Planet formation in stellar clusters

Project supervisors: Thomas Haworth and Richard Nelson
(Questions to t.haworth@qmul.ac.uk)

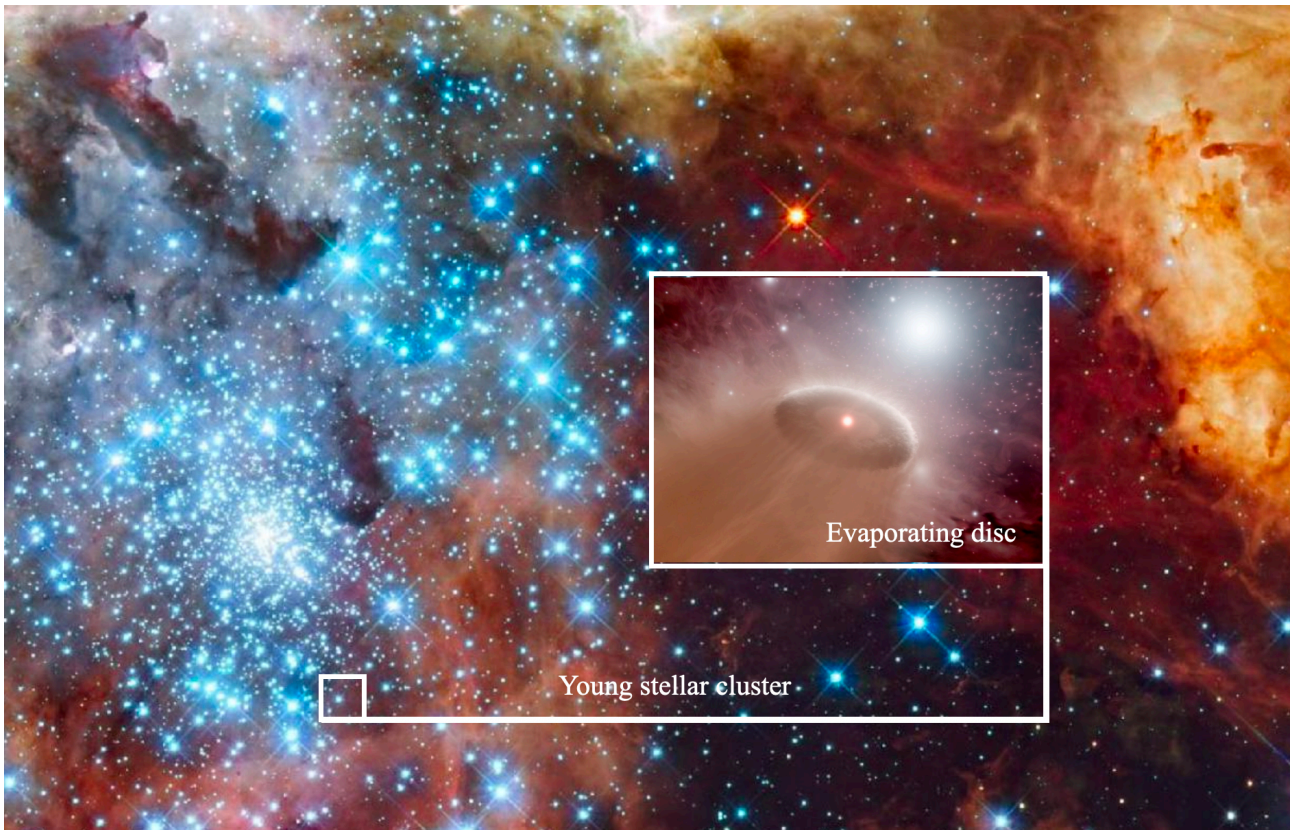
We now know that most stars host at least one planet, but what is a lot less clear is how the very broad array of properties of different planetary systems is determined. We see different numbers of planets per star, different planet masses and different planet orbital radii, even for planets around stars that are very similar. Why is this? A big part of answering this question requires understanding how planets form.

We know that planets form from circumstellar discs of material. These discs are found around young stars, but stars form in large clustered groups (see the figure below) and are therefore not isolated systems. In a dense stellar cluster stars can undergo close fly-bys in which the disc would be gravitationally perturbed. In addition, there is a strong UV radiation field from massive stars in stellar clusters, which heats and "photoevaporates" discs. This strips discs of mass and truncates them, which reduces the disc lifetime and the mass reservoir available for planet formation. The "nature vs nurture" of where a disc tries to produce planets could therefore be just as important as understanding fundamentally how planets can be produced in the first place.

The group at QMUL works on many problems to do with planet formation in clusters, including

- Simulating stellar clusters and the evolution of discs within them
- Detailed modelling of the photoevaporation of discs
- Predicting and searching for observational signatures of disc photoevaporation with state of the art observatories such as ALMA
- Gravitational interaction between discs and external stars

And is keen to support interested candidates to work on topics in this field.



Note: This project description can be used for the "Research Proposal" part of your application.