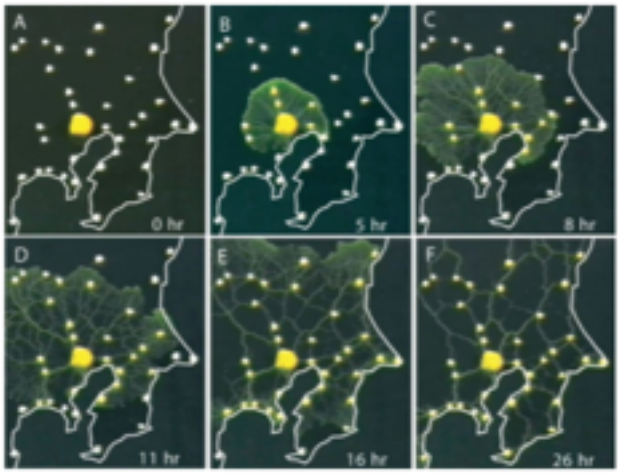
Bio-inspired Computing: Exploring the Use of Slime Mould *Physarum Polycephalum* as a model for a distributed, intelligent network.

Motivation:

In recent years, there has been a sure in interest on modelling computer networks on existing biological systems that exhibit interesting network behaviour (Lio et al). The field of bio-inspired computing draws inspiration from a number of different sources, with ideas about networked systems stemming from low-level creatures such as ants and termites, all the way up to the human brain.

My particular interest is in the lowest level possible: the slime. *Physarum* acts as a self-organising system: one that can adapt to change and as such exhibits fault-tolerant behaviour (Jones). *Physarum* is also a good example of an intelligent morphology - an organism with no real 'brain' that can nevertheless solve complex environmental problems (Tero, Jones).

I am interested in exploring existing adaptive and bio-inspired network designs (Frazer), and considering ways in which these could be used, adapted or extended.



Physarum growing in the shape of the Tokyo subway, Tero, 2010

Themes:

- Adaptive morphology as a model for a fault tolerant, 'intelligent' network: using parallels between the *Physarum* behaviours and real-life network problems to produce a comparative discussion on the merits of using a bio-inspired over a traditionally networked system.

- Physical structure over 'clever algorithms', looking at 'simple' networks that perform in interesting ways.

Resources:

Tero et al (2010): Rules for Biologically Inspired Adaptive Network Design, Science, Jan 22, 2010, Vol.327(5964), p.439

Lio et al (2007): Bio-Inspired Computing and Communication, First Workshop on Bio-Inspired Design of Networks, BIOWIRE 2007 Cambridge, UK ,Springer

Jeff Jones (2016) Applications of multi-agent slime mould computing, International Journal of Parallel, Emergent and Distributed Systems, 31:5, 420-449,

William Butera (2002), Programming a Paintable Computer, PhD thesis for the Media Arts and Sciences Program, MIT

Michael Joseph Broxton (2005), Localization and Sensing Applications in the Pushpin Computing Network, MA thesis, School of Electronic and Computer Engineering, MIT