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This episode of World of Ideas featured theoretical physicist Evelyn Fox Keller on the rhetoric of science. When she first set out to be a scientist in the 1950s, Fox wondered why the language of science itself reflected patriarchal, masculine metaphors and values, and what it meant for the discipline. Here, she talked with Bill Moyers about her work on gender and the history of science.



(Photo: Janet Van Ham)

TRANSCRIPT

BILL MOYERS: [voice-over] When Evelyn Fox Keller set out in the 1950s to be a scientist, she discovered it was a man's world. Not only because most scientists were men, but because the language of science itself reflected masculine metaphors and values. Why is this so, she wondered? Trained since then as a theoretical physicist, she has taught mathematics and done research in mathematical biology, but it is her work on the history of science, her book, *Reflections on Gender and Science*, and her biography of the geneticist Barbara McClintock [*A Feeling for the Organism*] that brought me to the University of California at Berkeley where Dr. Keller teaches in the department of rhetoric.

[interviewing] What does rhetoric have to do with science, I thought, when I first heard about you?

EVELYN FOX KELLER: Right. That is a good question. Language, I think, is the mediator of human values and human expectations into our descriptions of nature. And if we want to understand how science reflects—the ways in which science is reflecting back to us particular expectations, particular values, we have to understand, we have to look at the language of science and see how that works, how the traffic between ordinary and technical language works as a carrier of, if you will, of ideology into science.

BILL MOYERS: And one of your chief contributions to this has been that gender plays a significant role in the language that scientists use to describe their work.

EVELYN FOX KELLER: It has played a very, very powerful role.

BILL MOYERS: And by gender you mean—you don't mean sex, that—the given of nature, our biological difference, do you?

EVELYN FOX KELLER: No, I mean ideas of masculinity, ideas of femininity, that the language of sex and the language of gender have been extremely prominent in scientific discourse since the scientific revolution.

BILL MOYERS: And the dominant image has been?

EVELYN FOX KELLER: Well, Henry Oldenburg said it very clearly. The purpose of the Royal Society was to establish a truly masculine philosophy. What did they mean by a truly masculine philosophy? Francis Bacon said, "Let us establish a chaste and lawful marriage between mind and nature." The purpose of this marriage was to bind nature—bring nature and all her children to your service, bind her and make her your slave. That was the purpose of the—

BILL MOYERS: Mind/husband-nature/wife. And the purpose of science was to give the mind, the husband, mastery over nature?

EVELYN FOX KELLER: That's right. That's right. That the central metaphor for the scientific revolution was a marriage between the mind and nature that was modeled on a particular kind of marriage, a patriarchal marriage, the purpose of which was the domination of nature, the bride nature.

BILL MOYERS: And the Royal Society of London was founded in 1662, and didn't admit a woman until 1945.

EVELYN FOX KELLER: [laughing] Yes.

BILL MOYERS: That's letting the language determine your policy for a long time.

EVELYN FOX KELLER: But science had a particular commitment to the notion that there was something special about what they were doing, a special kind of thinking, a special kind of philosophy, a special kind of activity

BILL MOYERS: What was it?

EVELYN FOX KELLER: -that was, in the most general sense, was thinking like a man. It was thinking—it was the idea, it was committed to an ideal of objectivity that was from the beginning equated in a very curious way, the equation between objectivity and masculinity is a very curious equation. And in fact, it was that equation that motivated my entire inquiry. I wanted to understand what does that mean, to say "thinking objectively is thinking like a man"? What could it mean? Where did such an idea come from? And more important, what consequences has it had for science?

BILL MOYERS: There were so many examples of these first scientists, 300 years ago, founding modern science, who used this masculine language to assign masculine virtues to science. Your book is full of them. Which is your favorite?

EVELYN FOX KELLER: The best quote I can think of is Joseph Lanville. He wrote: "That Jove himself cannot be wise and in love may be understood in a larger sense than antiquity meant it. Where the will or passion hath a casting voice, the case of truth is desperate. The woman in us still prosecutes a deceit like that begun in the garden, and our understandings are wedded to an Eve as fatal as the mother of our miseries," He concludes: "Truth has no chance when the affections wear the breeches and the female rules."

BILL MOYERS: He was saying that we have to exclude feeling, empathy, intuition from the search for this—how the world works?

EVELYN FOX KELLER: That's right. But he's doing it by attaching them to the female, to the female voice. He's saying both. Excluding female—we're excluding affection, feeling, emotion, because it's female, and we're excluding females because they bring affection, they carry with them affection. By that equation, by that equation between emotion and female, he is excluding both in one move.

BILL MOYERS: Whatever their motives, the consequences have been significant for science, and for all of us, right?

EVELYN FOX KELLER: Right. Once you have shown how important, how prevalent these images of masculinity and femininity and domination were, the question remains, so what? Right? That's really the question. And it is very clear—let me take the arguments that would be made. One person might say: "Yes, but that's just in the 17th century. We've left that long since behind." Well, the response to that is that we haven't left it behind, it is still with us, and just in case—just as an example, I brought—I looked in my office this morning—

BILL MOYERS: A scientist who does her research.

EVELYN FOX KELLER: -right. I just pulled out, as an example, a quote from C.P. Snow from *The Masters*, in 1951. He's describing the young scientist, Luke, who has just had a breakthrough. "It's wonderful," he burst out, "when you've got a problem that is really coming out. It's like making love. Suddenly your unconscious takes control, and nothing can stop you. You know that you're making old Mother Nature sit up and beg, and you say to her, 'I've got you, you old bitch.' You've got her just where you want her."

BILL MOYERS: Hmm. That's 300 years after the birth of—

EVELYN FOX KELLER: That's 300, 300 years after.

BILL MOYERS: -so what happened was that this, as a consequence of that era, there was created this ideology, that mythology, that objectivity, reason and the mind are male attributes, and subjectivity, feeling and nature are female attributes. But what did that mean to the history of science?

EVELYN FOX KELLER: That's a question, I think, that really is the kind of question that faces all of the history and philosophy of science today, that we have learned — the hard way, I think — we have learned that the notion that science, whatever the motivations of the individual scientist, that science gives us a mirror, a reflection of nature, so that the laws of nature are in nature. We've learned that that picture of science just doesn't work, that that's a metaphor that has many functions, most of them political and social, that it really is not a very good description of the—of actually what happens, that actually, what happens is

that the descriptions of nature, the theories of nature, are very complexly influenced by all kinds of social, cultural, psychological presuppositions.

BILL MOYERS: My friend at the University of Texas, a physicist, Steven Weinberg, talks about the universe as being one of overwhelming hostility. Now, do you feel the universe is hostile?

EVELYN FOX KELLER: Well, how can the universe be hostile? I also quote Steven Weinberg in this same lecture. That's another example. You know — Steven Weinberg is somebody I quoted in my book on gender and science, also, here's a wonderful quote. He says: "The laws of nature are cold and indifferent. We didn't want it to come out that way; it just came out that way." Well, I think that there is a sense in which we did want it to come out that way, that there is a — that the language of hostility, of coldness, of indifference is a human language, and that that human language is written into our descriptions of nature, into what Weinberg calls the laws of nature.

BILL MOYERS: So this is what-

EVELYN FOX KELLER: It's written into the very notion of laws of nature.

BILL MOYERS: -in what sense?

EVELYN FOX KELLER: A law of nature is a very curious construct. It is—whose law is the law of nature? Where does the idea of a law of nature come from? And what is the function of a law of nature? The law of nature, the concept of a law of nature comes originally from the civic realm. Well, first it comes from the realm of God; the laws of nature were originally God's laws. Now, in contemporary science, we don't believe in God's laws, but still, the laws are—have an existence in our imagination, somehow above the phenomena, but the phenomena must conform to the laws of nature.

And this is very important when you think about—actually how physicists work, and how we develop our science. Because what in fact we do is, we—you know, Francis Bacon gave us all kinds of memorable expressions about how we have to "vex" nature, that nature only under the art of vexation will reveal her true nature. Well, we do vex nature, we vex nature quite a bit. We twist and conform—we make—it is no easy task to make nature conform to the laws of nature.

Let me tell you—as a scientist I can tell you that it is very hard work to get nature to conform to the laws of nature. Nature has to—the natural phenomena have to be structured and constrained and twisted and vexed to an astonishing degree, and then they will obey the laws of nature. So what is this telling us about the laws—what are laws of nature doing? What is their relation to other kinds of phenomena?

BILL MOYERS: So when Steven Weinberg says that the laws of nature are as impersonal and free of human value as the rules of arithmetic, you're not objecting to the formula as much as you are to the very language, the very use of the word law to describe the operations of nature. Is that what I'm hearing?

EVELYN FOX KELLER: I'm objecting to both. I'm objecting to the language of laws and also objecting to the notion that they are as free of human value as the rules of arithmetic. I think it's not true. I think there is nothing, it is a fantasy that any human product could be free of human values. And science is a human product. It's a wonderful, glorious human product.

BILL MOYERS: But what about nature? Nature is not a human product. I mean, the natural world is not a human product.

EVELYN FOX KELLER: Yeah, but science doesn't give us nature. Science gives us a description of nature. Science gives us scientific theories of nature.

BILL MOYERS: And in the description of nature, we assign to that description our own subjective experience.

EVELYN FOX KELLER: There is no way of avoiding that. There is no way of—there is no magic lens that will enable us to look at—to see nature unclouded, with—uncolored by any values, hopes, fears, anxieties, desires, goals that we bring to it. There is no such magic lens. We interact with the world, we interact with the world in purposive ways, and it is very easy to see how values, whether they are values that come from an ideology of gender or ideology of class or ideology of—or commitment to militarism, it is relatively easy to see how the values will help guide the kind of question you want to ask.

BILL MOYERS: But you're not arguing, are you, that if there were more women in science, we'd be studying acid rain instead of Star Wars? That's—

EVELYN FOX KELLER: No, no.

BILL MOYERS: —more complicated.

EVELYN FOX KELLER: I wish that were true. I wish all we had to do was to bring more women in science, because we're bringing more women into science now, and then it would change, you know. But no, it's much more complicated, because these social, ideological patterns get imprinted onto the very structure of science. It's a—you know, it has—there's a momentum to the development of science. You don't just come in and change it with—you come into science with a different language, first of all, you don't come into science. I mean, that's the first thing.

BILL MOYERS: You may come in, but leave fairly soon.

EVELYN FOX KELLER: You will leave very soon. So the first point is that in order to enter into this world, you have to become resocialized. So whether you are, you know, you may have had a different language or a different set of expectations or a different set of interests because you were socialized' as a woman or because you were socialized as, you know, working-class, a black, or whether you were socialized as—you grew up in Japan or China. It doesn't matter. When you enter into the world of science, if you want to be a member of this world, you have to learn its language. You have to learn the language of that world. So that's the first point.

BILL MOYERS: Right.

EVELYN FOX KELLER: And the second point is that the language and the goals and the endeavor have a dynamic of its own. If it is the case, as I believe, if it is the case that the language of science shapes the actual content of science, what it—how we employ this wonderful, this wonderful human endeavor, this wonderful human talent, then I think that is far more important in the question of women and science. The question of women and science is important; I don't want to say it's not important.

BILL MOYERS: Right.

EVELYN FOX KELLER: But there are more—given the tremendous role that science plays in the world we live in, the idea that science could be redirected, that there could be changes in the way in which science is done and the way in which it moves, the direction in which it moves, that seems to me of even greater importance. That's my principal argument. And my principal case, my strongest case for that argument, is the story of Barbara McClintock. I titled my biography of McClintock *A Feeling for the Organism*—it wasn't for my agenda that I chose that title. The title was hers. It's her deepest belief that you cannot do good research without a feeling for the organism. A feeling for the organism was her refrain.

BILL MOYERS: But what do you mean, Dr.

EVELYN FOX KELLER: "a feeling for the organism?"

EVELYN FOX KELLER: I mean, the ability to identify with the subject of study, to feel kinship with the subject that you are studying, instead of feeling engaged in a battle, in a struggle, in a state of opposition.

BILL MOYERS: And you really feel that's primarily a female mode of approaching science?

EVELYN FOX KELLER: No. I believe that it's been called a female mode of approaching science. I believe it is a human virtue, a human talent. We're talking about empathy, the capacity for empathy. I don't think that women have a corner on the market of empathy. I think that all of us are capable of empathy, although I do think that it's not a talent that is very well developed in many men, because of the ways in which they're raised. But it is precisely because it has been identified as a feminine virtue, as a feminine talent, that it has been excluded from science.

BILL MOYERS: Can you give me some specific examples? I mean, I can think of some very obvious ones. I think of the first atomic bomb was called "Fat Boy," and it was delivered from the womb of a bomber named "Enola Gay," a female delivering a weapon of destruction. But that's probably too extreme an example for you.

EVELYN FOX KELLER: Well, isn't it extraordinary—that metaphor. I mean, what do you make of it? That was a metaphor that really, really plagued me.

BILL MOYERS: I make of it that men were at war, and men were the scientists who invented the atomic bomb, and they gave it the name they would give something if they were playing in a schoolyard.

EVELYN FOX KELLER: Yes, except that the idea of the metaphor of bomb as baby is to me more than something a kid would do in a schoolyard. I mean, that carries, for me, far more import.

BILL MOYERS: And as you pointed out, the bombs with the thrust are called boy babies, and the bombs that were duds were called girl babies.

EVELYN FOX KELLER: That's right, that's right. That's right.

BILL MOYERS: It isn't just the 20th century, though, is it, Dr.

EVELYN FOX KELLER:? I mean, I think of Mary Shelley writing *Frankenstein*, carrying on that—depicting that story of the mad scientist down in his basement pursuing the secret of life, discovering the secret of life.

EVELYN FOX KELLER: Right.

BILL MOYERS: And then turning the secret of life into something monstrous.

EVELYN FOX KELLER: The difference, of course, is that that was a story.

BILL MOYERS: It was a story, but stories get at meanings. And here's a—I've often wondered if this was a woman's view of science, Mary Shelley writing Frankenstein as a parable about how a woman, or perhaps many women, saw science, pursuing perfection and finding instead the monster that destroys the creator.

EVELYN FOX KELLER: Except that that's a story, a fantasy that has been embraced by many men. I mean, that story, the popularity of that story, Mary Shelley wrote it, but who reads it? Who reads the story of Frankenstein? That myth, that idea, that men, in seeking the secret of life, in seeking the power to create life without women, that's really what that story is about. It's the—that, along with many other stories. It's about the co-optation of the procreative function by men. It's a story of dispensing with female procreativity. That's what that story is about. And what does it result in? It results in a monster—not the secret of life, but a monster who becomes the secret of death. It becomes an agent of destruction. That theme is with us everywhere, that theme that—and that was my interest in the metaphor of bombs as babies, that the idea that when men succeed in discovering the secret of life, in taking it in their hands, they will produce babies that will be agents of destruction. They will be the instruments of death. That is a cultural myth. That's a cultural motif, and not just our own. It's a motif that you find in many, many cultures. That's a very archetypal story. It isn't only Mary Shelley's story. But stories are very powerful, and they speak very deeply to our deepest anxieties, our deepest desires. Still, there's a difference between a story and the actual construction, technological structure. And I think these stories have had a lot to do—they tell us a lot about the motivation that has led us to the moment in time when we can all but create life out of a test tube. We are engaged in this activity, in this interaction with nature, if you will, with natural phenomena. We are seeking knowledge. For what? To what end? Knowledge—we are always we are very purposive creatures. Some people will say—I think McClintock would say, many other people would say we are just in it for the understanding, for the sheer understanding. And that's very beautiful, and it's very nice, and I can really resonate with that. But understanding always has consequences. For example, take the human genome project. The purpose of the human genome project is to give us a complete readout of the human genome so that—it's not just for knowledge, why you know, why do we want a complete readout of the human genome? Why not a readout of all the molecules that make up our solar system? Why do we want the human genome? Well, we—it has, it's not just for understanding. It has a purpose. We think it will give us better control over the genetic constitution of the human race. People say, "Well, it will help us cure disease." I think—I don't believe it. I mean, not many people do believe it.

BILL MOYERS: Right.

EVELYN FOX KELLER: The real purpose of the human genome project is to gain—is to fulfill a vision of control over the future course of evolution. I mean, that's putting it very baldly, but that really was the vision that inspired the early development of classical genetics and molecular genetics. The idea was to get the future course of human evolution in one's hand, and that's a very extraordinary vision, that it speaks to a kind of control, a degree of control that one would not think of having in relation to a subject that one had a more erotic, more interactive, more reciprocal feeling—engagement with. That is control in the sense of—in

the Baconian sense of domination, that nature is there to be steered, to be directed, to be—now who are we to steer and direct this—the future course of evolution?

BILL MOYERS: It's very biblical, you know, men interpreting their mission from God to dominate the Earth.

EVELYN FOX KELLER: That's right, it is biblical. It is exactly biblical. And scientists have inherited that mantle, that we don't need God anymore because we are doing it.

BILL MOYERS: But as a biologist, are you not curious about what will be learned from the human genome project?

EVELYN FOX KELLER: Of course I'm curious. I think that—you know, I have no doubt that it'll be tremendously interesting and tremendously useful. But it will not—first, I do not think it will fulfill the fantasy. I do not think you can control the course of evolution by getting your hands on the genes, because I don't think the genes are where everything is at.

BILL MOYERS: The public at large—there are people in the general public who think of this project as giving us the power to create the perfect human being, you know, that ultimately, down the road we'll be able to connect way back in the genetic chain the potential for a disorder in that child that's emerging so that we'll avoid the crippling disease.

EVELYN FOX KELLER: Right. It is the desire for perfection, there's no doubt about it.

BILL MOYERS: But that's driven us for how many centuries now?

EVELYN FOX KELLER: Oh, many. And very productively, you might say. But also dangerously. I mean, that—in the 20th century, we can't speak—any longer speak of the glories of science as an unmixed blessing. And it's cost us and it endangers us, and it also empowers us. And the question is whether we can harness this resource or we can redeploy this wonderful creative resource in ways that would be more productive for the future survival and well-being of humankind.

BILL MOYERS: [voice-over] From her home in Berkeley, California, this has been a conversation with Evelyn Fox Keller, I'm Bill Moyers.

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