuroscience research and the potential applications of the results of that research. And I'll begin here and work way down for one single issue. Doctor Casebeer?

DR. CASEBEER: Thanks, Doctor Gutmann. On the procedural side, I think the single most important issue is pedagogic. So how are we going to surface the resident expertise both in the engineering and the scientific communities and in the ethics communities and bring it together to provide rational guidance for the research? So how are we going to do that procedurally? And then the second issue, and I know this a little bit of a dodge here in questions substantive. And that relates to how are we going to take into context in which the research funded by various agencies is done? And I raise that just because especially in DARPA circles we have a defense mission which I think is somewhat different from the clinical body.

DR. KOROSHETZ: And I agree that to me I think the highest priority is education. I agree with William that education of the scientists, I think we're going to enter new areas where the scientists are going to be looking to bioethicists like they have never before. So I think that's important in the public as well. I think the one thing I would say is that if I was a mouse I would be really worried. Because pretty soon somebody is going to know everything about my brain. Luckily, I'm a human --

DR. GUTMANN: Is that scientifically true that if you were a mouse you would actually be worried?

DR. KOROSHETZ: No, absolutely true. I think that's where there's really going to be big changes in the lower organisms. I think being human we have time to kind of do this. It's not going to be like the genome project like bang someday it all lays in front of you. There's going to be very kind of incremental as far as the human is concerned. But I think the animal work is going to move very, very quickly now.

DR. GUTMANN: So we should be concerned on the ethics of imposing pain on animals?

DR. KOROSHETZ: No, I think that's true, but I was actually --

DR. GUTMANN: I'm asking because it isn't -- as far as I know mice don't worry. But they do -- we know that they experience pain.

DR. KOROSHETZ: No, I was saying somewhat --

DR. GUTMANN: No, I'm not being facetious now. I want to know --

DR. KOROSHETZ: No, I think that's a very concrete example of which people could stimulate brain cells inside the brain to create a pain. Something that experiences pain how would we know about it, how do we deal with it? The bigger issue is I think, you know, we will understand in a way which we never before how a brain is working in these little organisms. And that is just -- that I think is what is going to foretell what will happen in humans, but over a longer, longer period of time.

DR. GUTMANN: Thank you. Doctor Johnson.

DR. JOHNSON: Not an easy question so I've been scrambling here. So I think what I want to say is -- this is going to be odd. I think that emphasis should be on the -- and I'm

thinking of the technologies that are going to be developed, not the research itself. I want to say there should be a great deal of attention given to the social relations constituted by those technologies. I mean, I know it's odd and abstract, but I think ethical issues are always embedded in a social context. So what I'm saying is a lot of attention should be paid to, in a way, its uses, but it's really who, how, you know, who is impacted. Because the knowledge is going to -- knowledge is not disembodied. It's used, you know, social relations.

DR. GUTMANN: Doctor Murray. Thank you.

DR. MURRAY: Although we may be able to anticipate some major categories of future challenges, we cannot anticipate the particulars. And so we need to prepare in the best way possible to be able to handle the surprises that will inevitably come upon us just as they did in the genome project. And we talked about ways of doing that, creating a basis of fundamental scholarship, creating communities, interdisciplinary communities of scholars, educating sciences and helping the public. But I would say that's the fundamental thing I care about.

DR. GUTMANN: Proactively prepare for the un -- right now the unknowable developments in the future to be prepared for them, yeah.

DR. MURRAY: Lay the groundwork for them.

DR. GUTMANN: Prepare for the incidental findings which will not be incidental actually, but... Doctor Chatterjee.

DR. CHATTERJEE: As an aside, I have a colleague who quips that it's a great time to be a mouse because if you have a disease we probably know how to cure it. But separate from that, I think going back to where I ended my talk. I think public education for me seems to be a really critical thing and one that we haven't probably paid enough attention to. I think this is a way in which education actually loops back into a kind of regulation but not in a formal sense.

So it is probably the case that everybody here who buys a book on Amazon and goes on and reads other people's reviews. These are people you don't know and you read them and you try to decide whether this makes sense to you. If you get a hotel, you maybe go on Trip Advisor, do the same sorts of things. I think we need an engaged public that has opinions and are confident about their opinions. So if someone says we're going to do a SPECT scan in a way to guide their therapy which people are doing out there you have a public that says this just doesn't make any sense and they feel confident about that and the only way to do that is to have them educated in the basic inferences that you can make from your science data.

DR. GUTMANN: Thank you. And that's paired with something Doctor Murray said earlier about using the new technology. The flip side of that is it's a lot harder to get the public's attention these days because they're flooded with information overload. But definitely something that this Commission is at the heart of our -- you know, our sense of our mission is -- has to do with the education. So very helpful. Doctor Chalmers.

DR. CHALMERS: I suppose I think that one of the most important issues here has to be privacy just because the mind is traditionally such a private domain. And this is something which has the potential to be completely transformed by the kind of neuroscience technology that might come out of the BRAIN Initiative. And here I think the contrast with the genome project is useful because there are issues about privacy come up very much in the genome project along with a number of other ethical issues, but there are also some differences. One difference is, of course, there's so much more we don't understand in the case of the brain. And the technological challenges are so much greater -- The genome project is basically mapping something esthetic. Although it sounds like a very deep personal concern it's the genome that's built in to you for life. The BRAIN Initiative if it comes off is basically mapping

something completely dynamic. In the moment by moment state of the brain and ultimately, if it all works out, the moment by moment state of the mind. And that takes issue about privacy to a whole new level of probably well beyond those raised by say the genome project.

DR. GUTMANN: Doctor Wingfield.

DR. WINGFIELD: First of all, I agree with everything that's been said so far, but there's one thing I'd really like to add and that's open access. And as you probably know, the office of science, technology and policy asked the funding agencies to start developing plans for open access. And those details will be forthcoming, I think. But of course, this relates to taxpayer's money paid for this and it should be open to all. And the NIH and USDA have been doing this with publications for some time. But this open access will also include data that go along with --

DR. GUTMANN: So this actually -- there are bookends here because the concern of Doctor Casebeer being context specific and the open access may be an intention.

DR. WINGFIELD: Yeah, and it addresses issues of privacy. But also it brings in dual use research of concern and that whole issue began when the H5N1 paper and the data -- should the techniques be released, should the data be released. Because there's this possibility that others could use them for nefarious purposes. And that's going to be a huge issue as we develop further on in the future.

DR. GUTMANN: Thank you all. I have a group of questions from the audience and I also want to give Commission members and I see -- I'm going to alternate. I'm going to begin with Dan Sulmasy, go to a question from the audience, go to Raju, go to Anita and intersperse it with at least a few of the questions we've gotten from the audience and any others that come up. So Dan, why don't you begin.

DR. SULMASY: Thanks. I wanted to follow-up on Amy's questions about animal ethics actually that several of you brought up. And I just wonder what the state of sort of the neuroethics of animal research is. Obviously, we talk about not causing animals pain, but we're engaging, I think, a set of experiments which we'll be altering perceptions, memories, behavior, creating lesions, doing these implants and other stimulators in animals. And I just wonder whether there's a literature on this. We're familiar with not causing animals pain, but what about changing their minds.

DR. CASEBEER: This is not my field of expertise although I do try to monitor the animal ethics literature. And there is an example on this topic. So there are several authors writing in the area of animal experimentation. The traditional millionths notion of sentience and what obligations we owe to other creatures by dent of the fact that they can experience the phenomena of pain. It is relatively well-explored. I remember, in fact, having a very interesting with a cadet at the Air Force Academy one time about whether or not fish feel pain and whether that influenced whether he wanted to put out fish as a hobby on his road scholarship application, for instance. So those are, I think, conversations that have been drawn upon in the literature. In the great age, especially, there is an applied ethics literature that has looked at the decision making capabilities of these creatures and I know there is a movement afoot to recognize that they have some form of agency that deserves moral respect in the contents sense as well.

DR. SULMASY: But literature about changing those sorts of things, not just about pain. You know, in the sense of changing perceptions, changing memory, changing orientation. Things that are going to happen in animals faster than they will in humans. Is there sort of literature on those things?

DR. GUTMANN: Doctor Wingfield wanted to take that up.

DR. WINGFIELD: The Institute of Laboratory Animal Research at the National Academies has a journal and its devoted to all aspects of laboratory animal research, but some of these debates could be found there.

DR. GUTMANN: Let me take a question from Nina Mack. Nina, where are you. Can you raise your hand? Thank you very much. She's a program consultant for Alternative Research and Development Foundation. And Nina asks do we need to also consider the ethical implications of the research agenda itself, for example, what research is funded or prioritized, where, how, when, why research money is allocated. Not just which mental functions or disorders are studied, but also which models are used. How much should be devoted to animal research versus human research versus development of new technologies to facilitate and advance human research.

DR. MURRAY: Well, the answer is yes. We should bear all of that in mind. But a small distinction here though. There are ethical implications everywhere. But policy decisions are not usually driven by in the narrow sense ethical implications. But very much driven by value? The values that we regard as most important to pursue and value priorities. So the answer is yes for those reasons.

DR. GUTMANN: Good. Raju.

DR. KUCHERLAPATI: Amy, I want to make a couple of observations and they may or may not be accurate. I want to base upon those observations I want to pose a question to all of our members. First of all, this is extraordinary that the President of the United States would actually ask the Commission for Bioethics to study the implications of ethical issues for a new research initiative. To my knowledge this has never happened before, so that's number one. The second observation I want to make is that I think I have to confess that the communities that

we're talking about, the scientists, engineers and the ethical scholars they don't know each other. And you know, I -- and you were talking about this stuff. You know, I was part of the human genome project. You know, I was part of the national advisory council for human genome research for six years and I knew about the ELSI program, but I bet you don't know me and I don't know you, okay? But I'm part of the human genome project and we spent a billion dollars to do that and I don't know you. It's the first time I met you. So there's something fundamentally wrong about this, right. So -- I mean, you talked about the Hastings Center and how we'll be able to bring all of these people. But I know Hastings and I know some of their work, but the communities are different. So everybody -- you know, we knew like in the human genome project ELSI gets five percent of the money and all of the people that get funded they do what they're doing. We in the human genome project we was mapping and sequencing in the human genome by ourselves. And the same thing happens everywhere, right. Or think a little bit more about that. You know, the human -- NHERI has an ELSI program. To my knowledge there is no such similar ELSI programs at other institutes -- Right, they don't exist. So there is an opportunity here I think that as we think about this we're sitting in this room to think about this. We might be able to reshape this. If we all truly believe that the way to be able to accomplish this goal of really educating everybody and thinking about these ethical principles right from the beginning we got to think about ways at the beginning of this effort that we need to bring all the people together. And I want you -- some of you have addressed this issue and how do we do that, so that's the question.

DR. GUTMANN: Can I just say and I want to call on Nita because she wants to say something to this as well. It's -- the two observations you made, I think, are intimately connected as part of the recommendation which is President Obama did see fit to ask the

Bioethics Commission at the very beginning of funding and exploring intensely the BRAIN Initiative to be part of this. And he brought us together so I and our executive director were there at the launch with the heads of -- I was there with the heads of the other agencies and we were there at the launch of this. So that's both real -- practically speaking and symbolically speaking a very important statement. And then I just add one other thing and then I'm going to turn it to Nita. We as a Commission are constituted quite distinctly from some other Commissions in that we have Raju and scientists, Stephen and others, you know, on the Commission along with people whose specialty is you know different forms of practical ethics. So I think what you've called for is not only called for, but it's practically possible and ethically justified. And I will turn it over to Nita for her comments.

DR. FARAHANY: So I wanted to comment about how some of the ways in which I've observed the neuroscience community to be quite different than the experience that you've had, Raju, because it's one of the things that I have found most interesting in my work in neuroethics. Is how many of the neuroscientists and people in the field of neuroethics really actually do know one another and have developed a community and how inclusive the neuroscientists have been from the get go of individuals involved in ethics. So just a few examples, there's International Neuroethics Society which is headed by a neuroscientist, but the board which I'm also on has quite a few people who comes from each of the different disciplines. The Society of Neuroscience at their annual meeting features the David Kopf lecture which has regularly 20,000 plus people who attend to hear an ethics conversations. There has been countless TV shows like the PBS show that's coming out on Brains on Trial bringing together neuroscientists, neuroethicists, philosophers. Steve Center at UCS actively engaging both neuroethicists as well as neuroscientists. Duke -- the Duke Institute for Brain and Society

Initiatives, at Harvard, at Stanford. Each of these different places have been actively engaged with neuroethics. That isn't to say there isn't far more that can be done. But there's been a real interest and commitment by this community to make ethics part of the conversation and integrate it from day one. And so that encourages me to think that there's a real opportunity here and a real distinction here from other past approaches of integrating the two.

DR. GUTMANN: And I want to just emphasize the opportunity part. Because we can't take for granted that as a field develops it will continue to be so integrated. In fact, it won't unless there are institutions and practices set up to make this happen. And the purpose of it isn't to just have lots of diverse people with different expertise coming together. The purpose is to make sure that the practice of neuroscience moving forward is scientifically and ethically sound. And so this is -- if nothing else comes out of this morning's session then our commitment to make recommendations to further this kind of productive integration and collaboration I think we will have had a very productive morning. Please.

DR. KUCHERLAPATI: Quick follow-up comment. I think that the fact that we have diversity among the Presidential Commission members, that's great. But I am trying to get at something different. Maybe I can make a specific suggestion. What I'm saying is that when we actually award money for a project to develop new technologies in neuroscience or any other area is that the time when we should also embed within that a person or a group or somebody that whose knowledgeable about the kinds of issues so that it is not post facto that you think about this. But during the work that you would actually be engaged in that conversation and whether that is a good thing.

DR. GUTMANN: So my answer -- I can't speak yet for the Commission is yes. So that's -- I do want to -- but in the interest of -- I want to get a question from the audience

otherwise we're going to squeeze out these really excellent questions which I don't want to do. So we'll -- Tom, we'll get back to you. But Karen Gallinari. Karen, where are you? Who is the Director of Regulatory Affairs for Research at Montefiore Medical Center. And Karen's question is as follows: Should this Commission develop some policy which drills down to details such as forbidding memory control technology to prevent depreciation and recollection of future violent acts or should it simply articulate only more general guidance and reply upon agencies such as NSF and DARPA to develop policies to prevent harmful uses of neurotechnology?

DR. GUTMANN: Since we -- as a Commission we're going to have to deliberate. It might be good for one of the agency -- the people who are actually in the agencies to answer from your perspective. Anyone want -- Doctor Casebeer.

DR. CASEBEER: We have a multilevel problem we have to tackle here. So I don't see it as being an either or. So I think on the one hand we need education and training for the practitioners. And that education and training has to take seriously the expertise resident in the applied ethics community, but also the expertise and natural savviness of the scientific community and I think that has to compliment whatever transparent and democratic oversight mechanisms are put in place to ensure that that native education is applied well in the scientific domain. So it's a multilevel problem. I don't think it's an either or.

DR. GUTMANN: Doctor Murray, can I –Oh, Doctor Wingfield?

DR. WINGFIELD: I just wanted to add to that. As these new technologies develop and we get a new insight on exactly what it is we're doing and how we're going to do it then I think is the time to consider the ethical implications of that. And again, open access to what the data should be released in relation to those kinds of technologies is something we're going to have to address.

DR. GUTMANN: So I want to then give Doctor Murray a chance to come back to the previous -- what you wanted to say, but I just wanted to make sure to get in some of these more specific excellent questions.

DR. MURRAY: Thanks. So I'm sorry we didn't get to know each other through the genome project, Raju. I think I would have enjoyed that very much. But I think Amy's summary was incredibly on point. My most intense time was at the beginning and it was at that point a very open and vibrant community. The boundaries were less important. So I know many of the leading scientists in the first five years or so and have become good friends of mine, Victor McKusick and I we're very close. From what Nita said it's great to see that that seems to be happening here. But Amy is right. Keeping that vibrancy and those contacts alive is going to require a lot of creativity, a lot of effort including some institutional pressures that keep it going. And I think we should be creative and open-minded about the ways -- the best ways to accomplish that. Experiment with lots of ways, but I thoroughly endorse what you said.

DR. GUTMANN: And Raju has one very specific recommendation that we should consider about how to continue that. Doctor Chatterjee.

DR. CHATTERJEE: Just piggybacking on that. I think what I'm going to say is obvious, but it should be said which is that the pressures if you're a scientists is to run your lab, right, and that's a very specific enterprise and that's what you get rewarded for which means that you don't go out and talk to other people because that's pro bono work, right. So what you need to do is advance your science. And our institutions are set up to promote that and not cross disciplinary engagements.

DR. KOROSHETZ: Let's make a really quick comment to the last question that came. I think -- one thing that I would anticipate is that the sticky problems are going to be

coming to human studies committees. And they're individuals at different institutions. They have a lot of variability. So one potential concrete things that could happen is to develop a way in which these questions -- this education of these human studies committees could occur.

DR. GUTMANN: Good. Anita had a question.

DR. ALLEN: In some ways my question relates to the last audience member's question about are we going to be drilling down into specifics or operating at a level of generality. I've been worrying about mental health all morning. And so I was particularly struck by Doctor Chatterjee's arresting image of a 50-year-old woman in the hospital, in neurology, who is manic, has papers scattered around her room, who scribbled all over her body because they're liable to say, oh, bipolar or schizophrenia, but ah, it's not that, it's encephalitis. And now we know since this because we know more about the brain, right. And I wondered whether in telling that anecdote you were in a way suggesting that the ultimate translation of the BRAIN project will be that conditions that we now think of as one sort of thing, about what you can do very little, are actually something else, about which we can do a lot. And this raises in a general way for me concerns about how the public will address mental health applications of new brain science. You know, it's a huge public health problem. You know, some studies say 25 percent of all Americans suffer from some kind of mental condition every year. It's affecting workplace productivity, family functions, criminal justice issues, education, etc., and yet we don't have a really good understanding of how to deal with those problems and yet the science may hold the promise of enabling us to fix the problem that people will undergo the right kind of brain stimulation or take the right drug. How much coercion will we allow, how much mandate will we allow to fix these problems in ways that involve sort of circumventing the self. And so I guess my question is about -- to Doctor Chatterjee. Were you actually intending to make the kind

of point that I was hearing you make and would you agree that the Commission were going to start to drill down maybe should drill down on the ethical implications for mental healthcare and policy of the BRAIN project?

DR. CHATTERJEE: I think part of the reason for using that true example is that it is as vivid as it is and most people hearing that description wouldn't realize that this something that we have a particular condition. The phenomenology of which you might see on a psychiatric ward. But in this case is something that is treatable and we have some understanding of its treatment -- of the approaches where this person can be brought back into a relatively normal state. But it is the case that if you look across the spectrum of what's going on right now. If you take Alzheimer's disease, depression, bipolar disorder, addiction, that these are discourages of this era. In a way that 150 years ago we instead of talking about Alzheimer's disease we would have been talking about neurosyphilis but we don't talk about that, right? That's over and done. For the most part, you know, except for some very specific instances. So I am hopeful that some of these things will be addressed and will be treated and they won't be even thought of as societal problems. But that's not to say that we're there and what's going to happen between now and then and some things that might not be treated. So a more recent example would be that you consider obesity a disorder or not. Do you restrict how much soda people can be drinking, right? These are the kinds of issues, I think, that perhaps you're talking about which I think are real societal concerns. And part of it is how you define disorder, how you define dysfunction and whose business is it to modify people's behavior and how do you go about doing that. And to me it seems as though until -- to use the simplest analogy, until we have something that just sort of fixes and you move on, this to me seems like part of the issues that commissions like yours have to struggle with. And we in the field have to struggle with.

DR. ALLEN: And I really do think that it is an important area and I think if we do start to drum down I would like to see this addressed under the hard questions around public policy and the use of neuropsychological and neuroimaging and neuroscience in general to address these huge problems.

DR. GUTMANN: I am going to another question, this one from Celia Sharp in our audience. Cecelia, where are you? There you are. Thank you. This is directed I think to Doctor Casebeer. What percentage of the DARPA project is classified intelligence research and who is in charge to raise the ethical issues of concern considering the secrecy of the national security -- ethical -- is it disenfranchisement -- is that what the word is? I can't read the last word. Yea, ethical inconvenience.

DR. CASEBEER: Yeah, good question. Little to no of my work is classified actually. And most of the programs that they fund are 6/1 work in nature. What that means is that they are basic science work with a publication requirement and total transparency on the results of the program. There is classified work that takes place at DARPA, of course. We do have sensitive department information facilities inside of our building, as many department defense facilities do. But I can't give you a good answer with regard to what percentage of our budget consists of classified programs, I just don't know. The larger issue about who is responsible for discharging. The work that is done inside the Federal Government that is secret. I think ultimately, you know, falls back to our Commander in Chief and what role you think secrecy plays in conducting effective research in an adversarial environment.

DR. GUTMANN: Commission members questions. Nita, go ahead. I actually called you the last time you didn’t raise your hang.

DR. FARAHANY: So I wanted to return to something actually that Doctor

Chalmers said in his talk earlier. About the extent to which we think that the BRAIN research and BRAIN Initiative is going to help us with our basic understanding like consciousness and self. And you pointed to the ON study for the minimally conscious state and vegetative state as to whether or not there's some detection in consciousness and, of course, that's come up now in several other studies to see whether or not there's some way we can detect, for example, the difference between perception of pain versus nociception. So actual experience of it or not. And it seems like some of those things actually could be transformative, right. And we're actually able to see something that looks like a neural signature of the perception of pain as opposed to the registration of pain. And when we talk about things like animal models and see one signal but not the other one that could be quite powerful. Or to the extent that people are trying to do it at the end of life or even the beginning of life to try to detect the difference between nociception and perception. These things could really impact a lot of the conversations that we're having. So I was hoping you can elaborate a bit about -- you know, I agree that there are many philosophical issues that neuroscience simply cannot change. These are normative questions that are layers on top of an analysis on top of it. But it would be helpful to hear from you the ways in which you think neuroscience might actually change the conversation or impact the conversations that we're having in philosophy around concepts of consciousness and self and person.

DR. CHALMERS: Well, I think philosophy has already begun to be transformed a great deal by the impact of neuroscience and cognitive psychology and computational models of the minds in the last few decades. And I think this very much promises to continue. You mentioned finding things like the neural signature of pain. And I think this kind of thing potentially has a huge role in applications as I've talked about before. At the same time, there's a delicate interaction between the neuroscience and the philosophy here. I mean, it's not as if

neuroscience is just going to come up with the neuro signature of pain. I mean, we've talked about the issue of animal ethics before and the question do fish feel pain. Well, exactly that debate is going on right now in the journals. I read a lengthy journal debate in the journal and fisheries about just this question with two sides. One saying look, we found this neural signature of pain in fish. And the other side said, well, no, we don't find this neural signature of pain in fish. And this just raises the question which is the neural signature of pain. And we don't know that we know there is a bunch of different things in the brain that correlate with pain. We don't have a direct measure of pain in the first place. If we just had the consciousness meter that we could come in to extract the -- measure the state of consciousness directly. And then we could more or less find the state of the brain that correlates with it. But in fact, even behavioral studies, you know, our best measure of whether the state is in pain -- system is in pain is behavioral. And that's very indirect. And coming up against it the traditional philosophical problems of other minds. When it comes to systems like fish and so on it's not -- whether a system is in pain or not. So I think what we're actually finding is that delicate interaction between the neuroscience and the philosophy together the neural correlate of consciousness. Even the neural correlates of consciousness to many scientists that's already sort of off limits because, of course, consciousness is so subjective and hard to measure. So I think there's room for philosophy and other kinds of foundational things would even together what's going on with finding these neural signatures. Of course, once we have the neural signatures and they're going to play back in to the philosophy in all kinds of ways. The traditional philosophical problems won't go away. Is pain just a neural signature or is it something more. But you know, once we actually have the theory in place then we've got room for something like a scientific attack on the problem of the mind, for example.

DR. GUTMANN: Good. I have a question from Sudit -- I can't real your last name. A Penn student and I'm going to ask Sudit for you to come and read this because you are -- deciphering is beyond my brain or mind's capacity. But I'm sure it's a good question once it gets read. Sadit, thanks. And you're of the generation that types on a computer and handwriting is not important.

AUDIENCE MEMBER: Doctor Murray suggested earlier not to view the Commission's project as an education -- as a knowledge debt problem. We see already everyone represented here already having these discussions. They already have bioethics. I want you to think of bioethics as something that's not its distinct field. It works best when informing other fields. Already these conversations are taking place is that agencies -- not just scientific agencies but family room dining tables, they take place in hospitals, people who are experiencing, we see them on TV shows. How does the Commission incorporate these discussions so as to avoid being viewed as ethical experts with higher recourse to moral knowledge or does it -- or should it claim some sort of moral status higher because of the people who are gathered here today?

DR. GUTMANN: Thank you. So let me begin and then have Doctor Murray give his answer. We are constituted by President Obama as Presidential Commission on Bioethics independently of any oversight or from, you know, Government agency so as to give advice of own choosing through, you know, extensive deliberations, but legislatively they must be constituted publically and open which we welcome. That's our status. The status of our findings are only -- and our reports are only as good as the outcome of those deliberations are. There's something about the process of the deliberation itself that he we believe is valuable which is it -- is open to the public. It invites public comment and it demonstrates by the -- our deliberations and we wish to demonstrate a respect for the wide range of use including those we ultimately

don't come out in agreement with. I think that's a status that's very not only compatible with the best forms of Constitutional democracy, but that furthers our Constitutional democracy in the realm of working to further in this case ethical neuroscience. The rest is -- we have to work hard and we do work hard to get reports and recommendations that we live beyond the Commission both in the quality of the science, the bioethics that we can help inform and in public education -- in public education. Tom, why don't you give your view.

DR. MURRAY: Well, that was a great question, Sadit. And it's not easy to stand up in front of an audience like this and so articulatively ask it so good work. There's no question that something like skill and practical moral reasoning can be cultivated and can grow and then in some people develop into greater extent than others. That doesn't make you a moral expert. But it does enable you to be a very helpful conversation partner for people who are trying to also make sense out of very complex issues. It requires a deep foundation in the relevant facts of the case and by facts I don't just mean the science although that's a part of it. It's the scientists institutional, political, economic, social factors that shape the question that -- all these things matter. These are all part of good practical moral reasoning knowing all of that. And in the end, I think, it's not up to "experts" to make the decisions, but it is very much a part of our responsibility to be engaged in these kind of fruitful and open ways with our families, with our communities and with the public -- and the policy makers more broadly. And I'm glad the Commission is doing this work and I look forward to seeing their recommendations which I hope will be for a forceful program that will do all those things.

DR. GUTMANN: I actually -- just thanks for that question because I think it is often misunderstood that when a group is constituted as we are to ask the ethical questions we're no more presumptuous in addressing those than a scientist is in addressing scientific questions or

a literary scholar is in asking literary questions. It's an intellectual enterprise that has rules and practices of logic, evidence, argument, openness to an ability to respond to challenges and so on. And it is really essential and I think Sadit wasn't suggesting otherwise. That when we move forward in neuroscience in this Country or at our University or at an agency in the Government that it be as informed by the ethics as by the empirical evidence because as we discussed earlier the two go hand in hand to make good science. Barbara.

DR. ATKINSON: I have a question for Doctor Murray. You said you had recommendations you would talk about later. And I know we heard one, at least maybe two. But I didn't want to lose that piece of what you had because I think the experience is really -- probably important as the basis for what we're doing.

DR. MURRAY: Thanks so much. I think I snuck them all in in my answers. But what I'll do is I promise I'll work with the staff and I'll also write them up for you. But I think you've heard pretty much everything.

DR. ATKINSON: That's even better.

DR. GUTMANN: Thank you. Doctor Hauser.

DR. HAUSER: I would also echo what a great morning this was and this I think highlights how animated we all get when we think about neuroscience and its implications. No offense to other disciplines. But this is particularly, I think, of interest to all of us. And I would also say that it's very clear and we all understand that the deep answers that we're looking for are going to come from a bottom up approach or we begin with simple systems. But a number of you also discussed short-term human opportunities. And Walter especially and a number of people discussed the very terrible lack of significant progress with electric convulsive therapy, for example, for treatment of depression and the opportunities that technology development could

give us in that area. And you showed the lovely images of our ability to fiber track, map living brain image molecules, etc., surface brain grids that can help us better localize areas of abnormality. A number of computer brain interfaces for sensory processing and also for motor output assistance. These all -- and some cognitive enhancers either working on function -- and these are all so interesting, I think, to all of us. But from a neuroscience perspective are incremental changes and my question is are there transformational short-term intractable possibilities that this program will give us over the medium term that we should worry about as a bioethics commission?

DR. GUTMANN: Great question. Somebody here has got to at least venture a response. Doctor Wingfield.

DR. WINGFIELD: I'll try. I think there had been some transformational advances. One being optogenetics and clarity which I think has been a game changer. But you are quite right. There are other intractable problems right now and one that came up earlier, I think, was actually working on theories of brain function. And one way at NSF we're trying to address these kinds of intractable problems is what's called an ideas lab in which we bring people together who would not normally talk to one another and don't know each other but are approaching the problem from different perspectives. And to sit down we have them -- first of all, it's they send out the barrier of talking the same language. We get them communicating with one another. And they begin to develop ways in which they might be able to address this problem. They actually start writing proposals. And also the ideas lab we have a panel that will criticize them and over a period of five days. These are intense meetings. And they come up -- they form small groups. Maybe five groups of two or three PI's with actual proposals of how they might address this intractable problem. And one that we just did was -- nothing to do with

neuroscience, but just to give you an idea of how intractable this problem is is how to engineer crop plants that can fix their own nitrogen which will increase crop productivity, feeding the world, but also will make the need for nitrogen fertilizers. Huge, huge problem. We just funded three grants through ego mechanism to address that problem directly. We have one coming up in March which will be focusing on brain theories, theories of brain function, failure of brain function that we hope will do the same thing. And we fund them through what's called an ego grant, an early concept grant for exploratory research. So once we get that grant in and it's peer reviewed we can fund it in four to six weeks. That just gives you an example of how we're going to go about that.

DR. KOROSHETZ: Steve, One technology which is a little bit off the grid, not that well-known, but I have been struck by the fact that it could be transformed on the short-term. And that's what's called MR focused ultrasound. So it's a technology that's now being used so it's noninvasive stimulation of brain with ultrasound waves that can be targeted to a one millimeter spot. So Frank, what it is you may remember from -- was one of the pioneers. So they're currently using it to make lesions, but the really interesting part is that energies below lesions you can potentially either stimulate or shut off brain with that and potentially without doing harm to the nervous system. If that plays out, that opens up the ability to interrogate all deep structures in the brain, turning them on and off. Seeing you know, in mental health conditions does it -- you know, finding areas like Helen found just all over the brain. That would be the one thing that I think is a long shot, but I see as potentially really unbelievably short-term transformative.

DR. JOHNSON: So this is not an answer to your question, but something that -- and idea that was provoked by your question which hasn't come out at all. And that is sort of the

role of futuristic thinking in science fiction in the enterprise. I have one friend who had a case of nanotechnology interviewed scientists and engineers and actually used science -- tried to get them to write science fiction stories that involve. So I just wanted to suggest that engineers and scientists are clearly problem solvers. But they also I think implicitly are going somewhere, you know, they're going -- we're all future -- we're going somewhere in the future. And being able to tease out that futuristic thinking really could facilitate those -- facilitate kind of the ethical issues. Even though the scenarios, you know, may not come to pass, it tells you a lot.

DR. GUTMANN: Well, this panel has certainly helped us think about where we may want to go in the near future. I don't know in the distant, but we really without any reservation very enthusiastically thank you all for your input to the Commission this morning. Thank you so very, very much. So this is our last session. I want to thank our executive director, Lisa Lee, and the members of our really expert and dedicated staff who make these meetings and our reports much more possible. And they are the real unsung heroes of the Commission. Thank wonderfully diverse in our expertise set of commission members who have bonded coming from very different intellectual and indeed very ethical perspectives as well and turn it over to our vice chair, Jim Wagner, to conclude this, our 14th Meeting.

DR. WAGNER: Really, Amy, I want to celebrate with you the success of these two days. Join my thanks to yours for all who participated. It's been an extraordinary -- of all our 14 meetings I think this has been the most extraordinary audiences that has contributed to our conversation. So I thank you. Thanks to fellow Commissioners as well. Thanks to Penn for this venue, and you for your leadership.

DR. GUTMANN: We are adjourned. - - - (Whereupon, the Meeting was concluded at 12:45 p.m.) - - - C E R T I F I C A T E - - - STATE OF PENNSYLVANIA: : SS

COUNTY OF PHILADELPHIA: I, Michelle Palys, Court Reporter-Notary Public within and for Philadelphia County, State of Pennsylvania, do hereby certify that the foregoing Presidential Commission Meeting was taken before me at University of Pennsylvania, Smilow Center for Translational Research, 3400 Civic Center Boulevard, Philadelphia, Pennsylvania on August 20, 2013; that the foregoing meeting was taken by me in shorthand by myself and reduced to typing under my direction and control, that the foregoing pages contain a true and correct transcription of all of the Presidential Commission Meeting. ..... MICHELLE PALYS Notary Public My Commission expires December 23, 2016