SHOW: Talk of the Nation/Science Friday 3:00 AM EST NPR

October 14, 2005 Friday

LENGTH: 5842 words

HEADLINE: The ethics of engineering humans

ANCHORS: IRA FLATOW

BODY:

IRA FLATOW, host:

You're listening to TALK OF THE NATION/SCIENCE FRIDAY. I'm Ira Flatow.

Remember "The Six Million Dollar Man" and "The Bionic Woman," TV series, where the heroes' powers were heightened with mechanical body parts? Well, today advances in robotics, genetics and nanotechnology are bringing science-fiction scenarios such as these into the realm of the--reality. Scientists have taught monkeys to move a robotic arm using only brain signals. That means perhaps one day paralyzed people fitted with electrodes in their brains--Who knows?--they might be able to do the same, which, you know, would blend the boundary between humans and machines, science and science fictions.

And, you know, there's a new drug out now on the market that treats short stature in kids by replacing a hormone they're missing. Should drugs that make us smarter or boost our muscle mass or make us live longer be allowed, too? What's in store there? Pregnant women today can undergo prenatal testing for a host of genetic diseases, with the option of terminating a pregnancy if a disability is discovered. And while few would argue that preventing debilitating diseases isn't a worthy goal, what if it doesn't stop there? What if parents can someday select for characteristics such as intelligence, height or gender, and perhaps not by terminating a pregnancy, but perhaps by genetic engineering?

So for the rest of the hour we'll be talking about the advances in medicine and technology that may someday allow us to be better, stronger, faster and maybe even disease-free. But, of course, with that future comes also these questions: Do these advances also change what it means to be human? And who will be left behind in our quest for perfection? Probably people who can't afford to get those kinds of treatments. Our number: 1 (800) 989-8255; 1 (800) 989-TALK. As always, you can surf over to our Web site at sciencefriday.com.

Let me introduce my guests. Joel Garreau is the author of "Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies--and What It Means to Be Human." It's out this year, published in Doubleday. He's a reporter and editor at The Washington Post, where he covers cultural revolution, and he joins us today from our NPR studios in Washington.

Welcome to the program.

Mr. JOEL GARREAU (Author, "Radical Evolution"): Hey, Ira.

FLATOW: Hi there.

Joan Rothschild is the author of "The Dream of the Perfect Child," published this year by the Indiana University Press. She is a professor emerita of political science at the University of Massachusetts in Lowell, a research associate at the Center for Human Environments in The Graduate Center at City University of New York, and she joins us here today in our SCIENCE FRIDAY studios in New York.

Welcome to the program, Dr. Rothschild.

Dr. JOAN ROTHSCHILD (Author, "The Dream of the Perfect Child"): Thank you.

FLATOW: Let me begin with you. One application of genetic technology--and I mentioned this in my introduction--is the quest to create a perfect child. Do we all know what a perfect child is, or do each of us have a different idea of what that might be?

Dr. ROTHSCHILD: Well, I think that what's happening is we're--really, the perfect child is a perfect child by default; in other words, that through testing we can find out certain conditions that a fetus may have. I don't like to use `disability' or `defect.' They're such loaded words. And by those criteria, we know what we don't want. And by default, really, we're talking about what we might want. We also do know that when there is sperm selection when people are trying to get a sperm donor, they do actually ask for specific characteristics, and that's where we get into what people want.

FLATOW: You have these Mensa people giving--I've read about these groups and clubs.

Dr. ROTHSCHILD: Really?

FLATOW: Yeah. So we're not talking about just healthy now in this brave new world. We're talking about intelligence, maybe hair color, things like that.

Dr. ROTHSCHILD: Yeah. Well, there's a difference between--for example, hair color and physical characteristics you might be able to match for in a sperm donor, to some extent. But when you start getting intelligence, that becomes a little--one person at a sperm bank in Boston that I talked to on the phone--she said, `Well, we don't have any trouble with that because they're all graduate students and medical students.' And she couldn't see my face laughing.

(Soundbite of laughter)

Dr. ROTHSCHILD: So, I mean, you really can't predict that.

FLATOW: Mm-hmm. Joel, let's talk about--you say we're in a unique time in history when these technologies are aimed inward instead of outward. What do you mean by that, that we're trying to create better people from the inside?

Mr. GARREAU: Well, Ira, for hundreds of thousands of years, our technologies have been aimed outward: at modifying our environment, in the fashion of fire, clothes, agriculture, cities, space travel. Now they're increasingly aimed inward: at modifying our minds, our memories, our metabolisms, our personalities, our kids and what it means to be human. This is...

FLATOW: Why do you think we've changed that way, that, you know, instead of searching--reaching for the stars, we're reaching for the gallbladder or something like that? Why?

Mr. GARREAU: Well, we're going through an unprecedented time in our technology. We've got a curve of increasing change that's been going on since the '60s known as Moore's Law. This is the idea that computer power has been doubling every 18 months since the chip was first invented in 1959. This means we've seen an increase of over 400 million times in the amount of power you can buy for a dollar, and this is opening up entirely new vistas in completely different areas, like genetics, robotics, information and nanotechnology, what I call the GRIN technologies. And these are all aimed at changing what it means to be human. For example, you're going to have a kid coming home in tears in the very near future because he's the--he can't compete with the other kids in school who are more athletic, smarter, better behaved, more beautiful, more capable, better able to get into college. And the reason for this is that their parents have invested in these enhancements which are coming at us in ever-increasing frequency, and you haven't.

FLATOW: What kind of enhancement?

Mr. GARREAU: And that means...

FLATOW: What kind of enhancements are you talking about?

Mr. GARREAU: We're talking about everything--I mean, take, for example, the second-grade daughter whose hand you're holding now. Flash forward 15 years to the time that she's coming back from law school for the first time. If the stuff that's in the labs right now--I mean, right now--turns out to work, her friends in

law school are going to have amazing thinking abilities. They'll be not only faster and more creative than anybody she's ever met, but faster and more creative than anybody she's ever imagined. They'll have photographic memories, total recall...

FLATOW: And how will they get this? Are we going to genetically modify the brains of these kids, or are we going to select for the...

Mr. GARREAU: Probably not. Probably not in 15...

FLATOW: ...sperm or the eggs, or what?

Mr. GARREAU: No. There's a vari--there are these four technologies, one of which is robotics, which means blurring the distinction between the made and the born. It's--right now there are--a guy up in Boston named Matthew Nagle, who is the fellow who is the first human to be able to send an e-mail with his thoughts, and he's also able to control a robotic arm long distance. This is military technology that was originally designed to help pilots fly an F-22, because it's very difficult to fly one of these aircraft with a joystick. How much better it would be, the people at DARPA think--DARPA is the Defense Advanced Research Projects Agency, which is the R&D arm of the Pentagon. How much better it would be if there was a direct mind-to-machine connection between the pilot and the plane, and also, the plane could feed back directly into your brain without benefit of screen or keyboard, so that whatever it senses you'll be able to see and feel.

And this is not just military. Michael Goldblatt, who was in charge of this research, was--he has a daughter named Gina Marie, who's a very talented young lady at the University of Arizona, but she has cerebral palsy. And he's very up front about the fact that he's been spending millions of taxpayer dollars to get her out of her wheelchair, because if you can have a direct connection between mind and machine, there's no reason why those machines couldn't be in Gina Marie's legs. And this would mean disabilities would be as difficult to detect as whatever a person's original hair color might be.

FLATOW: Joan, you've been shaking your head here.

Dr. ROTHSCHILD: Well, I just--I'm just wondering if that can really happen that soon. I'm somewhat skeptical about the fact that we would go that far. And it also would be to a very small part of the population. I guess in my book, I'm really talking about something that's happening much more widespread. And because testing is--the doctors, the gatekeepers, are trying to have every pregnant woman tested. My research is much more in the United States, but there, it's true. And even now, poorer women are getting tested. And the colle...

FLATOW: You mean prenatal testing...

Dr. ROTHSCHILD: Yeah.

FLATOW: ...and you think we can get there by the prenatal testing route?

Dr. ROTHSCHILD: No--well, no. I'm saying that the prenatal testing that we have is--no, I'm not saying that at all. I'm saying that I don't know whether what we are doing now is trying to find genes and--for particular diseases and particular conditions. And I don't see us getting to the next area--in other words, of really genetic enhancement, for a very, very long time, and it would only be for a really very select group of people. That's really what I'm saying.

FLATOW: But Joel, I think, is talking about mechanical enhancement with some of these things...

Dr. ROTHSCHILD: Yeah. Yeah.

FLATOW: ...right, Joel?

Mr. GARREAU: Yes.

Dr. ROTHSCHILD: That's true.

Mr. GARREAU: Yeah. Genetics is only one of these technologies.

Dr. ROTHSCHILD: Yeah.

Mr. GARREAU: And I think one of the things we're missing...

Dr. ROTHSCHILD: OK.

Mr. GARREAU: ...is this curve of accelerated change. I mean, when you're seeing the doubling of these technologies--and not just computers, but genetics--I mean, genetics--we thought that we wouldn't sequence the human genome until the year 2015 at a cost of untold billions, and yet, of course, it happened in 2001 at a fraction of the price. Why? Because you're seeing this repeated doubling of technological capabilities, and what that means is that the last 20 years, by this arithmetic, is not a guide to the next 20 years. It's a guide to the next eight. And then that last 50 years is not a guide to the next 50 years; it's a guide to the next 14. The idea that the future is going to be a linear progression from the past is, I think, an old idea that we can no longer deal with.

FLATOW: But we are--you know, if you think that we're going to be moving in this direction in the next few years, and your kids are going to come home, you know, being more athletically enabled, yeah, we're seeing a--you know, if you look at what's going on with the drugs in baseball...

Mr. GARREAU: Yeah.

FLATOW: ...we're seeing a backlash against that idea.

Mr. GARREAU: Well, there are three scenarios as to how this might work out. By the way, I don't make any predictions in "Radical Evolution." I'm a reporter. I'm just talking about what's in the lab right now, what's being funded right now, and I'm talking about what happens to our society and values when this stuff begins to work, as it already is. For example, within three years, we should have memory pills on the market. There are five US companies now in Stage II clinical trials, and this will do wonders to people with Alzheimer's, but it should also be a commercial blockbuster because, I mean, think of all the baby boomers who are going to want to banish their senior moments--I mean, me, for one. But in addition...

FLATOW: Oh, we don't know if they work yet. They could be in clinical trials, but we don't know if they work yet.

Mr. GARREAU: They work--Yeah. Yeah. I mean, there's--you know, you--they're--I don't have a crystal ball, alas, but when we're looking at thousands of procedures and thousands of researchers, all of whom are aimed in the same direction, which is to fundamentally change the capabilities of what it means to be human, I think we have to ask, `Well, what happens if some portion of this works?' And that's when you get into the three scenarios of heaven, hell and prevail. The heaven scenario is the one that researchers say, `Hey, look, we're talking about banishing ignorance, stupidity, ugliness and even death.' They see this curve going straight up, and they see that with--and their version of it is that within five, 10, 15 years, we're going to be seeing astonishing changes that are essentially indistinguishable from the Christian version of heaven, and they think that's just great.

But of course, there's also the reverse possibility. There are other researchers who say the power that we are unleashing here--what happens if this gets into the hands of maniacs or even bumblers? I mean, there was the case of the Australian mousepox incident where Australian researchers were trying to make a contraceptive for mice because this is the creatures that just run amok in Australia, and they made one genetic change, and they created a monster. All of a sudden they had a virus that was 100 percent fatal to mice. And then they put their research on the Internet where anybody with a reasonably well-equipped biology lab could replicate it. And mousepox is not fatal to humans, but it's a very close relative to smallpox, which obviously is. And I mean, what happens if someone just begins to copy this technology?

FLATOW: Yeah.

Mr. GARREAU: This is where the optimistic version of the hell scenario is one in which we wipe out the human species in the next 25 years or earlier--that's the optimistic version.

FLATOW: All right. Let me give our...

Mr. GARREAU: The pessimistic version is the one in which we wipe out all of life on Earth.

FLATOW: Uh, yeah, we hate when that happens. We're talking this hour about the future on TALK OF THE NATION/SCIENCE FRIDAY from NPR News.

Talking with Joel Garreau, author of "Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies--and What It Means to Be Human." Joan Rothschild, author of "The Dream of the Perfect Child," published by Indiana University Press.

Joan, you been listening. What do you think?

Dr. ROTHSCHILD: Well, again, I can't predict, as Joel Garreau has, about how fast this is happening. It certainly is happening fast. But I think to project ahead that these things really are going to happen and they're going to happen that fast and that those--the people in the laboratories are trying to--are talking about what's making us human. I think that there's a lot of other research going on which is trying to get at genetic disease and so on, and I'm really questioning where our resources are, where we're putting all our resources--not to all our resources, but to some of the resources. And I--I mean, that's sort of his agenda. But the thing that I'm talking about is what's happening in the real world.

And in the real world, in reproductive medical practice, people are making decisions about which children are acceptable and which are not. And that's happening real. That's happening right now. And I think that when we have to look at reproductive medical practice, we do have the tools now--yes, we have the genetics and the technologies to do some of this. And in hundreds and thousands of doctors' offices throughout the country, the doctor, the genetic counselor and the parents, who very much want this, are making decisions, and these aggregate and they add up to the children we don't want and by default the children we might want. The sex selection is a very good example of your template. It's the dividing line. It's making--it's testing to find out the sex for non-medical reasons. All of the other tests are medical; this is social. The others are social in their own way...

FLATOW: Right.

Dr. ROTHSCHILD: ...social and cultural, but these are social. And so this is the kind of thing that's happening, and we should look at that kind of thing, of decisions that are being made on social reasons, and then we get into some of the scenarios that Joel was talking about. But I think we get through it through medical practice, through reproductive medical practice that's happening right now.

FLATOW: It's happening all over the world.

Dr. ROTHSCHILD: Yes.

FLATOW: Even accelerated outside of the US.

Dr. ROTHSCHILD: That's right.

FLATOW: In other countries.

Mr. GARREAU: Right.

FLATOW: Yeah. All right.

Mr. GARREAU: I think there were countries...

FLATOW: I've got about 30 seconds. Go ahead.

Mr. GARREAU: There are countries with other ethical systems than ours that are farther ahead in a lot of these technologies. I mean, the first genetic therapy to be licensed came out of China. The first cloned human embryos came out of South Korea. India has as its stated government goal to try to leap-frog the West in all of these technologies in order to bring them into development ahead of us, faster.

FLATOW: We're going to have to take a short break, and when we come back we'll talk more with Joel Garreau. He's author of "Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies--and What It Means to Be Human." Joan Rothschild, author of "The Dream of the Perfect Child." And we'll come back after this short break, take your questions. Don't go away. We'll be right back.

I'm Ira Flatow. This is TALK OF THE NATION/SCIENCE FRIDAY from NPR News.

(Announcements)

FLATOW: You're listening to TALK OF THE NATION/SCIENCE FRIDAY. I am Ira Flatow.

We're talking this hour about engineering better humans--if that's possible--with my guests Joan Rothschild, author of "The Dream of the Perfect Child," and Joel Garreau, author of "Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies--and What It Means to Be Human."

Joan, how does--give me an idea first of how many pregnant women are being offered these prenatal tests. Is this a large percentage or just...

Dr. ROTHSCHILD: In the United States, women--what's called older mothers--advanced maternal age--35 and over--are definitely offered. Others who are considered--they're considered high-risk, others high-risk who have given birth to a child, for example, with spina bifida. But now in many places, many--most women, an awful lot of women, particularly in California and New York state, we don't have national statistics in this country. You have more and more programs where poorer women, women who are not white and middle class or upper class, are being offered it. I don't have the actual numbers; in fact, it's almost impossible to get those numbers in the United States without a national health-care system.

FLATOW: Different topic.

Dr. ROTHSCHILD: Different topic is right. OK. So that it is becoming more and more--and let me make the distinction. The screening--the triple screening, now the quadruple screen, which is testing the mother's blood for an indication, and then you go to ultrasound and amnio if there is something. So there's a distinction between a screen, which is not diagnostic but merely gives you some idea of a partic--that there may be something wrong, and then you go to testing, to actual diagnosing. So there is a difference there, so then the numbers become much, much smaller. OK.

FLATOW: And having this--let's call it a tool--the prenatal testing.

Dr. ROTHSCHILD: Yeah. Yeah.

FLATOW: How does that change the way a woman experiences a pregnancy?

Dr. ROTHSCHILD: Well, I can give a plug to another book that came out 15 years ago by Barbara Katz Rothman, called "The Tentative Pregnancy," and she did a beautiful job, and it's still there. You find it in the literature, that particularly when amnio is in by about the fourth and fifth week--I mean, fourth month, excuse me--in other words, the middle of the pregnancy, a woman really just couldn't experience her pregnancy without doubt before she had some kind of assurance, some assurance that there might not be somethi--that the child might be OK or that isn't even a guarantee. Whereas--so that--and that still continues. So that it's very trying for women.

The testing is now done much more in the first trimester, which does change the view as to whether a woman will carry the pregnancy to term or not because the abortion is--and by the way, there are really only two choices. There's a choice to terminate the pregnancy or to continue it. There are really no cures, and I think what your first interview did today talked about that, the fact that we really know very little. We've only isolated single-gene disorders. We have not isolated other kinds of conditions where they're multifactorial.

FLATOW: Yeah.

Dr. ROTHSCHILD: So we have a long way to go.

FLATOW: Joel, how close are we to doing any kind of genetic engineering, prenatal genetic engineering?

Dr. ROTHSCHILD: As far as I know, it's not--it would have to be done, though, in the petri dish.

FLATOW: Yeah.

Dr. ROTHSCHILD: In other words, it would have to be done there, and right now that is preimplantation genetic diagnosis is only to diagnose for particular conditions so as far as I know, we are not doing it.

FLATOW: Joel, is this one of the things that your folks--that you've been looking at or working on?

Mr. GARREAU: Well, there's a company called Functional Genetics, and one of the founders of this is Stanley Cohen, who's the guy who basically invented recombinant DNA. And they've got a proprietary

system that works in pigs right now in which you attack viruses like AIDS or avian flu in ways that are completely different from the way that medicine has done this up until now. In the past, we've aimed at the virus throughout the infectious agent. Now they're talking about turning genes on and off so that the virus can't hijack the machinery of the host.

Now this has already begun to work in pigs, and the question is how quickly we're going to need to start accelerating this kind of research in the face of pandemics like the avian flu. This is work that is being funded in a big way and is going commercial where--this is at the venture capital stage. I mean, this is not some kind of science fiction. It's like the work that Rinat Neurosciences is doing in California to come up with a vaccine against pain. Again, they're approaching the initial public offering stage. This is not science fiction; it's like the pharmaceutical industry that expects half of all new pharmaceuticals by 2010 to come out of genetic research. This is all stuff that's happening in the here and now and accelerating.

FLATOW: 1 (800) 989-8255 is our number. Let's go to Michael in Augusta, Georgia. Hi, Michael.

MICHAEL (Caller): Hey, thanks for taking my call. I think the idea of genetic enhancing is wonderful, perhaps even the future evolution of man. I do have a concern, though. The subject reminds me of a sci-fi movie I saw in the late '90s called "Gattaca," and in this movie potential parents could choose the exact specifics of their children, including, like, intelligence, eye color, hair color, physical structure, longevity, etc. And doing this--it created a much better human being, but it also created a new kind of segregation between humans that could afford and those that couldn't. The job force in the movie actually required your genetic data entering the work force, and potential employees either were tagged valid or invalid. And I'm just wondering given this--that it could cause a new kind of human segregation, would this be something that would be available to all people or just the wealthy?

FLATOW: Joel, you talk about this in your book.

Mr. GARREAU: Well, "Gattaca's" a good example of the hell scenario in which--now you remember that genetic selection has been going on for hundreds of thousands of years in every bar on every Saturday night on this planet. We've been doing this for a long time. All we're talking about doing is adding some precision to this matter. The--now the thing about "Gattaca," you know, if you're talking about eliminating Tay-Sachs or sickle-cell anemia, I'm hard-pressed to be against that. But "Gattaca" imagines that everybody becomes blond, blue-eyed and six feet tall. That would really be a bummer.

That's why I'm interested in the prevail scenario, which is neither heaven nor hell. (Technical difficulty) are based on the notion that our future is determined by technology, there's not much we can do about it. Hang on tight. The end. I mean, it would make a great summer blockbuster movie with terrific special effects, but not much plot. Prevail, on the other hand, is the third scenario, and that's based on the notion that the way our future should evolve is one in which we focus not on how many transistors we get to talk to each other but how many creative, unpredictable, cussed humans we get to connect up.

An example of this is--the prevail scenario is what happened during the Dark Ages. I mean, in the 1300s when the plague was spreading, you might have assumed that the species was really cooked, but all of a sudden you had the rise of the printing press, which allowed us to store, gather and spread around ideas in ways that had never been possible before. And...

FLATOW: Well, but I think what Michael was talking about, and then I'll just speak for Michael--if he's still on the line--is if you get to this point, who was--you know, and the kind of racism he's talking about is the racism of people who can afford to select these things and go through the medical hoops and paperwork that it's required here.

Dr. ROTHSCHILD: Yeah.

Mr. GARREAU: Right. Well, there is a hell scenario here in which you could end up in the very near future with three different kinds of humans: the enhanced, who embrace all of these technologies, enhancements; the naturals, who could do it but who choose not to, like today's vegetarians; and the rest, which are the people who for reasons of geography or money don't have access to these technologies and envy and despise those who do. But the thing is that's not the only scenario. These technologies are getting out to the Third World and to the poor vastly quicker than did other technologies like refrigeration or radio or television or cars. I mean, already you can see that this curve of accelerating change means that the price keeps on dropping in half on a regular basis. So in Africa, for example, you've got 30 nations now with

more cell phones than they have land lines. And in the Philippines in the year 2000 and 2001, there was a terrible tyrant by the name of Joseph Estrada, who was basically run out of town by people who were using their cell phones to text-message in ways that brought hundreds of thousands of people into the street.

FLATOW: Well, but a $20 cell phone is a little bit different than a $10,000 genetic procedure, you know, or more.

Mr. GARREAU: No, it isn't. No, it isn't.

FLATOW: Well, for the person who needs to have it...

Mr. GARREAU: Information is information.

FLATOW: ...well, it certainly is, but information is cheap, and you know, and operations are expensive.

Mr. GARREAU: The first genetic sequencing of a human being cost $12 billion. It's not going to be long before that price comes down to a thousand dollars and then a hundred because it's essentially an information process. I mean, there...

FLATOW: Joan, you want to jump in?

Dr. ROTHSCHILD: No. I...

Mr. GARREAU: ...this is not like heart transplant. Heart transplants never got cheap 'cause hearts never got plentiful.

Dr. ROTHSCHILD: Well, the point is that you are--I think that in your book you talk about Robert Silver's book "Remaking Eden," and that's another hell scenario where you have projected many generations further where you will have the haves and the have-nots. He calls it the gen-rich and the gens--and the naturals, or whatever he calls them; that's not important. The point is that I think that that will happen and if we talk about extending technology, we have medical technology. What about AIDS? What about all of the family planning, all of those kinds of things, which are not particularly cures for them or being able to deal with them--are not reaching the Third World? And I think that those are the kinds of things that we do have to concentrate on.

And to get back to Michael's question, I think that "Gattaca" was a terrible movie. I just saw the video of it. I hadn't seen it and somebody gave me the video. And I think it's a terrible movie because it, first of all, that kind of precision really--I mean, maybe somewhere way in the future it might happen. And I think it was very simplistic. And it leads us to believe that there is sort of this--that this kind of future or a very bad one. I do agree with your book about the prevail scenario. Of course, we should be able to control and we should be able to think about what we're doing. But I want us to think about what we're doing right now in medical practice and I--because of so many decisions being made. And I want the bioethicists to start asking real questions instead of supporting the status quo of saying, `Where is our genetic research going? Where are our reproductive technologies going?' I want those questions to be asked on a general basis. It isn't that we shouldn't dream and that we shouldn't think about the future, but I think we also have to think about the immediate future.

FLATOW: We're talking about the future this hour on TALK OF THE NATION/SCIENCE FRIDAY from NPR News.

With Joan Rothschild, author of "The Dream of the Perfect Child," and Joel Garreau, author of "Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies--and What It Means to Be Human." Our number, 1 (800) 989-8255. Erin in Ithaca. Hi, Erin.

ERIN (Caller): Hi, Ira.

FLATOW: Go ahead.

ERIN: Well, I'm calling because my daughter Maggie has a very rare chromosomal disorder. We did not have in vitro testing, although it would not have shown up. And this has become a really personal issue to me because I think had we known during our pregnancy what her disabilities were going to be--she has a syndrome called Angelman syndrome--we probably would have aborted. And she contributes so much to the world. She has taught us so much. I think our humanity has been so enhanced. She's completely non-

verbal and so she's taught us how to listen, you know, in ways we never would have, and I just really wonder if we get to the point where people seem to want to get to of aborting children who aren't perfect, what that means for us in terms of how we accept difference, how we accept disability and how we understand disability as being a fault that must always be corrected rather than something that's just part of being human, and that people with disabilities contribute to the world in so many ways and often force us to look at it differently than we would have otherwise.

FLATOW: Joan.

Dr. ROTHSCHILD: Well, I just want to say to this young woman you've read my book because that is very much my argument, because when I started it I didn't know where it was going to go, and doing the research on people with disabilities has really changed me. I think if I were 35 and pregnant and diagnosed with a particular kind of disability, I still might--I don't know. But the point is that now that I've done the research I'd be much more conflicted. And I think that one of the things that's happened is that people with disabilities and their advocates have become much more vocal to talk about this. What we want to be able to do is put our energies to cure the syndrome that your daughter has, to be able to get to it, and there is a great deal of literature of the kind of thing that you have experienced too. As I said, I don't know what I would have done personally in this particular situation, but I think this is what we have to stop and think about. And again, where we put our resources to do something about some of these conditions that we still have no cure or treatment for.

ERIN: And the part that to me is so important that we couldn't--first of all, we enjoyed our pregnancy and we enjoyed our daughter's infancy because we didn't know there was something wrong. And part of what makes it part of the human experience is that we didn't know, we couldn't plan for it. We couldn't, you know, and stuff happens: earthquakes, hurricanes, right? And that's part of disability too is that, you know, we can't control these things and maybe we're not supposed to be able to.

FLATOW: All right. Thank you for calling. Good luck to you; have a good weekend.

ERIN: Thank you.

FLATOW: 1 (800) 989-8255. So only about 30 seconds left. Joan, a lot of people will be making more choices now because of genetic screening.

Dr. ROTHSCHILD: Well, they may be making more choices, but I hope that they will be thinking about the choices and all of the people involved: the medical personnel, the pregnant women and their partners, and all of the other people in their family and in the human community will be trying to think about this in a different kind of way. That doesn't mean we're going to stop; I am not a Luddite. I--we are not going to stop the science or the technology, and I think it's fascinating and I think it's remarkable. But I think we have to think.

FLATOW: All right. We're going to stop thinking 'cause we've run out of time. Not in the literal sense. Joel Garreau is author of "Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies--and What It Means to Be Human," out this year from Doubleday. He's also a reporter and editor at The Washington Post in Washington. Joel, thank you for taking time to be with us today.

Mr. GARREAU: Thank you.

FLATOW: You're welcome. Joan Rothschild, author of "The Dream of the Perfect Child." She's also a professor emerita of political science at the University of Massachusetts at Lowell, and a research associate at the Center for Human Environments at The Graduate Center in City University of New York here in New York. Thank you for coming in.

Dr. ROTHSCHILD: Thank you.

(Credits)

FLATOW: Always, surf over to our Web site at sciencefriday.com where you can leave us e-mail. Also, you can podcast SCIENCE FRIDAY now and download our podcast. And you can also take it away on Real Audio or on audible.com. And also the SCIENCE FRIDAY Kids' Connection is up there, where we've created free curricula for teachers. Just click on the teachers button, and there it is--back editions of SCIENCE FRIDAY and this program today that you can bring into your classroom.

Have a great weekend. We'll see you next week. I'm Ira Flatow in New York.