

Selection in relation to sex

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GEOFFREY MILLER: My goal at this point really is to take evolutionary psychology the next step, and to apply standard of evolutionary theory as much as possible to explain the whole gamut of the human mind, human emotions, human social life, human sexual behavior as much as possible. I'm especially interested in looking at areas that have been relatively ignored or overlooked in the standard evolutionary psychology so far.

For example, in Steven Pinker's book *How the Mind Works* there's a very good discussion of vision, memory, and emotions, but some of the most interesting aspects of the human mind, such as art, music, humor and religion tend to get relatively slighted, and it's apparent that we don't have very good explanations of them yet. I'm very interested in applying sexual selection ideas to explain some of those areas, but I'm quite open to any new ideas that come along that take seriously those aspects of human nature that have not been taken seriously before.

Another thing I'm interested in at the moment is trying to create more cooperation between evolutionary psychology and behavior genetics, especially for understanding the mind, and distinguishing between parts of the mind that are truly universal, where everybody's got the same structure, versus parts of the mind where there's significant variability between people, and where some of that variability is genetic. There's been too much hostility between behavior genetics and evolutionary psychology, too much mutual misunderstanding.

Evolutionary psychology is studying human universals. Structures and adaptations in our minds where everybody's got the same stuff, everybody has the same abilities. Behavior genetics is traditionally studying differences between people—for example, differences in intelligence, differences in personality. And, their aims have been different.

Behavior genetics tries to figure out, are the differences between people due to genetic differences, or environment differences? And so far the answer seems to be, as far as we can tell, surprisingly, the genetic differences are very powerful. And evolutionary psychology just hasn't coped with this news yet, and is not making the best use of powerful new DNA research methods from genetics. And there's serious unresolved questions about the nature of human intelligence itself.

We know from intelligence research that there is such a thing as general intelligence—there's a *g* factor—people differ on this dimension that accounts for hugely important things, like success in education and real life, and we know that people who tend to be good at certain kinds of mental things like having a large vocabulary also tend to be good at other mental tasks such as mathematics, or spatial navigation. Why are there these correlations between mental abilities?

People have the mistaken idea that general intelligence, as it's talked about in intelligence research, is somehow contrary to the views of evolutionary psychology. The evolutionists say our minds are a collection of different capacities; different adaptations for doing different things. And from that point of view there's no such thing as a general intelligence that spans these capacities, or that sits on top of them directing everything.

That does not actually conflict with what intelligence researchers think. The best intelligence researchers admit there's no such faculty as a general intelligence; this *g* factor is just a statistical abstraction, it just captures the ways that people who are good at one thing are also good at another thing. There's a fight now between intelligence research and evolutionary psychology that doesn't have to exist. It's easy to solve; I hope we can have a conference about it soon, and both fields will be better off for resolving that confusion.

Some of the leading evolutionary psychologists, like Steve Pinker, Leda Cosmides, and John Tooby, have a very good understanding of the mind's architecture but they sometimes don't seem up-to-date about individual differences and about intelligence research. On the other side, some of the leading intelligence researchers, like Arthur Jensen, Ian Deary, and Robert Plomin, understand that the mind might be a collection of different capacities, but they're also starting to find powerful indications that different people have different brains that operate at different degrees of efficiency, and some of those efficiency differences are due to genetic differences.

The study of human intelligence is really explosive, ideologically, politically and socially. It was a good strategy for the early evolutionary psychologists to distance themselves as much as possible from genetics, from individual differences, and from the study of intelligence, because they could avoid all of this political fire storm surrounding those issues, and they could get on with the job of describing human nature, where it comes from, how it works, why it's there. But evolutionary psychology is now established, and we don't have to make the same mistakes and we don't have to be as cautious and shy about avoiding some of these controversial issues.

EDGE: You and your colleagues may not make the same mistakes but there are countless zealots with different political, religious, and class interests who will be more than happy to make them for you.

MILLER: There are serious considerations, serious downsides to studying individual differences. Evolutionary psychology has been successful in teaching people how to think properly about sex differences already, which used to be a really contentious area. Now people are starting to cope positively with the idea that there might be important differences between male and female psychologies, especially in terms of social and sexual behavior -- and that used to be a totally taboo area, that used to be outlawed, to talk about evolutionary or genetic differences between the sexes. People's sophistication about the sex difference issues is starting to catch up with the sciences.

In the area of individual differences, it's going to be a really hard fight to teach the general public the concepts and attitudes that they need to properly understand research in this area—to properly understanding the genetics.

One thing to understand is some of the positive sides, especially for parents, of understanding the importance of genetic inheritance and individual differences. Now, toy manufacturers and purveyors of educational materials are doing a very good job of convincing parents that they have to give their kids the optimal environment for intellectual growth, and that if they don't spend the money on the right toys, the right child care, the right private schools, and the right universities, then the child's going to be a failure. And that if they don't push their child and motivate them, and be worried for the entire time that they're growing up about what they're going to become, then they're going to be failures.

That's completely the wrong attitude, and Robert Plomin has been very good at pointing out that the more you understand about genetics, the more you can just relax and love your kids for who

they are, and who they turn out to be, and the interests that they show, and you can abandon this idea that the kids are born as formless blobs and you have to shape all of their desires and their capacities yourself. It removes some of the burden and anxiety from parents.

Also, for educational policy, understanding individual differences is absolutely crucial. In Britain we have things called league tables for ranking high schools. They rank them by the outcome of high school exams called A levels. Always the private schools that cost the most come out at the top of the league tables. Of course, they might come out because they're taking in brighter students, and the brighter students do well and it has nothing to do with the quality of the teaching.

To properly measure the quality of education, the quality of teaching, you have to measure what the students are like when they come into a school and then what they're like when they go out. You have to have a value-added measure. The only way to do that is to have some good tests of their capacities and their knowledge when they come in. At the moment nobody's doing that in Britain, and very few people are doing it in America. It's going to be difficult for people to cope with ideas that there are just a few measures that can describe—not just their intelligence but their personalities, and that some of those differences might be relatively stable across their lifetime, and relatively hard to change.

But look, in a sense we all know this already, and we especially know it for other traits, like physical attractiveness and height. Kids are growing up and they sort themselves out into little social hierarchies based on all kinds of things, and we all have to learn to cope with the traits and abilities we have -- how physically attractive we are, how tall we are, how athletic we are -- as well as what our intellectual capacities are, and what our personalities are. It will be nothing new coping with this new marriage between evolutionary psychology and the new genetic research. It's just a matter of learning to be realistic about ourselves in an area where we've been allowed to get away with wishful thinking for a long time.

EDGE: Let's talk about sex.

MILLER: It's extraordinary what's been happening in biology, and so few people in the social sciences know about it. Over a century ago Darwin's idea of sexual selection through mate choice published in his best book, *The Descent of Man and Selection in Relation to Sex*—that was the full title—the book came out and this wonderful idea of female choice—the idea that female animals of many species choose their mates for all kinds of traits, not just physical appearance, but behavioral traits, songs, and dances, and courtship behaviors.

A wonderful scientific theory that Darwin advanced hundreds of pages of evidence for, and it fell like a stone and was widely rejected by Victorian biologists, who refused to believe that this psychological process of female choice could be a causal force in evolution.

This theory of mate choice languished in a sort of scientific limbo for over a century, and it's only been revived in biology in the last 15 years, but its rise has been meteoric; it dominates the best evolution journals, the best animal behavior journals, and everybody who works in a biology department knows that the study of mate choice is now the hottest topic in the study of animal behavior.

This revolution has passed psychology and social science by almost completely. All of psychology, anthropology, the humanities, political science, economics in the 20th century, developed without any understanding of how sexual selection could have shaped human

behavior. It was just not on the table as an idea. Everything that we are, every aspect of human nature, had to be explained through survival selection—natural selection. And that imposed such serious restrictions on what we could explain—it seemed easy to explain tool making; it seemed hard to explain music. It seemed easy to explain parenting, but hard to explain courtship.

All that's changed now. We've got from biology some powerful new principals about sexual selection that are just ripe for applying to human nature. That's what I'm trying to do; lots of other people are doing it as well, and it's the most exciting area to be working on in psychology at the moment.

EDGE: Examples?

MILLER: This revival of sexual selection in biology was of course promoted very strongly by people like George Williams, E.O. Wilson, an ingenious Israeli biologist Amotz Zahavi, and many theoreticians working alone in their offices writing down mathematical proofs showing that sexual selection could indeed work, just the way Darwin thought.

Some of the exciting new ideas coming out now are that many of the traits we're selecting when we choose a mate are not just arbitrary traits, they're not random, they're not meaningless, but they're actually powerful indicators of things that matter in reproduction—that a lot of beauty is really an indicator of health and fertility, and a lot of traits that are psychologically attractive to us, like kindness, warmth, creativity, intelligence, imagination, also are not random but actually are indicators of somebody's ability to get along in the world—not just physical world but the social world, and that in choosing a mate for these psychological qualities, we're insuring that we have a partner with whom we can have a constructive relationship, rear successful offspring, and to pass their better than average genes on to our children.

What we're seeing here is in studying how people choose their mates, not just for physical appearance but for all these rich psychological traits, it's a wonderful confluence between evolutionary biology, personality theory, and evolutionary psychology. And that to me is very exciting.

One of the great surprises for David Buss, one of the leading evolutionary psychologists studying mate choice, was that when he did his wonderful study in the late '80s of sexual preferences in 37 cultures all around the world, giving questionnaires to 16,000 subjects that just span all sorts of cultures with all sorts of languages with different traditions and different histories, he found that in every culture, the top two most desired traits in a mate, for both sexes, were kindness and intelligence. It wasn't physical appearance, it wasn't money, it wasn't status, it was these psychological traits, and these are universally important. They're also the two traits that Darwin tried to explain about our species—why are we so nice to each other and why are we so smart? (Relatively nice, compared to other primates.)

And that's fascinating, that two of the major traits that distinguish us from other primates are the same traits that we search for in mates—that are currently under the strongest sexual selection. My hypothesis is that they're not just under sexual selection now, but they have been for a very long time, perhaps hundreds of thousands of years, and the reason we're so smart and so relatively kind to each other is that our ancestors who were smarter than average and kinder than average attracted more mates and higher quality mates.

Another interesting question is about language. Language is a really tricky case because, as Steven Pinker has pointed out, language is extremely useful for many functions. You can tell your friends how you're going to hunt an animal and cooperate on tracking it down. Women can tell their friends where the best roots and berries and tubers are growing this season. Parents can tell their kids all sorts of useful information as they're growing up.

But of course the principal way that people court each other is through language. Human courtship is largely through conversations. It would be foolish to say that sexual selection was the only force shaping language; clearly survival selection and many other forces were shaping it as well, but I would claim that some of the more mysterious aspects of language can be understood only by thinking about how language is used in courtship.

A project I'm very excited about at the moment is trying to understand why humans have such large vocabularies. The average human knows about a hundred thousand words by adulthood. That requires memorizing arbitrary patterns that relate sound to meaning. It requires memorizing ten words a day every day from age 18 months to age 18 years, and that's a fantastic feat of learning. There's nothing else like it that humans do. The funny thing about that vocabulary is how little of it we use in ordinary conversation. We get by in our day to day speech with just a few thousand words counting for 95% of all the words that we say.

There's a tremendous number of words we've learned that are not used very often but that we bothered to memorize, that don't seem to be very useful in ordinary day to day life, but that we still sometimes use with each other—and those are the words that I want to explain—not the 5,000 most useful words but the 95,000 ornamental words. My prediction is, people mostly use them in courtship. They use them essentially to show off, they use them to show how bright they are, how good their learning ability is, how good their memories are for words.

We know in the brain where these words are remembered, roughly in Wernicke's area, in certain parts of the left hemisphere, we know that there's specialized brain machinery for learning these words; we know that vocabulary size is an extremely powerful indicator of intelligence—this is why vocabulary items are used in IQ tests; within a few minutes of conversing with somebody you use the vocabulary that they're producing as a pretty good indicator of how intelligent they are—so it's an extremely useful thing to use in mate choice. The hypothesis here is that vocabulary size itself has been strongly shaped by sexual selection, and that most of the words that we know have been learned not because they're useful for survival, but because they're useful for courtship.

Another mystery is why we enjoy music so much—and this is one of the questions that Nicholas Humphrey has asked in the EDGE forum. Music has such powerful emotional impact, and nobody has ever found a good survival function for it. The very first serious conference on the evolution of music only took place last year at a wonderful little town called Fiesole, Italy, in the hills overlooking Florence. It became abundantly clear to me at this conference that there were amazing parallels between human music and bird song, and whale song, and all the other complicated acoustic signals that animals send to each other—even gibbon song. The most musical apes are gibbons who do wonderful duets, long calls that they give to each other, especially to their sexual mates.

Wherever you're looking in nature, if an animal is producing a complex acoustic signal it's almost certainly a courtship signal, it's almost certainly involved in sexual selection. We know this for bird song, we know it for whale song, and we know it for gibbon song.

Darwin thought the same should apply to human music, that human music was largely an outcome of courtship displays. That's a wonderful overlooked theory, and it's surprising that people have scrambled for a century, coming up with all kinds of silly hypotheses about music functioning to make people in a group feel closer to each other and to facilitate group cooperation, for example—that's a favorite idea. If you go to any nightclub in London or New York or Berlin or Tokyo you can see the proper context for understanding music's function. Although it's done in groups, the point of it is individual display.

Music combines exactly the features that an evolutionary biologist would predict—for something that indicates an individual's creativity, motor control, self-confidence, and lots of other traits that are important in courtship. Music is a system of basic elements, notes, that are combined according to certain principals of rhythm, tonality, and we know that the basic principles of rhythm and tonality and melody are universal and cross cultures. Even though many of the musical styles are different. And that people can demonstrate their coordination and virtuosity, both as musicians and dancers, by using this system that has stereotyped basic units.

The essential thing about rhythm is that you can see whether somebody is rhythmic or not, whether they're coordinated or not. If rhythm didn't exist it would be hard to tell whether somebody was keeping to a regular beat, and whether they could coordinate their body and their musical productions according to a regular beat.

To tell how good somebody is at something there have to be some rules, there have to be some regularities, but for them to demonstrate how creative they are, how innovative they are, they also have to be able to play around with those basic elements, and play around with those rules. Music also provides great scope for that—for melodic innovation, for improvisation, for producing innovative lyrics, for producing unusual timbres when you're singing, or playing an instrument. It's the perfect display, really, for sexual selection theorists. Art and language and many other display forms that we have follow some of the same rules—we combine basic elements that are stereotyped in ways that are innovative, and that's a recipe that you need to indicate your quality to a sexual prospect.

EDGE: Where do you see your work going in the next few years?

MILLER: It's fine to talk about all these just-so stories, these evolutionary hypotheses, about why this evolved, why that evolved. Evolutionary psychology is getting much more sophisticated about the methods it uses, experiments and observations, to test some of these theories; the wonderful thing about mate choice is that there are already a large number of methods that biologists use routinely to study animal mate choice that are just starting to be applied to human mate choice. But equally important, there are a lot of methods for studying these courtship displays themselves—to see whether their features and how do their features indicate the quality of the person producing them.

What I want to do next is really try to cash out my hypotheses about art and music and language and ideology as courtship displays, to see do they really have the necessary features to really indicate the things about a sexual prospect that need indicating. This is going to require basically measuring lots of correlations—seeing is vocabulary size really a good indicator of intelligence? Is it a costly display that indicates your quality? Is it noticed, do people pay attention to it?

The reason why I'm trying to get my ideas better known in evolutionary psychology and amongst the general public now is that testing big hypotheses like this is too large a job for any

one individual to do—it requires cooperation between dozens or hundreds of people. It took one person to think up Darwin's sexual selection idea, but it took hundreds and hundreds of theorists and animal experimenters to actually show that his theory works. The same is true of trying to apply Darwin's sexual selection ideas to understand human nature.

EDGE: What biologists are at odds with your set of ideas?

MILLER: Unfortunately there are a great number of biologists who shy away from applying evolutionary theory to the human mind. A large part of it is a failure of nerves—that they're comfortable getting grants to do research on animals, and those grants might be threatened or compromised if the public understood that the theory that they're using for animals applies equally for humans, and have some challenging and thought—provoking indications for humans.

It's very comfortable for biologists like Stephen Jay Gould, or Steven Rose, to write about evolution in general and animals in general but to draw a line around the human mind and try to keep it immune to analysis, try to keep it essentially outside the domain of science itself. I'm a believer in the unity of science, I don't believe there should be any artificial boundaries drawn around anything. I'm interested in pushing evolutionary theory absolutely as far as it can go into the deepest recesses of the mind, into consciousness, and intimacy and romance, and our self-concept, and things that really matter to us.

I'm also interested in pushing evolutionary theory into domains like intelligence that might be politically explosive but are extremely socially important. It's time we grow up; it's time to face the music and to confront these issues. There's never been a time before when as many people are reading popular science, or watching science television, or expressing an interest in science, and when the sophistication of public understanding is really taking off now. People are ready to confront these, and it's patronizing for some biologist with a vested interest in intellectual status quo to try to keep the human mind out of bounds, to try to keep it outside science.

EDGE: Status quo?

MILLER: Science is interesting—it's powerful at what it does, but people credit it with far too much ideological importance. Basically people believe what they want to believe politically. There's even evidence from behavior genetics that mostly people's political ideologies are genetically inheritable. Whatever context you grow up in, to some extent the kinds of attitudes and beliefs you have about political issues and social issues, does not seem terribly much affected by the intellectual environment that you're exposed to—people pick up the ideas that fit with their preconceptions and they reject those that don't.

It's a big mistake to credit science with too much importance in shaping people's attitudes towards other people, towards government policy, towards social priorities—once you know what social priorities you want to pursue, science is very helpful in suggesting effective ways of pursuing them.

It's also a big mistake to confuse science with ideology. Ideologues always pick up whatever science looks like it will fit their cause and they distort it and present it and support it and they'll try to use it to convince others, but that doesn't mean that scientists should go around trying to censor themselves for fear that their ideas will be picked up and used by the wrong people. The wrong people always pick up and use any ideas they want in the wrong way. There are so many

ideas out there anyway that good people can already do good with the ideas at hand and evil people can do evil with the ideas at hand.

Let's take one rather provocative piece of research. There's some evidence from behavior genetics now, some evidence, not a lot, but a little bit, that happiness itself is somewhat heritable. If you're extremely reactionary and conservative you could say 'Ah! See, we can't do anything for people, they'll just be happy or not as they see fit; there's no point in trying to improve people's lives'. On the other hand you could be a radical socialist and you could take this as a profound critique of capitalist consumerism—you could say 'People have been duped into believing that the more stuff they acquire the happier they'll be'. That is empirically not the case. You could take it either direction. You could also just say well, pragmatically speaking, if you want happy kids, marry somebody happy.

Any given scientific discovery can be taken in a thousand different ideological directions for a thousand different purposes.