

## Dark Matter Cake

*If this cake doesn't make you appreciate the scarceness of visible matter in the universe then nothing will.*



You'd think we know what the universe is made of by now, right? Wrong. We know that the universe is expanding, as it has been ever since the Big Bang. We can calculate the rate that it should be expanding given how much matter exists in the universe, but when we do this calculation we find that the universe is expanding as if there is far more matter than we can account for.

By measuring the expansion rate of the universe, and comparing this to what the expansion rate would be if all of the matter we know about ("visible matter") was the only stuff that existed then we can work out what fraction of the universe is made up of visible matter. Once we made this measurement we realised that we actually only know what 4.9% of the universe is made of. The remaining 95.1% is made up of "dark matter" (26.8%) and "dark energy" (68.3%). Neither dark matter nor dark energy have ever been observed, and what they are is still a complete mystery. Nevertheless, we have a few ideas about how they might behave and how to look for them.

There are experiments all over the world (and a few in space!) that are hoping to detect dark matter particles. At the LHC experiments we search for an 'absence' of particles when we're looking for dark matter. Since conservation of energy is one of the fundamental laws of physics, we know that if the total energy of all of the particles we see coming out of a collision is much smaller than the total amount of energy that went in then some other undetected particles must have been responsible. As for dark energy, even less is known about that, but we know that it must be there, driving the expansion of the universe and fighting against the gravitational force of all of the matter (both normal and dark) that would otherwise cause the universe to collapse in on itself.

This cake is exactly what you'd expect a dark matter cake to be - dark, rich and very chocolatey. Dark chocolate chips represent the dark matter in the universe, and white chocolate chips represent the visible matter. Eating it will really make you appreciate the scarcity of visible matter in the universe! The whole lot is bound together by an unexpected ingredient - beetroot - which gives the cake its dark energy.

#### Ingredients

180g cooked beetroot, roughly chopped  
100g plain flour  
100g cocoa powder  
1 tsp baking powder  
250g caster sugar  
4 eggs  
200ml sunflower oil  
70g dark chocolate chips (or dark chocolate chopped into pieces)  
13g white chocolate chips (or white chocolate chopped into pieces)

#### To decorate (optional)

280 ml whipping cream  
30g butter  
30g caster sugar  
400g white chocolate  
Black, blue, purple and pink food colourings  
Edible silver glitter

Preheat the oven to 160°C. Grease and line a 20x30 cm baking tin.

Put the beetroot into a food processor and blitz until finely chopped. Add all of the other ingredients apart from the oil and chocolate chips. Once everything is completely mixed then pour in the oil in a slow stream. Once all of the oil has been added, stir in the chocolate chips and then pour the mixture into the baking tin, making sure the mixture gets right into the corners. Cook for 45 minutes, or until a skewer comes out clean. Transfer to a wire rack and leave to cool. You can stop here and just eat the cake as it is if you want. Alternatively, go all out and make it look like the cosmos as in the picture - don't worry, this is simpler than it looks!

To decorate, make a white chocolate ganache by heating the cream, butter and caster sugar together in a saucepan until the butter has melted. Pour over the white chocolate and leave for a few minutes until melted, and then stir until smooth. Transfer about a third of the ganache to a separate bowl and colour it black. Place another third in a different bowl and colour it dark blue. Split the remaining ganache into three, colour one pink, one purple, and leave one white.

Place the cake upside down (so that you have a nice flat surface to work with) on a wire rack over a baking tray. While the ganache is still warm (it needs to still be quite liquid for this next step), pour wide stripes of black and blue ganache across the cake. Once the cake is well covered, add a few drizzles of pink and purple here and there, working in the same direction as before. Use an offset spatula to smear everything together a bit and make it look nebulous. Drop a few small blobs of white ganache onto the cake in random places and use a skewer or the tip of a sharp knife to gently swirl out to resemble galaxies (make sure not to disturb the cake underneath). Finally sprinkle edible glitter across the cake to look like stars. None of this needs to be neat (after all, the universe isn't!), so just have fun with it.