Genealogies in Cakeland

- To begin with, the population of Cakeland consists of just one lonely cupcake. Its DNA determines what type of cupcake it is: in this case "chocolate orange", which we will call genetic type A.
- The time comes for the cupcake to reproduce. It passes its DNA on to its children, so they generally inherit the same type: in this case type A.
- (Place two type A cupcakes)
- But every now and then something goes wrong and a mutation occurs. This corrupts the DNA, so it results in a child of a different type.
- (Place a type B cupcake)
- (This) child has a **mutation**, and has come out "lemon and raspberry" flavoured. We'll call this type B.
- Once it has reproduced, its three children make up the next generation of life in Cakeland.
- So now the population consists of three cupcakes: two type A and one type B.
- Not all cupcakes are lucky enough to survive to reproductive age. Some of them get eaten before they're able to have any children.
- But not all cupcakes are created equal: one type may be more appealing to predators (that's you!) than others. A yummier-looking cupcake is more likely to be eaten before having children. In Cakeland, looking yummy is bad news!
- (Get audience member to select a cake)
- So (that) cupcake gets eaten, but the other two survive long enough to have children of their own. And as before, their children will mostly inherit their parent's type.
- (Place a new generation of cakes...)
- This means that, because we removed a type (?) cake from the population, that type is likely to be less prominent in the next generation.
- This phenomenon is called **selection**. It is sometimes called **survival of the fittest**: in this case the fittest cupcakes are the least yummy-looking ones, because they are the most likely to survive.
- If we ignore the types and just look at which cupcakes are the parents or children of each other, we can see the **genealogy**.
- So we've seen that there are two mechanisms controlling the types of cakes in the population: **mutation** and **selection**.
- In my research I'm looking at algorithms that use mutation and selection to approximate integrals by averaging over the types in a simulated population after a lot of generations.
- I assume that the population is really big, and try to find out what the genealogy looks like.