

Ok so we are going to focus on a set of chromosomes coming down here. This set of chromosomes is eventually going to make it all the way down to man, and as it comes down here we'll blow it up. We're going to focus in particular on this one pair. An ordinary pair of autosomes that become the x and y, we'll call it Proto X and Proto Y. Now we know that in meiosis things first get duplicated. So we're going to need 4n stage, and this is just a reminder of what we saw yesterday that this ordinary pair of autosomes, destined to become X and Y can recombine and shuffle genes. They can do it at either end like so. This is all review for you, this is all familiar stuff. And just to remind you that recombination can occur anywhere along the length of this ordinary pair of autosomes. Now just to simplify throughout the rest of the animation, we'll just show one version of the x and the y. Here is an ancestral gene, which has now mutated on the Proto Y. This is the initiating event of sex chromosome evolution. We've got this tyrannical male determining gene. And here is RPS4, again, an ancient ancestor, which survives today on the Y chromosome. Now how is recombination suppressed between the x and the y? Well it turns out the Y underwent a series of inversions, just like the one shown here. We'll see a few more. As a result of all the inversions, the x and the y no longer nicely align. UGH if they can't swap parts, what's going to happen? The fruits and veggies on the Y rot, the ultimate?? form of rotting is just plain getting lost, or deleted. So the Y is getting shorter, and now recombination is restricted to these regions. These are still nicely aligned, nicely paired here at the ends. Alright we're going to zoom back to our timeline. We're now going to cross the point where we part company with the duck billed platypus, and we're going to have some of the same themes. We are going to have some of the same themes reappear. We're going to have this Y undergo an inversion, which is sort of an internal recombination event. It's ability to pair with the X is again, reduced. Now why isn't the X rotting? The X isn't rotting because two X's can still recombine in female meiosis. So genes on the X remain healthy because of ongoing recombination on the female side, whereas the Y is rotting because it's only being passed through a clonal line of males. Let the tape roll. Oh so more rotting, this is just... just cover your eyes if you can't stand the sight of it. And it's very hard for someone who works on the Y chromosome to actually see this. This could very well be continuous to this very day. Ok so now we're going to pass the point where we part company with the kangaroo, and now something interesting is going to happen. Another autosome is going to contribute a fresh supply of genes to both the X and the Y. This kind of renews the game, starts the game rolling again, but look the Y just did another inversion even within some of this newly acquired autosomal DNA. So guess what's going to happen? More rotting fruits and veggies. This is still happening. It's probably not happening in too many of the men in the room right now, but X-Y recombination is still continuing just out at the ends. I think we're going to be desperately in need of some new kind of theme here. Fortunately, as we move now down into primate evolution, well we're not quite there yet, but we're shrinking. Really a tough time... The last 300 million years have been quite tough, now we're getting down into primate evolution, and some good stuff is going to happen to us guys. OK, now this other autosome has a spermatogenesis gene, it's called DAZL. This autosome is kindly going to contribute a copy of the spermatogenesis gene to the Y without asking permission from the X chromosome. Let's let the tape roll. So we're going to see a copy, as the tape rolls we'll see a copy of the DAZL gene insert into the Y, where it's now called DAZ, and an amazing thing happens. The gene gets duplicated on the Y chromosome, and then those two get duplicated again, and we end up with 4 copies of

DAZ. Turns out the spermatogenesis genes on the Y, now fortunately none of this red stuff got lost. Spermatogenesis genes on the Y in many cases arose through the process of migration in from autosomes. And so there we are, we've got the sex determining gene, the SRY. One of these surviving housekeepers aren't just for Y spermatogenesis DAZ, that gets us to the modern human X and Y chromosomes, of course in the context of the genome.