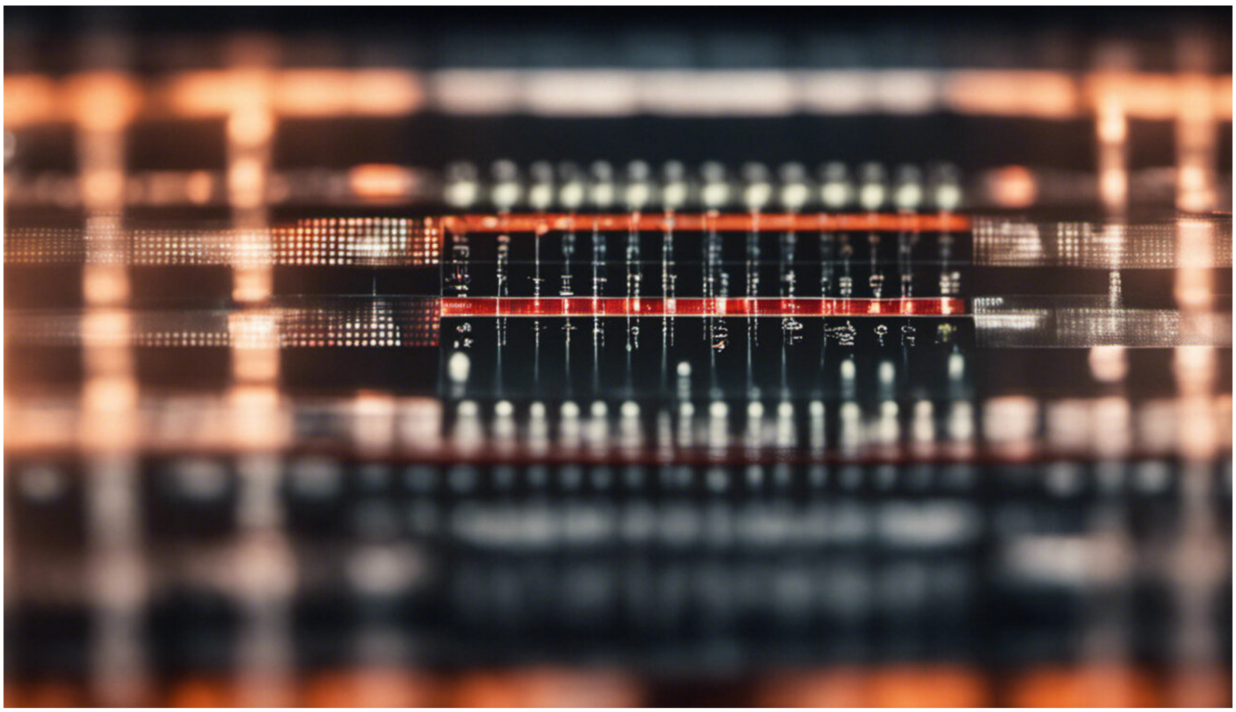
Cells like us stick together

June 10 2013, by Pete Wilton



Credit: AI-generated image (disclaimer)

Once upon a time all cells were solitary, going about the everyday business of life on their own.

Then, perhaps as many as 25 times in the history of life, some cells tried something different: banding together into groups. A few of these attempts gave rise to groups of cells that worked together rather like bees in a beehive, eventually resulting in the trillions-strong communities of cells that make up complex multicellular organisms like us.

So how did cells learn to stop 'being selfish' and embrace the multicellular lifestyle? In this week's *Current Biology* a team from Oxford University and Lund University report research using data from 168 species to examine the role genetic relatedness may have played in this transition, Pete Wilton at the Oxford Science Blog asked team member Roberta Fisher of Oxford's Department of Zoology about this work…

OxSciBlog: How do we think cells made the leap to multicellular life?

Roberta Fisher: Multicellularity has evolved many times, and so it's likely that lots of different factors have favoured single cells becoming multicellular. It's thought that clumping together as a defence mechanism against predation may have favoured multicellularity in the green algae. There are also several species where multicellular behaviours help dispersal and reproduction, e.g. slime moulds.

OSB: Why is understanding genetic relatedness key to understanding this leap?

RF: We know that relatedness is important for social behaviours (you're more likely to help your relatives than a stranger), and multicellularity is essentially a social behaviour. Cells are joining together and interacting, much like bees in a hive or ants in a colony. So, we expect that genetic relatedness will be key in determining when multicellularity can evolve.

OSB: How did you investigate the role of relatedness in this process?

RF: The way multicellular groups form is key in determining whether cells will be highly related or not. If groups form by cell division, then the cells will be clonally related, whereas if groups form by aggregation then the cells will be less related. So, we don't directly measure relatedness, but look at how the multicellular groups form. And, luckily, multicellular organisms do tend to fall into the broad categories of ones that form via cell division (like us!) and ones that form by aggregation (like slime moulds).

OSB: What did you discover about how sterile/different 'castes' of cell might arise?

RF: Sterile cells are behaving altruistically, because they are giving up reproduction in order to help other cells. We found that sterile castes are much more likely to arise when cells are highly related. This is somewhat expected, because we know from theory and experimental work that altruistic behaviour is much more likely to evolve when you have high relatedness, but it has not been examined in this context before.

OSB: What does this tell us about the evolutionary costs/benefits of single cells teaming up?

RF: The benefits and costs of teaming up will vary from species to species. For some, there may only be a benefit of being multicellular for certain parts of the life-cycle and so the major transition to multicellularity is never made, because there are still big benefits to being unicellular. However, if the costs of being multicellular are low enough and benefits big enough, then cells can be selected to team up and help each other out.

OSB: How could your study guide further research in this area?

RF: Our study is the first of its kind looking at such a broad scale comparison of lots of different multicellular organisms. I think that other interesting evolutionary questions could be answered using this kind of comparative data.

A report of the research, entitled 'Group Formation, Relatedness, and the Evolution of Multicellularity', is published in *Current Biology*.

More information: www.cell.com/current-biology/abstract/S0960-9822%2813%2900567-8

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