# Popular science summary

## Rotating self-bound pancake dough, without a mess in your kitchen

A recent discovery in ultracold physics is on the verge of revolutionising our beliefs about Bose-Einstein condensates, a type of ultracold matter that behaves differently from any regular gas or liquid we would expect in our day-to-day life. A regular gas or liquid consists out of atoms or molecules all moving in arbitrary directions. If we cool it down, the movement of the particles gets weaker and weaker, until it eventually stops.

However, in a Bose-Einstein condensate, this is not the case. Imagine you have pancake dough in a bowl, where the dough is the condensate and the bowl represents what physicists refer to as "trap". A highly technical system of lasers and magnets, that keep the condensate together and in place. Now, if you cool down normal dough, it would eventually become solid. For a condensate, however, this is not the case, as it will remain liquid and each dough-particle will have the same properties. For example, if they are still moving, they are all moving in the same direction, something often referred to as "superfluidity". What is interesting about anything "super" in physics is, that it means something flows without friction. So if you start stirring your dough, it would just keep on spinning in the bowl, after you stopped stirring. Additionally, due to quantum mechanical effects, the swirl when rotating would not get bigger if you rotate the dough faster, but rather you would get multiple small swirls across the dough.

The discovery mentioned above are so-called “self-bound droplets”, meaning, if you take the bowl away, the pancake dough would retain its shape and not just create a total mess in your kitchen. At this point the question becomes; would our pancake-droplet support swirls or not? One can imagine that if we start stirring the dough and take away the bowl, again, we would paint our walls in dough. In this work, we want to see if this works in lower dimensions than the three dimensions we’re used to. Here three dimensions would be one giant tasty pancake ball, two dimensions the shape of a French Crêpe and quasi-two dimensions more like an American pancake.

If we find that self-bound droplets can hold swirls in them without flying apart, we make an important connection between superfluidity and the existence of droplets, that helps to deepen our understanding of this new type of matter.