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Prof Mark Fricker – The Magic of Slime Moulds

Although they superficially resemble Fungi, Slime Moulds are in fact Amoebozoa, which some taxonomists regard as a separate Kingdom, on a par with Animals, Fungi and Plants. There are over 1000 named species which occur worldwide with two main subgroups, cellular and acellular slime moulds. These dry facts give no clue as to quite how weird and wonderful slime moulds are – as Prof Fricker, of the Oxford Department of Plant Sciences explained with great clarity and enthusiasm.

In good times, when food is plentiful, cellular slime moulds (Dictyostelids) behave as individual amoeba, feeding and dividing normally. In bad times, however, when food is short, they aggregate together, at first loosely and then more tightly to form 'slugs' a millimetre or so long which move in search of food. Eventually these 'slugs', composed of individual cells, develop into stalked fruiting bodies with spores which germinate to produce new, individual amoebae. It is possible that this dramatic shape change is controlled by the reaction-diffusion mechanism proposed by Alan Turing in 1952 – which may also control the development of stripes on zebras and tigers.

Acellular slime moulds (Myxogastrids) are single cell organisms and although most are small some can grow up to a metre across and weigh up to 20 kilograms. Included in this group is *Fuligo septica,* alternatively known as Scrambled Egg Slime Mould or Dog Vomit Slime Mould!

Much of Mark Fricker's research has been carried out using *Physarum polycephalum,* Many-headed Slime Mould. In the wild this is found in cool, moist wooded areas, in the laboratory it has the advantage of being very easy to grow in cultures. The particular interest in this species derives from its behaviour when presented with multiple food sources when it has to develop networks to distribute this food to all parts of the cell. These networks have to be a complex compromise between the energy cost of growing them, the efficiency of delivering the food and resilience to damage to the slime mould. Substitute monetary cost, grumpy passengers and snow on the line and similar complex compromises have to be made when designing a robust railway system.

Prof Fricker and his Japanese collaborators were awarded an Ig Nobel Prize in 2010 for their paper in Science which showed that given a similar distribution of food sources and stations in the Tokyo rail system, *Physarum polycephalum* and Japanese planners came up with broadly similar network solutions. The mathematics required to model these networks, and similar networks of blood vessels in humans and veins in leaves, are not trivial, although Mark Fricker claimed that he had originally chosen to study botany because he didn't like mathematics!

Prof Fricker's talk lived up to its advance publicity and title and was fascinating from start to finish.

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