Why Do Birds and Bees Do It? (extended version)

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My third-floor faculty office has three rather large windows that overlook a nicely wooded park at the outer rim of the University of Missouri campus. At the end of a long day, I often spend a few moments, maybe more than a few on occasion, spying on the wildlife that resides in and among the trees. I'm not talking about the undergraduates, as they're a bit more subdued than the park's permanent residents. (This might not be true in other venues, but that's a topic for another day.)

I've grown fond of watching the many species of bird that do their business and make their living under my watchful eye. On one occasion I was more than slightly amused to see a pair of sparrows converge from different directions and meet furtively in the tangle of leaves and branches of a nearby oak tree. On this day, their business involved a quick copulation and then they were off again in different directions. No small talk or festive banter to top the occasion, just a few moments in the branches and then back to their respective social partners. What I had just witnessed biologists would call an *extra pair copulation* or EPC, when individuals with different mates get together on the sly. I suppose other folks would call it something else, but a rose is a rose by any other name.

I can testify that birds do it, and bees supposedly do it as well. I've never witnessed the latter and imagine that obtaining proof might require some type of covert and remote surveillance since they do it in flight; a sting operation if you will. In any case, I'll take the word of entomologists who study such things.

Now, you don't actually need to be a scientist to realize and observe on occasion that all sorts of living things, most in fact, mate. Be careful. I'm not advocating that you peer through your neighbor's window on a moonless evening, as this type of voyeurism can result in all sorts of bad noise and an unscheduled visit from the local constable, not to mention some potentially unpleasant images (depending on the neighbor). What I am suggesting is that after a long day, you too might spend a little time outside paying particular attention to the teaming life flying above your head and squirming below your feet. Yes, you might run across a spider or worse a snake, but take the chance. Eventually you'll be rewarded with the sight of creatures, one pair or another, doing it. More likely than not, you'll run across some beetles. The world is full of them and, if you've ever seen these guys before, you might be able to imagine how interesting it would be to catch these guys in the act.

Ok, perhaps you can come up with something a little more enticing. Don't get me wrong. I'm not pushing some sort of cross-species voyeuristic perversion as an avocation. Trust me: The sight or even the thought of a dalliance between a pair of sex-starved beetles does nothing for me. The real curiosity is *Why* are all of these different creatures—from the lowly beetle to the smarter than average human—doing it? When approached scientifically the question becomes *Why did sexual reproduction evolve?* This is one of the most fundamental questions to confront the biological sciences since Darwin's and Wallace's independent discovery of the principles of natural selection. Of course there has always been the necessity to reproduce. Okay, fine. But why don't they, and we, reproduce in a more Dolly-like fashion, that is, make clones of ourselves? We don't have that option anymore, but way back in our evolutionary history our very small, probably slimy, pre-mammalian ancestors did. Scientists have suggested these

creatures started doing it in order to have extra copies of DNA, in case one copy gets messed up, or to make us different from one another. But most scientists hardly think about the purpose of sex, although many, aside from the ones who have trouble maintaining eye contact and keeping up a conversation, probably get to participate in the act every once and awhile.

Sex starved scientists aside, you might protest that life is just a lot more interesting and enjoyable when it includes having sex, or for some folks the prospect of someday having sex. There are even entomologists out there who derive some sort of enjoyment (vocational of course) studying how beetles reproduce. Doing it is fun and so why even ask these silly questions? Why not just do it some more? Sex helps to keep our relationships together and increases intimacy, as well as entertaining us before a new sport season rolls around. However, all of these objections miss the point. Making clones of ourselves would not only save us the trouble of trying to find a weekend date and ultimately a mate; the baking of the next generation wouldn't require us to mix our genes with those of someone else. Mixing genes doesn't sound so bad, but it comes at the ultimate price of giving up half of yourself, that is, half of your genes, to make another person. You might say that when two individual people mix their genes to produce little ones, the result is two parents who will look after the well-being of their mutual progeny. It might also be a way to get some better traits for your kids. When I originally got into the reproduction business, I thought, *there is no way in the world I want to try to raise a clone of myself.* We just wouldn't get along. So I found a wife, Leslie (married 20 years now), who is not only better looking than me, she is nicer, more sociable, and much more of a conformist than I am. Well, it worked for my son, Nick, but not my daughter, Corie; she's attractive, but ornery like her dad.

Anyway, it is often true that two parents are typically better than one. This is the case with most species of bird, especially when the young have to be fed and protected for weeks or months. While mom stays home, dad flies off to get the grub, and they'll even often switch roles. But for many species of gene-mixing creatures, only one sex (usually females) looks after the progeny once they are born or hatched or whatever the case might be. This is how it works for most mammals, as well as insects, fish, and reptiles. In these species, the male who out duels all others, the king of the hill, the champion in the ring, tends to do it with lots of females while the other males are forced to sit back and watch. While the offspring are gestating in mom, the males go off and hold new competitions. Whoever claims the crown this time gets to mate with the females that are not yet pregnant and thus, a cycle is formed.

There are many other gene-mixing species, some species of fish and insect, in which neither parent looks after the progeny. The mother simply deposits the eggs in one of the local crevices and then she's off with the girls, or sometimes off doing it again with one or several of the boys.

Mixing it up, so to speak, must then have some very deep benefit, one that goes beyond sharing the responsibilities of parenthood or simply having a good time. Nick, my son who's now 13, and I were discussing this one morning not too long ago. After some blushing and hesitating he argued that people just need to be a little different or things would get pretty boring. "Well," I suggested, "doesn't that depend on exactly who does the mixing and matching, or should it be matching and then mixing?" I asked him to think about it some more. So, think about it for a moment.

Bill Hamilton, one of the greatest biologists of the 20th century, began thinking it over several decades ago and did so for many long hours and many long years. In addition to discovering why sex evolved, Bill also figured out why bees and other very social insects work together so well (they're all highly related sisters), and among other accomplishments set the

foundation—later elaborated by Bob Trivers—for understanding why unrelated individuals will often cooperate. Although I've read many of his scientific papers, I didn't know Bill personally, but a friend and colleague, Mark Flinn, did. Bill and Mark, in fact, shared an office during part of the time when Bill was most intensely focused on the evolution of sex. Mark tells me that Bill (who passed away recently) was gentle and unassuming, yet brilliant. Like Darwin, he was among that rare breed that knows the right questions to ask and has the intensity and focus to find the right answers.

Bill's answer to the evolution of sex was pathogens, that is, things that make us sick. His point was that there are all sorts of nasty little critters out there—viruses, bacteria, and worms — that do their business and make their living at our expense. Viruses need our DNA and RNA to make copies of themselves, and many of these worms are headed for a place where the sun don't shine, warm and cozy for them it seems. So what's a person to do? If we were in the Wild West having a shootout with these critters, they'd beat us to the draw every time. Sure we could and do build defenses to keep them in check (at least most of the time), but they reproduce so quickly that a few of them consistently find ways to break through our defenses. Once this happens, we get sick and sometimes we die.

The answer to these nasty little critters is *Sex*. Ok, maybe thinking about replicating viruses and intestinal worms doesn't get you in the mood, but perhaps it should! Actually, sex won't help you, at least as far as these critters go, but reproducing sexually will help your children. You see, by mixing your genes with those of someone else, you give your children an immune system that leaps over the tricks these critters use to get around. Now they'll eventually catch up to the new defenses built by your children's immune systems, and thus the only way your children's children can outsmart viruses and bacteria is to reproduce sexually. It never ends. As the Red Queen told Alice in Lewis Carroll's *Alice in Wonderland*, you run and you run as fast as you can, but you never seem to get anywhere. This is the way life goes. You work and work but you never seem to solve the puzzle, and you can't stop, because once you do, shit really hits the fan.

Although sexual reproduction helps to stay one step ahead of viruses, it opens up a whole other can of worms and this brings us back to those two-timing sparrows and the more general issues of dating and mating. The problem for us and all other gene-mixing creatures is that not all mates are created equal. Sexual reproduction not only benefits our immune systems, it makes us different and less boring, according to my son, in many other ways. Many of these differences are unimportant and uninteresting, but other things—intellect, looks, money, cows, or whatever it takes—help us and our children do well in life. Anyway, this new issue involves finding the right mate, or mates depending on the species. Easier said than done, as many of you may know.

Charles Darwin was familiar with this difficulty. Not just from his own experiences, but through careful observation of the sexes and their behavior. A natural-borne naturalist, Darwin not only discovered how natural selection works, in 1871 he published the most important book ever written on mating and the different ways in which females and males approach the subject, *The descent of man, and selection in relation to sex*. The subject being when, where, with whom, and why they do it. Scientists call this *sexual selection*, that is, the social behaviors involved in competing for mates and picking mates.

Just a few yards outside one of my three windows is an ash tree. It's so close in fact that the branches have grown above and around the window, which gives me a birds-eye view, so to speak, of all that's going on within. And there's a lot that's going on. This spring there were three cardinals vying for this territory, huffing and puffing in the branches, trying to bluster and

bully the others out of the tree. Darwin called this aspect of sexual selection *male-male competition*. The winner gets a spot from which he can sing to the ladies and strut his stuff, a place for wooing and nesting, and of course mating. Here in Missouri cardinals are called red birds, because during the mating season the males shine a brilliant red, which drives the lady cardinals mad.

The twist comes from the fact that some males are a little redder than others. Indeed some are just plain dull, not unlike some of the scientists I mentioned earlier. None of this would matter, except that the lady cardinals are picky. I mean *real* picky. They're not going to do it with just any Tom, Dick, or Harry that glides along. They want the pretty males, a preference Darwin discovered through his careful observations of nature, terming this inclination *female choice*, another aspect of sexual selection. Female choice is not just picking the males that sport a colorful coat. Sometimes size *does* matter. Often, when looking for that special someone, female birds are searching for colorful males with large feather tails.

But why? This is where Charles Darwin meets Bill Hamilton. It turns out that these big and pretty males are not just pretty for the sake of aesthetics. They have the best immune systems. Now this makes perfect sense if one of the primary purposes (not the only purpose mind you) of sexual reproduction is to stay one step ahead of illness and disease. The dull males have dull coats or unattractive tails because their immune systems have been pushed to the brink by bacteria and viruses. They're literally full of them. The immune system of the pretty males, however, is humming along. The little critters are knocking at the door, but they're not getting in. Females that mate with the dull males often have offspring that die young, because their immune system is poor. The females that mate with the pretty males have little ones that thrive. This is how picky females and pretty males evolved, at least for birds.

It seems to be true for people too, but for us and some other species there are more twists to this story. For most birds and people, both the males and the females watch over and feed their young. This means that the lady cardinals have to compete with one another—*female-female competition*—to get the pretty male to be their social partner, the one which will help them care for the little cardinals. They get the worm and eat it too. That is, they get the healthiest male as their social *and* sexual partner. At the same time, many other cardinals get stuck with the duller males. These ladies also want a piece of the worm, and this is where the EPCs, or extra pair copulations come in. The behavior of these lady cardinals—and DNA fingerprinting to determine the little ones' dads proves it—indicates that they want the dull males around to help feed their young, but they want the pretty males to sire them. The dull males are not too happy about this situation. They keep an eye on their lady and take to the wing to keep her from dallying with the spiff and shiny males. Sometimes the dull male succeeds and sires the little ones, and sometimes the lady gets her way. She gets a healthy immune system for her offspring and a hard working, if not a bit dull, male to feed and protect them. I'm not saying that the battle of the sexes simply comes down to keeping one step ahead of intestinal worms and other such nasty critters, but it is an important part of the story.

You're probably saying to yourself, well fine, but does this really explain why and who people choose to mate with? These are issues that evolutionary psychologists are beginning to tackle, and some early studies, as examples, indicate that yes indeed good-looking and physically vigorous men appear to have better immune systems than others, but it's not a perfect relationship. People tend to overestimate the health of really good-looking men and women, and underestimate the health of the duller types. For those of us in between, looks and vigor do appear to say something about our immune system. Darwin didn't know about the immune system, but did suggest that women, like the lady cardinals, prefer spiff and shiny men. No, not

men donned in bright red tuxes and hopping around in ash trees, but rather men that clean up nice. These men are healthy enough to cut a good dance, and wealthy enough to sport the latest fashions. Sometimes they drive a shiny red sports car, the type that most other guys can't afford (a friend of mine leases one, in an attempt to fool some of the gals.)

These guys are flaunting their wealth, a type of symbolic phallic display. In other words, they got big ones. Like the successful male cardinals, most of these guys also have their own ash tree, so to speak. All of this helps to attract the ladies. But this is not enough. The women not only want to move in, they want to keep the bed bugs out. They want to have their cake and eat it too. They want the healthy, vigorous men—those with a good immune system—who have a lot of stuff, not ash trees, but cash, cows, whatever it takes to successfully raise healthy children. It's not just good-looking guys with stuff, but guys who will stick around and share what they have. Yes, deep down women see guys as resource objects, ones they can use to secure profitable traits for their children, and that will stay around and help raise them.

The guys, of course, have some of the same preferences as the gals, but there are differences too. When it comes to looks, guys are even pickier than gals. Many women I know or have heard from, whether I liked it or not, have told me that guys' focus on attractiveness is superficial, or even "stupid." It turns out that the kinds of superficial things that guys find attractive and like to look at are correlated with fertility. Again, it's not a perfect relationship but attractive women are more likely to give the guys babies. Of course there is more to men (at least some men) than this. Many men in fact rate personality (compatible interests) above looks when it comes to picking a wife, but looks still count.

The punch line is that there is a rhyme and a reason for doing it, and for the battle of the sexes that ensues once a species evolves to reproduce by mating. It all started as a way to deal with viruses, bacteria, worms and all the other critters who want to do their business and make their living at our expense. The birds and the bees do it to outwit illness, and that's why we do it too, at least one of the reasons. However, we have progressed since the initial evolution of sex. As I mentioned earlier, humans do it for intimacy, to maintain relationships, and sometimes just to have some fun. People, in fact, are probably better than any other species (Bonobos, a cousin of humans, may give us a run for the money) in thinking up new and better ways of doing it, but what does this bode for the evolutionary future of having sex? Maybe nothing. One of Darwin's most important insights was that the mechanisms of evolution are not forward thinking. We may evolve further but from where we sit now any such change may or may not be "progress."

Still, when it comes to why, where, and with whom we do it, culture and social mores matter and progress can be made on this front. There are rules that say where and with whom you can do it. As pointed out by Mark Flinn and one of his colleagues, Bobbi Low, probably one of the most important of these rules is socially-imposed monogamy—you go to jail if you marry more than one person at a time. In most cultures, rich men get many wives and poor men go wanting. These poor guys don't always accept this situation and in fact can get rather testy, down right violent at times. When social rules put the breaks on the reproductive interests of wealthy guys—the rules for socially-imposed monogamy developed over hundreds of years in Western culture—the result is that they can only have one wife at a time. This might be too bad for the rich, but it has important benefits for the rest of us. Most men get mates and eventually marry, and thus they are much less aggressive than would otherwise be the case. Women also benefit. They get the exclusive attention of their husband and their children don't have to share him with another wife and family.

In closing, understand that evolution is not really about progress, it's about adapting, across many generations, to ecological and social change. These changes may or may not be progress from our current perspective. Progress for us is more likely to come from the rules we develop for our behavior; rules that influence how evolved tendencies are expressed or not expressed. Many of these rules are about why, where, when, and with whom we mate. These rules can and do vary from one culture and historical period to the next. Maybe progress is just allowing different strokes for different folks.

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