Lynn Hershman interviews Myles Jackson
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LH:

What we're able to do in terms of DNA manipulation is truly amazing, but also the ethical, legal and social implications, which have come from this metamorphosis in molecular biology, have been equally fascinating, right.

MJ: I think there are many issues that are at stake. I mean certainly you have the development of molecular biology, molecular genetics. So, you have reasons that are internal to the science. But more importantly, you have really an amazing amount of money being pumped into molecular biology from the federal government, the NIH, for example, but even more so from private foundations, and also from private companies interested in the technological biotech payoffs that come from such investments. One thinks after World War II, physics was the big science and a lot of money was spent by the federal government and also by companies such as DuPont and IBM to further research in physics. And clearly, the…the defense reasons behind that were obvious. With the start of the…the end of the Cold War and start of the new era, so to speak, the funding basically shifted. We still have a lot of funding for…for…for weapons, but there's been an increase in the funding of molecular biology for a myriad of reasons. For health reasons, for example. And as com…as philanthropic entities such as Rockefeller and Carnegie Foundations began to decrease the amount of money that they were able to give to the…to the biological sciences, companies such as Monsanto, or such as Novartis, or Pfizer, vastly increased the amount of money in biotech research.

if you find a gene, isolated gene, and you have a good intellectual property lawyer who will put the application in for you, you may patent a gene. These companies basically will patent genes with the hope that a gene will code for an interesting protein, a relevant protein. If it's for a disease, that's even better. Say Alzheimer's, for…for AIDs. And the idea is if you somehow if other companies need to manipulate the gene or the gene product, its protein, you must pay royalties or licensing fee to the…to the holder of the patent. With Monsanto, Monsanto idea is that they patent their seeds, because they will genetically engineer a seed and take a trait of one…one species, put it into a plant to say convey resistance to a particular bug, or a particular bacteria, or a particular virus that seed is now seen as artificial. It doesn't occur in nature, and they will patent their seeds, and they can (stammering) make deals with farmers in which they can…they will license their seeds to farmers for a particular fee. So, biological entities now are commodities and ways that would have been true say 20, 30 years ago, but not nearly to the extent as they are now.

I mean if you talk to say Monsanto of Pfizer, Monsanto, for example, would say look, we're just taking one gene from a particular species and we're putting it into something else. That's not really all that much. It still really is a tomato plant, for example. It just now has a gene from a bacterium. The bacterium would have been in the soil anyway, so it's really not that much of a difference. The interesting thing if it's not that much of a difference in terms of regulation, how

can you get a patent on it, right? So, there's…there's the artificial verses natural distinction. It also raises questions about ownership, right? Ownership of identity. Certainly these companies go out of their way to say we don't own you, right. We don't really own your genes. We just have the right to use those genes for a 20 year period, which is the U.S. Patent and Trademark Office and…and major trade…major patent offices around the globe from the date of application. And so, we don't technically own say a breast cancer gene in you, but we own the right to test for that gene. And that if you have that gene, you still have to pay us to test for it, because we have a patent on that particular gene. Now, it's I think a slippery argument that doesn't really hold up and it plays with definitions of ownership, because it is illegal, for example, to patent an entire human genome all three times ten to the ninth base pairs, because the…because it was decided that that would be an example of slavery, and that goes against the 13th Amendment to the U.S. Constitution. Now that's about ownership clearly. So, on the one hand, it's about ownership. On the other hand, it's not about ownership. It really depends upon I guess whom you ask at any particular point in time.

And so, given the fact that we can now patent virus genomes and bacterial genomes, the question was well, if there is little intervention needed, how about human? And like I said, there were…meetings were discussed in (stammering) law and in Congress and they said, look, you can't patent an entire human, because that clearly would raise questions about whether or not you own a human, and our 13th Amendment to the U.S. Constitution says you may not own a human. That is you know slavery. And so, one may not patent an entire human genome.

Erasing memory is a fascinating possibility, right. The work that people in Montreal that have come up with a pos…with a particular chemical that can suppress memories, particularly bad memories in particular. I always look at that as a historian with I am always skeptical because of my scientific training, but as a historian, I sit there and say you know bad memories are also important, right. They teach us things. When we do something wrong, we have a bad memory. Punishment, right. If we take away the memory and the punishment, we might continue to (Stammering) behave in an inappropriate way. It's the way in which we learn, good memories and bad memories alike. Another important question as a historian is who has the power to determine which memories are erased, and which ones are not. Memories, like I said, are very powerful things. They…they are part of our identity. They're a part of our history. And when you efface history, as we've known from certain dictators (laughter) throughout history, dangerous things can happen. _____, one of my favorite authors, always said you know you need to tell histories of objects and also histories from those who do not win in order to understand that where we are now is not somehow natural but is a product of certain political, social and economic decisions. And when we efface those memories, we lose the alternatives that could have been, that could have happened in our past. I think it's fascinating topic. But it…what needs to be done is to have the ethical, legal and social implications brought out in…in the public domain and have a debate even more than we had with the human genome sciences. The human…sorry, the Human Genome Project back in 1990 when we had the ethical, legal and social implications of that project discussed. We need more of that and more interaction.

It would be wonderfully utopic if we could, indeed, erase evil things such as racism. The fact that racism seems to be a human thing. Right, we don't have examples of racism in other animals, as far as I know. It's a cultural thing, right. And so the idea of getting rid of racism

biologically seems strange to me. I mean the ways in which one can get rid of racism, surely would be culturally with assimilation and understanding rather than a biological fix to it. It's a cultural problem. It's not really a biological problem per say. Because the interesting thing is that racism is not just biological, and this is a debate that goes on in biology, in the social sciences and the humanities. It's very fascinating to me, I work on a gene that's been patented that codes for a co-receptor that HIV virus recognizes. It turns out that there's a mutation of this one gene. The gene is called CCR 5 and there's a mutation called the Delta 32 D for deletion. And if you have this mutation, the receptor doesn't get expressed on the cell. So, if you think of a lock and key analogy, HIV is the key. The lock is on the inside of the cell, so that HIV cannot infect your cells, right. And then we…it turned out that a number of perm…self described promiscuous gay men had partners who died of AIDs, but after 15 years were still AIDs free. And so they have this mutation. It turns out that this mutation of the allele frequency throughout the globe is…across the globe, is very fascinating. If you go to the island of D_____ in Estonia, it has an allele frequency of 18%. That's very high, right. Other areas of…of Northeastern Europe, 16%. Among Huynh Chinese we haven't found the mutation. Among people, indigenous people of Central and Western Africa, we haven't found the mutation, right. So, some molecular biologists say is this a racial allele? And the allele is being understood in terms of race. The question is what do you mean by race, right? Is there…what's the difference…often in the articles in scientific journals, you read that they…one sees that they use the term race and ethnicity interchangeably, right. And certainly social scientists and historians would say you can't do that, right. And so, the idea that racism is biological is a fascinating idea. I think there certainly could be a bio…certainly a biological component, that…although that… also that has been debated. It's certainly cultural. So, did the notion that somehow you could take a chemical and biologically alter someone's memory, and get rid of racism, strikes me as… as rather hopeful and unlikely.

people talk about cells having memories, right. The interesting bit is whether or not…I mean in theory if cells have memories, if you implant something, you're able to unleash the…the proteins that…that get fired when the enzyme is right and the hormones that get fired with these memories, in principle one could. Now, the next question is can you pass that on to other generations, right? And then you get to the very dangerous area of Lamarckianism, right? The inheritance by acquired characteristics, that somehow something I learned in my life I pass onto the next generation Lamarck, of course, rather famously believe in that. Darwin was originally a Lamarckian and then said no, that there is no such thing as acquired characteristic pass on. The classic example is that you take a…many generations of mice. You cut off their tails and see if their progeny have shorter tails as a result of…of those experiments. And it turns out they do not. But it will be interesting to see if you can pass on memories that you learn in (stammering) your life to future generations that would be an absolutely fascinating and many people would bring up Lamarck's argument again. A Darwinian would say something to the fact that if you… if you had a particularly good memory, you…that…and that has a genetic component, say the ways in which neurons fire, or the number of neurons in connection to which is genetically determined, you could pass good memory on. The…the ability to have a good memory on to future generations. The actual memories that you had, you would not be able to pass on to future generations.

…I think humans are evolving very rapidly and our sense of self and what counts as being human is evolving very rapidly, and I would argue rapidly than any other period in history. Precisely because of molecular biology, biomedical research, we can change, we can begin to select traits, right. For a number of years now with in vitro fertilization clinics, for example, we can…if someone has say Huntington's Disease in the family, a horrific disease that has what's called a genetic penetrance, meaning if you have the (Stammering) mutation, there is a 1.0 chance, a 100% chance that you will have the disease, and it's…we have no cure for it, and it's a horrific death. So people want to screen to make sure that their embryo, the zygote, the fertilized egg, doesn't have that gene. And if it doesn't, then they can implant that in the womb. In a sense, we were selecting for a particular trait. The same thing Tae Sachs, right, or…or Down's Syndrome. Well now, and that's…you know I can very much understand that if…if someone has Huntington's Disease in his or her family, he or she will say, look, I want to screen for these embryos. But what happens if all of a sudden you say I want a blonde…a blonde haired, blue eyed child, right? And we're not that far off from being able to…you know we're beginning to isolate the number of genes responsible. It's actually complex, but for eye color, or eye color, and we get into the notion of designer babies, right. Clearly ethical issues arise. Everyone brings up you know the Boys of Brazil analogy. My question would be other…would be other ones including who has access to this technology? We're in a nation where healthcare is seen as a privilege rather than…than a right. You have to pay for medical goods in the United States. Not everyone has equal access to healthcare. There are a high number of uninsured individuals. And so ethical implications about all of these techniques, who will have access to them, who will have the power to use them or the money to use them, becomes rather critical. And so I think, yes, that which we consider to be human will be changed rapidly as we artificially select (stammering) more and more traits that we wish to pass on to our progeny.

I'm interested…as a historian, I'm interested in how it is that humans understand themselves in relationship to the world. And I've always been fascinated with the ethical, legal and social implications of that. And we are in a time now where, as I said, we can change things in ways that we never could before. We can design who we want to be potentially. And that's something that when I was a child, say 40 years ago, and…and even when I was in high school, I didn't think would have been possible. People talked about this might happen in 150 years from now, right, and then the amazing things that have happened in my lifetime in terms of molecular biological techniques have really caused us to…caused me to pause and say, wow, many of the things that I thought I would never have to worry about, I have to concern myself with. And so, as a historian, I ask myself how is it that we've gotten where we are today? Because much along the lines of someone like _____ or _____, that's a product of socioeconomic, political, cultural decisions. It's not natural. We didn't get here naturally, right. What are the options, right? Where is it that we could have made a different choice? And not only that, why is it that we chose the path that we've taken? And many sociologists and scientists use the term bio capitalism, a sexy term to describe where we are today, which is the amalgamation of biological science and capitalism, where parts of the human body are…are commodities. Genes, for example, are. Cells, cell lines are commodities. How did we get there? What were the factors that led to that? What are the alternatives to such moves? What are the alternatives to the political and…political structures that give rise to bio capitalism? And what are the ramifications of bio capitalism? All of these I find absolutely fascinating.

. The problem is that when you have a patent on a gene, you can actually stymie downstream research on diagnostics and therapeutics, unlike say other forms of intellectual property, copyright. Congress passed a law that says fair use, right. That if you know I teach and I want students to read a chapter of a book, I can put that…photocopy that chapter, put it on reserve with…the library knows the copyright law better than I, and so that's fair access. There is no such thing as fair access in patenting. What the patent owner wants, right, is the patent owner dictates the use. The patent…someone who has a patent can turn around and say yes, you may use my patent for $1, and that's fine. It's clearly accessible, or the patent…patent holder can say I want $100,000 or the patent owner can say no, I'm not going to give you rights at all. I want to keep these rights, right. I want to be very selfish. And precisely one of the major problems is that in patent law in molecular biology, in…in biotechnology, the…the model is chemistry. Chemical intellectual property law. And on one hand, that's fine. It's deoxyribonucleic acid. It's a chemical. On the other hand, it's information. And chemical intellectual property law was developed in the late 19th and early 20th century, was rather creative, because it forced companies to come up with if you patented a chemical in the United States, it forced companies to produce other techniques to come around and produce another chemical that had similar properties but was still a different chemical. So, you could patent around a particular chemical in order to… and again, this generated creativity. You can't patent around a gene, right. So, a patent owner on a gene potentially locks up, has a monopoly that can thwart research and development on…on understanding that gene and understanding that gene's product, mainly the protein.

We started patenting in 1982. There were debates in Europe in particular as to whether or not this…whether genes should be patentable. Not all countries were united in Europe on this. It took a rather long time for the European Biotech Directive to be signed by all countries. France was rather resistant. The argument was in Europe, for example, and also in Japan, that if we don't allow gene patenting, all of the research and development of major pharmaceutical companies, which are now international conglomerates, will move to the United States, and that we could lose a lot of revenue from research to the United States. So it became very defensive, a defensive (stammering) strategy in Europe and Japan to permit gene patenting. It's certainly true that the bar of patentability for genes in Europe is higher than in the United States. They have a higher turn…torpedoing rate, ie., patents that then get overturned than the United States has. So, DNA sequencing companies, which are companies in the 1990s that simply had computer homology readouts of what the gene might be, such as Human Genome Science and such as insight such as Millennium Pharmaceuticals, have hundreds of patents in the United States if not more by now. They're the…they're three of the leading top ten patent holders in the United States. They have very few patents in Europe, because it was much more difficult to get a patent based on say comuter…computer homology. You had to do wet biochemistry. But so they… there are laws in…you can patent in the major patent offices in the world and again, that was seen as a result to the United States granting the first patent, that we don't allow patenting, and a lot of the pharmaceutical companies made this argument, if you don't permit patenting in say countries like Germany, or France or Britain, we'll simply move our research and development to the United States where we know our work is protected.

James Watson actually wrote an **Amecus** Brief supporting the ACLU, saying that you know genes should not be patented. It actually goes back to one of the first, when this issue was raised back in the early 1990s with the Human Genome Project, J Craig Venter was at the NIH, and…

and Reid Adler, who was the head of intellectual property of the NIH, said look, we…we…we need to patent these genes, because of the…the bi **dolact**, which basically says governments, funded…governmental funded research, should be patentable if it is at all…has some kind of utility and it's patentable. When…when Venter announced that at the NIH, that he was patenting these genes, Watson was absolutely outraged and said how in the world can you patent genes? He said it was…you know it...that genes are now sequenced by automatic machines, automatic sequencers. Where is the creativity? He rather famously said they can be run by monkeys. He was as an inventor, was highly insulted, and also Watson warned that if you have a patent on a gene, you can certainly stymie downstream research on diagnostics and therapeutics, which is not to say, I mean Watson has…is on…he's not against the application of science for financial reward at all. He's on a number of boards of…of companies. But he does say that look, if you have patented genes, that's something very different than other forms of patenting, and that it can hinder scientific progress. And a number of scientists have said that. A number of scientists on the GNI work with CCR 5, the gene was patented by Human Genome Sciences, the sequence… they simply found the sequence. They did a computer search. There was a very high probability that it was a chemo _____ receptor, and they patented a very broad utility research. They had no idea that it…that it was used…that it was the co-receptor for HIV until five laboratories, the NIH, scholars here at NYU School of Med…

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