Attached-X experiment
Adapted from *Orr 1993*

Note: Drosophila sex determination, while XY, is slightly different from mammals. Any individual with two X's is female, regardless of the presence of a Y. It is possible to have viable XXY individuals.

You have a pair of Drosophila species that are known to produce inviable hybrid males, while hybrid females are normal. In these species, it's possible to get a strain with an "attached-X" chromosome; that is, the two X's are fused, and thus always inherited together, although otherwise they function pretty much identically to two separate X's. An attached-X female will have the genotype XX Y. A male will have the genotype X Y.

You order a strain of attached-X females from species 1 and cross them with males from species 2. What will their chromosomes, and sexes, be in the offspring? *Hint: try annotating which species each chromosome is from with a subscript, just for clarity. Drosophila has 4 autosomal chromosomes, although you could just write in one.*

You find that all of the hybrid offspring are inviable, regardless of sex. Which genetic theory of Haldane's rule does this finding support? Why?

Introgression experiment
Adapted from *True et al 1996*

You have a pair of *Drosophila* species that are known to produce interfertile hybrid males, while females are normal. Using those fertile hybrid females, you make backcrosses that introgress pieces of the genome of species 1 into the background of species 2; that is, by breeding hybrids with species 2, you end up with individuals where most of the genome is from species 2, but a small piece, about 10 cM long, is from species 1. This introgression was only done on the autosomes, leaving the sex chromosomes unaffected.

When you inbreed these backcrossed offspring, making the introgressed regions homozygous, you find that about 40% of the introgressed regions cause male sterility, while <10% lead to female sterility.

Which genetic theory of Haldane's Rule does this support? Why?