

“Neuroethics Pioneer Steve Hyman” with Steven E. Hyman

Transcript of Communicating Brain Science Podcast



Guest: Steven E. Hyman, M.D., is the director of the [Stanley Center for Psychiatric Research](#) at the Broad Institute, the Harvard University Distinguished Service Professor of Stem Cell and Regenerative Biology, and a member of the Dana Foundation Board of Directors. Hyman joined the Broad after a decade of service as provost of Harvard University, where, as Harvard’s chief academic officer, he focused on the development of collaborative scientific initiatives. From 1996 to 2001, he served as director of the U.S. National Institute of Mental Health (NIMH). Hyman is the editor of the *Annual Review of Neuroscience* and the founding president of the International Neuroethics Society. Prior to his government service he was the first faculty director of Harvard University's interdisciplinary Mind, Brain, and Behavior Initiative, where he studied the control of neural gene expression by neurotransmitters with the goal of understanding mechanisms that regulate emotion and motivation in health and illness.

Host: Bill Glovin serves as editor of *Cerebrum* and the *Cerebrum Anthology: Emerging Issues in Brain Science*. He is also executive editor of the Dana Press and *Brain in the News*. Prior to joining the Dana Foundation, Mr. Glovin was senior editor of *Rutgers Magazine* and editor of *Rutgers Focus*. He has served as managing editor of *New Jersey Success*, editor of *New Jersey Business* magazine, and as a staff writer at *The Record* newspaper in Hackensack, NJ. Mr. Glovin has won 20 writing awards from the Society of Professional Journalists of New Jersey and the Council for Advancement and Support of Education. He has a B.A. in Journalism from George Washington University.

Bill Glovin: Today on the *Cerebrum* podcast, we have a very special guest under very special circumstances. I'm *Cerebrum* editor, Bill Glovin, and I'd like to welcome in Dr. Steve Hyman. Why are these special circumstances? Well, for one, I generally conduct these podcasts on the phone but today, I'm sitting across from Steve at the Marriott Marquis in Washington DC, which is connected to the convention center that is hosting this year's Society for Neuroscience (SfN) Conference.

The other reason it's a little bit different than usual is we usually feature the author of one of our most recent *Cerebrum* articles. In this case, we are making an exception because Steve is one of the founders of the Neuroethics Society, which meets each year a few days before the SfN conference.

Some of our conversation will be linked to our most recent *Cerebrum* article, which is titled "[The First Neuroethics Meeting: Then and Now](#)," which consists of essays by three of the original attendees of the Mapping the Field Conference in 2002 in San Francisco. Steve was also one of the original contributors at the Mapping the Field Conference, which is celebrating its 15th anniversary this year. That conference is unofficially, or maybe officially, considered the first time the neuroscience world came together to discuss neuroethics, which has just exploded in recent years as an integral part of brain research.

The last few days, Steve has been busy at the society meeting, which was filled with all kinds of fascinating lectures and panel discussions and jam-packed with attendees. When Steve isn't busy at these kinds of meetings, he's director of the Stanley Center for Psychiatric Research at Broad Institute of MIT and Harvard. He's also Harvard University distinguished service professor of stem-cell and regenerative biology, and has served as provost of Harvard, as the university's chief academic officer, and as president of SfN.

Steve, instead of me rambling on about the Mapping the Field Conference, I'd rather have you tell me your memories of how it all came together.

Steven Hyman:

In many ways, the inspiration for bringing it together came from Bill Safire (former *New York Times* columnist and chairman of the Dana Foundation), who had been thinking about the rapid advances in technology to investigate and, ultimately, to influence the workings of the human brain. He had an insight that, what he came to call neuroethics, would extend far beyond the kind of important but conventional bioethics that many people were already involved in.

What I mean by conventional bioethics is the platform for research, how we get informed consent, how we make sure that we protect human research subjects, and the like. What emerged was a far more interdisciplinary field with concerns around things like brain privacy; once we were able to examine the brain, perhaps in new ways, or human identity, meaning, did we have interventions in the brain that would alter human personality or human sense of self, issues like memory editing and then other issues like cognitive enhancement. I don't want to go on with a laundry list but you can see how fundamentally important these advances are to our sense of what it means to be human.

Bill Glovin:

It seems that neuroscience had established itself as an incredibly important part of medicine long before 2002. Why had this Mapping the Field Conference not taken place 10 years or even 20 years before?

Steven Hyman:

I think that's a really important question. Neuroscience, in its early decades, was extremely successful but was largely focused on non-human models that were allowing us to understand how neurons talk to each other, how memories were stored, but much of the important work was done in model organisms ranging from the sea slug, *Aplysia*, which has a simple and tractable nervous system, to rodents. What happened, progressively however, is we began to understand human neuroscience, number one, and number two, to develop very powerful technologies, both to examine the living human brain such as magnetic resonance imaging, which allows both studies of the structure and function of the human brain, but also to develop new interventions directly into the human brain.

Let's take the example of deep brain stimulation, which is now widely used, perhaps there are 200,000 people worldwide being treated with this, but this

involves putting a depth electrode chronically into a person's brain and stimulating certain brain regions, with the greatest success being in treatment of movement disorders like Parkinson's disease and severe essential tremor. It became recognized that some people have side effects of such treatments that change their impulse control or aspects of their personality. I think Bill Safire recognized pretty early that we were entering a new era of the ability to understand and manipulate the human brain as the seed for our thoughts, our emotions, our self-control.

Bill Glovin: What was the takeaway from the conference and how did you get other leaders in the neuroscience world to keep the momentum going from that conference?

Steven Hyman: An important takeaway from the conference was the idea that we really did have to invent a new interdisciplinary approach. Many of the people at the meeting were practitioners of bioethics and they had thought for their whole lives about how do you get informed consent for research or for clinical care from somebody who was in cognitive decline or somebody with a mental illness. How do we protect such vulnerable people?

We recognized we had to supplement that approach with philosophers of mind, with lawyers who were thinking about under what circumstances might we begin to worry about somebody's moral responsibility or legal culpability. We had to include engineers and computer scientists because artificial intelligence was increasingly—even 15 years ago—making inroads in both understanding data about human beings but also mimicking and maybe improving upon some of the things that human beings don't do so well.

The big takeaway was this had to be a big tent and then the second thing is that it was really early days, that this would fall apart unless there was a sustained conversation among people who were anchored in difference disciplines, including, of course, neuroscience.

Bill Glovin: Were there any specific events in brain research that said, "We, as neuroscientists, need an organization?"

Steven Hyman: I think that there was no one. specific event, rather, there were a series of discoveries that, by the way, continue to this day and, while the International Society for Neuroethics (initially just called the Neuroethics Society), was founded 15 years ago, the membership has grown and the field has grown, both inside and outside the society as new discoveries are added that might influence the way we look at our brains and can influence our brains.

For example, recent research on memory editing, which is being conducted in order to perhaps treat people with severe post-traumatic stress disorder but, if one can begin to edit memories that are encoded under strong emotions, there are concerns as well about human identity and human narratives. After all, that's what Macbeth asked Lady Macbeth's doctor for "canst though not

minister to a mind diseased." Anyone troubled by conscience might also want memory editing. These are the kinds of things that really demand a deep subject matter base but also ethical analysis.

Bill Glovin: And neuroethics has seemingly become its own academic discipline in just 15 years. Does that surprise you?

Steven Hyman: It does surprise me, actually. I would say it's emerging as a discipline so, at the International Neuroethics Society meeting yesterday, there were a very large number of young people, some of whom even were doing Ph.Ds in what might be called neuroethics, even if their universities didn't have a designated program yet, many post-doctoral fellows who were working with people who would call themselves neuroethicists. I think it is an emergent discipline. It is really driven by a series of stunning advances in neuroscience and especially in human neuroscience and the recognition that we better be thinking deeply about these things and where they're going because for every advance, there's also potential downside complexities that perhaps people have not yet imagined.

Bill Glovin: You mentioned brain stim, consciousness, and memory. Are there some other areas that might be part of the new frontier?

Steven Hyman: Well, there are whole host of areas. One very interesting area is gene therapy. There were just some approvals for blinding retinol diseases, retina being the most accessible part of the brain, but where one uses a virus that's been engineered to carry a genetic payload to correct something, and it won't be long before we start seeing gene therapy for a variety of brain disorders that initially will be of course very, very severe disorders.

Now, it's important, gene therapy doesn't change your germline, it's not passed on to your children, but it's a direct manipulation of the genetic material in the cells, in this case, of your brain. This could have all kinds of implications, the most important ones being treating dreadful diseases but again, we don't know what manipulating the brain is going to do to somebody's sense of self, their identity, their memory, their self-control?

Another area that is emerging is our advances in deep brain stimulation. To date, deep brain stimulation has involved putting an electrode into somebody's brain and then, the doctor working with the person who has the stimulator, comes up with the best frequency with which to stimulate, it might change over time but it's very much a feedback loop that involves patient report symptoms, observed symptoms, the doctor and metaphorically, the twiddling of dials. But that's pretty inefficient; so, what's called closed loop deep brain stimulation is now very close to implementation, where you can have electrodes that not only "write," that is stimulate, but also "read," that is, you might be stimulating one part of the brain, to let's say, release more dopamine, a key neurotransmitter involved in control of movement but also in motivation and other important

functions, including deciding which memories might be important to encode, and then you have a second electrode somewhere else in the brain that is reading out the effects of having released that dopamine. Then there's an algorithm that feeds back to the stimulating electrode.

Let's imagine that somebody with closed loop deep brain stimulation or read/write electrodes that involve dopamine (and I selected dopamine on purpose because it also involves, when things are overdone, impulsive behavior). Let's say somebody then commits an illegal act; who's responsible? Is the person still a moral agent? Is it the algorithm that's at fault? In some ways, these are very similar problems to the problems of programming autonomous vehicles when they have to choose between two different, inevitable accidents, but this is actually within the human brain. I think the issues raised are profound and require, again, a new kind of interdisciplinary thinking.

Bill Glovin: Last month, Alvaro Pascual-Leone, a colleague of yours at Harvard, did a *Cerebrum* article for us. He spent a lot of time, in the article, talking about the neuroethics issues of it and how people are not using it properly, how it's being commercialized, so that is a great example of someone on the front lines really recognizing all the dangers.

Steven Hyman: I think Alvaro is most concerned, of course, not about these neurosurgically implanted invasive electrodes, which are still very much under the control of medical investigators but also increasingly clinical, but noninvasive brain stimulation apparatus that you can buy on the web or you can make it yourself in your garage. Often, people think that these things are, at worst, harmless and, at best, will advance their cognitive abilities, for example, or make them more alert. But in fact, we have no idea and there's some research to say that even if they work at the margins, perhaps you increase one function at the expense of another function. Not to be too much of a naysayer but I think the idea of exposing your brain to electrical current chronically, without much research, is probably not something I would recommend to a friend.

Bill Glovin: Sure. Since I brought up Alvaro, who are some of the other top thinkers in the neuroethics field? Can you recommend some works to listeners interested in neuroethics?

Steven Hyman: Right now, one of the really exciting things for the development of the field is that there is this global interlocking set of brain projects that are sponsored by government funded research agencies like the NIH, and the NSF, and the United States, but they're brain projects in China, Japan, Korea, Israel, and across the EU. Again, as these projects advance brain research, very explicitly in the United States, an ethical component was mandated, so there's now a neuroethics division of the NIH brain project, which brings me around to your question. One of the important leaders of that is a traditional bioethicist, a very good one, Christine Grady.

One of the founding neuroethicists, meaning somebody who was at the initial Dana Foundation meeting 15 years ago and part of the founding of the International Neuroethics Society, that's Hank Greeley, who really has rooted neuroscience and the law into neuroethics.

Judy Illes, who is just finishing her term as President of the International Neuroethics Society, has just produced a volume from Cambridge University Press on neuroethics; maybe some of the articles are a bit dense, but there is a lot of good background.

There have been no shortage of excellent neuroethics articles in *Cerebrum*.

Bill Glovin: Thank you. Yesterday I was in the audience when William Safire was posthumously awarded the Steven E. Hyman Award for distinguished service to the field of neuroethics. I've never had an award named for me, that seems pretty great. What about your own role? That's just a great honor itself.

Steven Hyman: Yeah, it was. I was really touched. On the other hand, I agree with you, it's very unusual. I worry that having an award named after me means that some people think I'm already dead.

I had actually been an undergraduate philosophy major and then I spent two years at the University of Cambridge doing history and the philosophy of science and was going to do a thesis in philosophy of science, when I decided no, you know what I really want to do is understand the biology underneath these issues that I'm so curious about. I took a circuitous route through medical school into the lab doing neuroscience but the initial questions that I brought with me, and actually I think a lot of neuroscientist are motivated by, which is: "Who am I? How do I think? How do I formulate an identity? How stable is it? How real are my memories? How are they encoded? What does that mean for me as a moral agent?" they lurked, always, inside my mind in spare moments when I wasn't pipetting something in the lab.

Then I had the opportunity to become the director of the National Institute of Mental Health and, while again, the cornerstone of the job was making sure that we were programmatically focused on funding the very best neuroscience, the very best psychiatric genetics, the best clinical trials; and an enormous host of ethical issues arose. They included traditional issues like: how do you do the best-informed consent in somebody who is acutely psychotic (if you want to be able to study that phase) but also issues of what happens long term to children who are treated with psychotropic drugs. On the one hand, you want to control symptoms that are keeping them from learning in school but, on the other hand, what are you doing to their brain development and how do we even get a handle on those tradeoffs, managing some very impairing, immediate concerns where we can see the harm and balancing that against some unknown, possible downstream consequences.

That's just one example but that rekindled my interest. I began writing about these issues, sort of as a hobby. I've written a number of articles about volitional control of behavior and agency in light of neuroscience, often using drug addiction, which is something I had worked on years ago, as an example. When the Dana Foundation crystallized this field, a group of us got together to think about how we would advance it and ultimately formed a society. I had this longstanding interest but I should say, my day job was being a neuroscientist, but I guess maybe it fell to me to be the first president and to be president, actually for too long, but while the society was forming because I'd had these administrative posts and I knew how to make things work and how to put together an organization and read a spreadsheet, things like that, not too elevated but important.

Bill Glovin: Getting back to the society for a minute, besides the annual meeting, what else does the society do, A, and B, how can people get involved if they're interested?

Steven Hyman: Well, I think there are number of ways to get involved, one is to look to the society's really excellent website, which you can find if you google "International Neuroethics Society" but there are lots of good writings that come from the society. One very important activity is the relationship to the *American Journal of Bioethics Neuroscience*, so there's the *American Journal of Bioethics* but it has this special neuroscience offshoot, that's edited by Paul Root Wolpe, who, again, is one of the founders of the society and a very big thinker. It is the official journal of the society, although there are other journals. It has a blog, which is very easy to follow, that is worth looking at.

Bill Glovin: So where do you see the field 15 years from now?

Steven Hyman: I'm actually quite optimistic. I think it will coalesce. I think there'll be some graduate programs and, again, I'm judging that based on the growing power of neuro technology, they're going to demand a lot of reflection in their application; the request from a number of neuroscience departments but also federal agencies to have a "neuroethicist" or people helping them think about these neuroethics issues, combined with the large number of young people who were at the Neuroethics Society meeting yesterday. I think of these bright, young students as the leading indicator that there's something there.

Bill Glovin: Anything else that I have failed to mention that you think is important to this?

Steven Hyman: I think, to come full circle, this is very much an interdisciplinary effort but I think we still have a long way to go in terms of these different disciplines really understanding each other. Very typically at our meetings or in journal articles, you can see polite but serious disagreements between the way criminal law would like to see human volitional control and the way neuroscientists see volitional control. This is an unsettled issue, right, where the legal system is based on the idea that, for the most part, we freely decide what to do and then act according to those decisions, and neuroscientists would, at a minimum,

caveat that a great deal in the way that the criminal justice system would find very, very difficult to manage.

What I would foresee, without knowing the outcome of those discussions, as one example, is this very rich discussion across disciplines that's going to take a lot of twists and turns, and frankly, also has to be international because different systems of law will have different responses to the insides of neuroscience. It's going to be an exciting future.

Bill Glovin:

An exciting future is always a great place to end. An enormous thanks, again, to Steve Hyman, who did just a masterful job of articulating the underpinnings of the neuroethics field. His enthusiasm is pretty contagious, I'd say.

You may have noticed some background and an echo during the last question, that's because people started coming into the meeting room we were in before we expected them to and we had to move out into the hall.

Let me just say that I failed to mention in the beginning of this podcast that Steve has also served as director at the National Institute of Mental Health, or NIMH as it's known in the field. Steve alluded to it at one point.

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