

# Public Policy Crafted in Response to Public Ignorance is Bad Public Policy

*transcribed remarks of*  
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Thank you Professor Rao, and thank you to the students of the *Hastings Law Journal* for inviting me to come to this symposium. I appreciate it very much. I always enjoy being a dissenting voice.

Those of you who are on the California Commission should recognize the statement that I have here on my first slide, because you wrote it. This is from the California Cloning Commission Report that was just published this past week. It says, "Over the last four years, polling in the United States has consistently shown that a large majority of Americans oppose reproductive human cloning." And then you go through a number of different polls, showing how Americans are against cloning. The conclusion is that one thing that is *clear* about human reproductive cloning is that most Americans and most Californians oppose it. So, the question is whether this belief really is as clear as it appears to be.

For the past couple of years, I've been teaching a course at Princeton University for non-science students. The title of my course is "Human Genetics, Reproduction, and Public Policy." It has no prerequisites, so I get students across the range of different kinds of fields. At the beginning of the course last year, I decided to do a survey with a number of different questions. The first question on my survey was, "If cloning technology is perfected and proven to be safe, should people be permitted to use it as a method to have children?" I thought it was a very clear question. This was a computer driven survey with three possible answers. One was, "it should be illegal in all cases." A second, "it should be allowed for infertile couples only." A third choice was that "it should be up to the perspective parents." In other words, that anyone should be able to use it if they choose to use this method of reproduction. The responses that I got are very different than the numbers you just saw a moment ago for the public at-large, but that wasn't very surprising to me. What was surprising is the answer to another question on the same survey. There were about twenty questions on the survey and the students had about a

half an hour to fill out the survey. Later down in the survey, I had a couple questions about in vitro fertilization, egg donors, and things like that. This is the other question I asked: "Should an infertile woman be allowed to produce and carry to term an embryo that contains genetic material obtained entirely from one of her own cells?" What I did was to look at the 35% who said that cloning should be illegal in all cases, to see what that subgroup of students would answer. The answers astounded me. Fifty-two percent of the people who said that cloning should be illegal said that this should be allowed and 48% said no. These are the exact words that I used in the survey. For those of you in the room who are not smiling, this second question directly addresses cloning, but without the use of the word cloning. And this is a group of Princeton University students.

The last *U.S. News and World Report* ranked Princeton University number one in the country in undergraduate education. These are very well educated students. Four years after the announcement of Dolly, 50% of undergraduate students at a top American University (i.e., Princeton University) who opposed human cloning don't understand what cloning is. This is really quite fundamental. My President was very upset, Harold Shapiro, when I showed this once at a place where he happened to be in the audience. He didn't like this slide at all, but I'm tenured, so there's nothing he can do about it. I was actually astounded. I thought that some students wouldn't understand what cloning was, but I was astounded that the numbers were so high. Conclusion number two: Only 17% of Princetonians, rather, 17% of Princeton undergraduates who take my course, not that that is an unbiased sample, oppose cloning. Only 17%, that's quite different than 90% of the country as a whole. By extrapolation, and you can decide whether it's a fair extrapolation or not, members of the public are no more likely than Princeton students to understand reproductive cloning. That's my extrapolation and my very strong opinion is that public policy crafted in response to public ignorance is bad public policy, at the very least. So, what does cloning mean to the public? That's the first question I want to address today. And, the second question is why do civic leaders and scientists play along with public ignorance, rather than try to educate people? This is actually a more interesting question to me. I don't have the complete answer to question number two, but I'm going to try to probe it a bit.

So, what does cloning mean? Well, cloning actually has a sort of mundane origination. In 1903 the word was created. A lot of words just sort of come into being by accident or through use. But cloning is a word that was actively created and published in 1903 by a botanist, a plant scientist, to describe a group of plants that had been derived from cuttings of other plants. In other words, a group of

plants like bananas for example. If you've eaten bananas, you've eaten cloned fruit without knowing it. Any plant that doesn't have seeds can only be reproduced by cloning and so cloning was used to describe groups of plants that have the same genes, that's all cloning meant. Asexual reproduction also takes place in bacteria, of course. There are some scientists that talked about bacterial clones and DNA clones for years, and nobody really cared very much about it.

But all that changed in 1970 when Alvin Toffler wrote a non-fiction book called *Future Shock*. It was a very, very popular book. In this book Toffler took the word cloning and said, "Clones are biological carbon copies." This was a change in the meaning of this word. Before 1970, I've done research on this, the notion of clones as biological copies didn't exist. But from a point in 1970 on, the media began to think of clones as biological carbon copies. This is a non-fiction book, which is why it had such an impact.

In 1996, there was a movie called *Multiplicity* about cloning, but there are many other movies like this in the popular media. It is a really bad movie, even though I make my students see it. There's a great line in this movie. Michael Keaton, the actor, clones himself because there isn't enough time to do all the things in his life. The fourth clone, the one on the right over there in my slide, is the dumb clone, because he's the clone of a clone of a clone. The popular notion that a clone of a clone won't be as sharp as the original comes from the Xerox metaphor for cloning.

Now, in January 1997, people around the world had heard the word "clone." The word was actually derived because there wasn't any other word like it in any other language back in 1903. That is the reason the scientist invented the word cloning. In 1997 people used the words "human clone" in a kind of metaphorical way. They said Tony Blair was a clone of Bill Clinton. People always used it as sort of a metaphor. It was a popular figure of speech. The public felt secure in its knowledge that real human clones—to the public that means biological carbon copies—were still purely in the realm of science fiction. This is what people thought and again they were thinking of real human clones as biological carbon copies.

In February of 1997, that security was shattered with the televised presentation of Dolly, the cloned sheep. What's fascinating is that Dolly appeared to have been created as a whole animal from scratch. There were never any pictures of her as a newborn animal, never any pictures of embryos. The scientists didn't even think about taking pictures under the microscope of the actual embryo or the cells, or of her as a newborn, or of her growing up. All we saw was this adult sheep. What did they expect people to think when they saw this? Not only were there no pictures of embryos or newborns, she was consistently shown on television together with images of

Frankenstein and *Multiplicity* and other examples of mass media versions of clones that had nothing to do with what she was.

So what do our civic and scientific leaders say about cloning? This is where the public image of cloning comes from, so it's not surprising why people think the way they do. George W. Bush, our esteemed leader, says, "No research to create a human being should take place." This was in response to a question about whether human cloning should be allowed. I'm not quite sure what that means, but that's what George W. Bush said a few months ago. But this next quote is worse. We all know that Bush doesn't know what's going on. But Ian Wilmut and Rudy Jaenisch are two of the top scientists in the world. Ian Wilmut was the creator of Dolly. Rudy Jaenisch, who used to be a very good friend of mine, is one of the top molecular embryologists in the country. They published a paper in June where they said, "We would never be in favor of using cloning technology to copy a person." So the implication they're giving is that cloning technology could be used to copy a person. This is what Rudy and Ian said. Now when political leaders and scientists use terms like creation and copying, is it any surprise the public can't distinguish reality from fiction when it comes to cloning?

So what's the reality? Well, I want to show you this picture of two children. They're both about seven years old. One of them is my son and one of them is my clone. It's actually not my clone, it's actually a picture of me at a young age. You can't be sure which is which can you? If you can't be sure which one of those images is me, then you're not going to know a clone when you see one. Now of course what happens to us all is that we look different as we get older. I know I've had the experience of looking in a book of baby pictures and asking, "Is that me, or is that my brother?" You know, you get confused, and we've probably all had this experience happen to us. So you're not going to know a clone when there are so-called clones walking on the streets at some point in the future, and there will be.

Will a "monoparental" child—I don't like the word clone, so I'm going to make up a new word for it—suffer intrinsic harm, in comparison to a "biparental" child? Now the fact is that every day children are born who will look and behave as much like one parent as a clone would. It happens every day. We joke about it, we say, "Oh, your son looks like a clone of you." In fact, the son does look like a clone of you. By chance, sometimes genetic factors come together to make a child look very much like one parent, or act very much like one parent. And what do you say about that? You smile, and you say, "Chip off the old block, isn't that so nice that your child looks like you, behaves like you, and wants to be a doctor just like you?" That's what people say. Now, the critical question is, do biparental children who happen to look and behave like one parent

by chance suffer intrinsic harm? Now, if you don't think so, then this is not a valid objection to monoparental children.

So what will cloning achieve? I'm absolutely adamant that all that anyone will ever get from the use of cloning, or any other reproductive technology, is an unpredictable son or daughter, who won't listen to his parents any more than my children will listen to me. Who could possibly want an unpredictable, uncontrollable child? Who could want such a thing? Well, it turns out that any knowledgeable person who has ever made a conscious choice to have a child knows that all they're going to get is an unpredictable child. Unless they're fools, they know all they're going to get is an unpredictable, uncontrollable child. The biological urge to reproduce is not dependant on being able to predict or control a child. It is based simply on the desire for a visible connection (which doesn't really exist). I don't have time to explain that parenthetical statement, if you want to understand it, you'll have to read my book, *Remaking Eden*. Who could be served by a monoparental child? There are three answers for this, you've heard them all if you've gone to the committee hearings: infertile couples; parents with a child in need of a compatible donor; and, the third answer, which is who I think in the end will end up using this technology (if it gets to the point where it's safe to use), is single women who want to have a child themselves and must use a sperm donor today. Now I am at the age, I'm forty-nine years old, where I happen to know a bunch of single women who have reached the age where they don't have a man in their lives and they want to have a baby. They're looking for sperm donors and they're not very happy about it. Its a very difficult thing to figure out, which sperm donor to use for your child. These women will have another choice at some point in the future. When a safe and efficient protocol is designed they'll be able to ask the question, "Why should I put unknown, unneeded, potentially disease-causing genes into my child when I don't have to?" Aren't family values best served by avoiding extraneous genealogies all together? That's what I think these women will say. These are women who have no man in their life, they don't want a man in their life. They're just using the sperm because that's the only thing they can do right now to have a baby.

What about the claims about the dangers of cloning? I'm here as a dissenting voice. All I'm trying to do is shoot down what other people have said. I'm not saying that the technology is safe at the moment. It took hundreds of tries, these are things you've all heard, before Dolly was born. The Dolly experiment produced hundreds of deformed animals. Dolly was born prematurely aged because of cloning. Dolly is overweight because of cloning. This is what people say. It is on the front page of the newspapers. Dolly has arthritis because of cloning. Dolly sneezes because of cloning. Women

carrying a cloned fetus will be risking their lives. Most of the time all cloned animals are aborted.

I'm a scientist and I look at some of these other things that other scientists are saying and it is an unbelievable misrepresentation of what the science is. I don't have time to go through it all now, but trust me, I'm willing to answer questions later on today. It didn't take hundreds of tries before Dolly was born, it took one experiment. It took 103 tries for the first baby to be born by in vitro fertilization. It took a single experiment to create Dolly. The Dolly experiment produced no deformed animals. Did you ever see them in pictures? They don't exist, they're a figment of people's imagination. "Dolly was born prematurely." That's not true. "Dolly's overweight because of cloning." Well, 30% of Americans are overweight and they weren't cloned, so I'm not sure if that's true or not. I can't say that's absolutely false, maybe cloned animals tend to be heavier, a little bit heavier than other animals. I don't know, so I'll put a dotted line through that one. "Dolly has arthritis." Again, I'm personally getting arthritis in my knuckles. I'm not sure if this is due to cloning. I doubt it based on my understanding of the procedure. "Women carrying cloned fetuses will be risking their lives." This is false from what we know about obstetrics and gynecology. "Most cloned animals are abnormal." Now this is the interesting, very important point that was raised by Rudy Jaenisch, who I respect greatly as a scientist, and this was a really damning point. He came out with a paper in June of 2001, which said that he took ES cells, a certain kind of cell, cloned those into embryos and then those embryos were used to produce mice. Most of the mice were born with defects. There was a certain kind of, I don't want to get into the science, of defect called an imprinting defect. When I read the paper I thought, "Well, if that's true, that's really damning." I mean there's no way this technology could ever be used on humans if that was really the case.

It is lucky this conference was this week instead of three weeks ago, because just last week, January 11, 2002 in *SCIENCE*, not a bad journal, a paper was published with this title, "Faithful Expression of Imprinted Genes in Cloned Mice." So what is going on here? This paper completely contradicts what Rudy Jaenisch said in June. The reason is Rudy wasn't wrong, it's just that the defect he found was not in the cloning process. It was actually in the cells that he used for cloning. So the reason they were defective is because the cells used for the cloning process were defective. If he had used adult cells, like cells from an adult animal, in fact this problem would not have existed. Now the amazing thing to me is that this paper that said that cloning was safer than previously thought was published in a top scientific journal, *Science*, and it didn't even make it into the newspapers. As I said, Dolly sneezes and its on the front page of the

*New York Times*, but this paper saying clones are okay doesn't go anywhere. People don't want to hear this. They want to hear cloning is bad. No technology is risk-free, of course, it's not going to be. A friend of mine named Brigid Hogan made the following statement while talking about genetic engineering. She said, "I think the technique is far too risky and is unlikely to ever be perfected to the stage when it is absolutely 100% reliable, which is what one would have to insist on." She could have just as well made the statement about cloning, knowing what her point of view is.

How rational is this point of view? To answer that question I want to tell you about another reproductive technology, neither cloning or genetic engineering. It's a different reproductive technology but before I tell you what it is I will share some of its risks. Then as lawyers you can decide whether or not we should allow this technology. The risk of serious harm to the prospective mother is 2-10% depending on where the technology is used. The risk of death to the embryo is 50% or even greater. The risk of death to the fetus is about 25% and the risk of a live-born child with serious birth defects is anywhere from 4-12%. So the question for you lawyers is, "Should this reproductive technology be allowed?" Or, as lawyers, should you go tell your legislators to make this illegal because it is too risky? Well, the answer is, if you disallowed this technology you'd have to stop people from having sex without contraception because this is the risk of having babies the old-fashioned way. The twelve percent risk of birth defects comes when a woman is over the age of forty. That's the risk of a birth defect in a baby born to a woman over that age. So the objection to reproductive technologies based simply on the risk to the child evaporates when the technology becomes less risky than reproducing naturally. I don't know if cloning is at that point yet, but I think that you have to be logical and consistent in your assessment of different types of reproductive technologies.

Now, what are the real objections to cloning? I think there are two real objections. I think people are trying to hide the real reasons they are so hysterical about human reproductive cloning. One of the reasons comes to us from a difference in worldviews on the derivation of life. One view is that God molds the human form. This is a pre-scientific point of view, but it is a view a lot of people still hold, that you start with this embryo, this malleable embryo, and God forms the human body out of this. The human spirit comes out of the embryo. In a modern version of this view, it's not God, it is a sort of God within nature, a pantheistic view of the world, that nature forms the human spirit. The first world-view is that embryos come into existence in this kind of a way, either by something that God or nature does.

The other view of the world comes from science: genes guide development through information processing. I have a picture here of my daughter and a monkey to show you that the embryo at that first stage is the same. There's no difference. If you looked at an embryo of a monkey or a chimpanzee and a human being you can't tell the difference at the one-cell embryo stage. They look the same and what a scientist would tell you is that the difference between the two embryos is the genes in those embryos. It is the genes that made them differentiate a little bit different from each other, so you get these two very different beings. A separate half-world view is that genes do guide development, but God chooses the genes. That is sort of between the two extreme world views.

So, what if there's a choice of who controls the genes? That gets us to this half-world view right? Here's what happens: you've got a man and a woman, looking at a single gene, there's a 25% chance of different gene combinations coming from these two people. Another poll: If you had to choose one of the following, who should have the power to determine the characteristics of a child before birth? This was in *Harper's* magazine in 1997. Who should decide, if anyone, which of these gene combinations goes into a child? The American public's response to the poll was: 11% said that parents should be the arbiters; the doctor was 0.7% (we don't leave things in our doctor's hands ever here); "no one" was 16%; and God was 70%. So 70% said it's God's choice. In America the number one choice is God, that's traditional religion. But, the amazing thing to me is that the number two choice was "no one." When I've talked to people who have answered this kind of survey in this way, they say they don't believe in God. They're atheists and they believe in nature, that nature is making the right decision. In a sense, that's a kind of a New-Age religion. Instead of God up there, God's down here within nature.

Now what happens if in the same survey (this is what I did to my students to trip them up) you ask another very similar question? For example, eventually genetics may allow couples to control certain characteristics of their unborn child. If you were expecting a child, how important would control of the following characteristics be to you? So what about disease immunity? Well, 84% said they want to control disease immunity. These are the people who just a moment ago said God had the choice but now they want the choice to be theirs to prevent disease. What about intelligence? Oh, well, 64% wanted to control the intelligence of their child. Okay, again, all of a sudden when you give them an explicit example they change their minds. Sexual orientation? 51%. Gender? 9%. There are these arguments about people wanting to control gender, but that's less important to people than health and intelligence. These are really the most



important things. People are worried about sexual orientation, but the top two are really the most important things. So cloning is a metaphor for human control over God's creation.

There's another cloning movie, a very sophisticated movie called *The Sixth Day*. You should all see it. It is another one of these "create a clone from scratch and have an adult born" metaphors, but it's very sophisticated in the ways it portrays it. Look underneath the movie box and you will see the phrase, "On the sixth day God created man." That's why the movie's named *The Sixth Day*. The notion is that man is taking over what is rightfully God's domain. The political right and the political left are both against reproductive cloning. The political right says man has no right to do God's work. That's what George Bush is saying. Man—of course they always say man—doesn't have the right to do what God should be doing. Man should not be creating life. God creates life. What does the political left say? The political left says people should not interfere with nature—of course they say people not man. People should not be interfering with nature. Both sides think cloning is an example of scientific hubris. I've had people yell at me from the audience many times, they say, "This is hubris on your part." It's very interesting to see what the derivation of that word hubris is. Hubris comes from the Greek; it means challenging the authority of the gods. That's what the word means and in both cases, what scientists are being accused of is going against either God on the right, or nature on the left. "We shouldn't be doing this. We should be leaving this to God or nature," which is really the same thing, depending on your point of view.

The fact is, nature doesn't give a damn about individuals of any kind. Nature gives us AIDS, smallpox and anthrax, all natural substances. Nature is sacrificing innocent children to cystic fibrosis, Tay-Sachs disease and sickle cell anemia, at the mercy of selfish genes. These diseases are not accidents of nature. I've been told by lay people that cystic fibrosis is an accident, but it is not an accident. If you look at the science, cystic fibrosis is a definitive, positive response of nature to selfish genes, which I don't want to get into right now. So nature doesn't care about individuals, it cares about populations and genes. We gladly go against nature to overcome disease. Every time we use medicine to overcome disease we are going against nature.

Scientists know all this stuff. So why are scientists against reproductive cloning? Well I'm going to give you my opinion, not that I haven't already given you my opinion, but this is very, very opinionated. Most scientists don't care about human infertility. They work in the laboratory, they don't really care about people so much, all they want to do is science. Being a scientist is like playing with a chemistry set for your entire life. You're just pouring chemicals,

having a wonderful time. They don't want their basic research impeded in any way, so they see reproductive cloning as giving scientists a bad name. They know everybody is hysterical about reproductive cloning, so what they do is take the moral high ground and repudiate reproductive cloning to show their solidarity with the public at large. Then they hope the public will reward them by allowing them to continue their research into human embryos and stem cells. Unfortunately for the scientists, they're shooting themselves in the foot, if not the heart, because the public is not quite clear about the difference between cloning human embryos and cloning human beings. The result may very well be a ban on all forms of cloning.

I'm going to go very briefly through future reproductive possibilities and ask people what they think about them. What I thought was pure fantasy two years ago, has already been done in mice. Two women want to have a baby together. One woman can obviously produce an oocyte. The other woman can take a cell from her cheek, put that cell into an immature spermatozoa and produce sperm. So, already it has been possible to make sperm from female animals. You then combine the sperm with the egg and produce a child who would come from two parents. This is not fantasy anymore. This is something that could be done in the future. We understand cell biology so well that we could do this. Two women could have a baby. Two men could do the same thing, in fact this has also already been done. One man makes sperm naturally. The other man can take one of his cheek cells and stick it into an immature oocyte. When the immature oocyte becomes a mature oocyte, they put the two together and put it into a surrogate mother. Then you get a boy or a girl. It could be either one at this point. Again, this is a future reproductive possibility. Now for the most extreme possibility. A woman can make sperm. A man can make an egg. They could come together, the man's egg and the woman's sperm, put them together into the abdomen of a man, and out comes a baby. I don't know why anybody would possibly ever want to do this, but in theory this is possible in the future. All of this is possible based on our understanding of biology.

The question is a moral one. Is cloning deserving of a legal ban? Why? In the end, all you get is the birth of a baby from a man and a woman. Even if you're totally anti-homosexual right-wing, what could be wrong with this? In this future, the other thing that will happen is that when you do all these things there will be no reason for cloning except for those single women in their forties who want to have babies.

I'm running out of time, so I want to go very, very quickly. Jeremy Rifkin, Francis Yukiama, Jody Narsekian, William Crystal,

and Steuart Newman—this is the coming together of the far right and the far left—have come together to oppose all cloning of embryos for any reason because they don't like the fact that human life is being reduced to a mere research tool to manufacture products and utilities. I have a quote that I love. It's a wonderful, wonderful quote. "The chemical or physical inventor is always a Prometheus. There is no great invention, from fire to flying, which has not been held as an insult to some God. But if every physical or chemical invention is a blasphemy, every biological invention is a perversion." This is J.B.S. Haldane, one of the great geneticists of the 20th century and he said this in 1923. The same is true today. Times have not changed. Future reproductive technologies will allow a person of any age or sex to have a monoparental baby or a biparental baby with another person of any age or sex, no matter where.

The most important thing I can say to you is that no matter how or where development begins, whether there's any genetic connection at all between adoptive parents and adopted children or artificial insemination, whatever you do, all that anyone will ever get with any reproductive technology is an unpredictable son or daughter indistinguishable from all other children in every way. Reproductive technologies are irrelevant to society. They help individuals. They help individuals build families. In vitro fertilization was supposed to destroy society twenty-three years ago, yet it has no effect on all those people who don't need it. Should expert committees, lawyers, scientists with other agendas and legislators be involved in determining the morality of the different ways in which people may decide to form their families? Or should people decide for themselves? That is something you can decide. Thank you very much.

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