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1994 B.Sc. Physics, University of Durham
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Research Cluster and Interests:

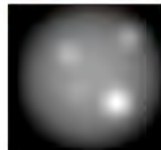
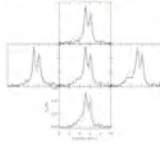
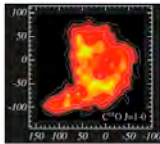
**Centre for Astronomy
Star formation and destruction, Astrochemistry, Radiative Transfer**

Massive stars form in spectacular nebulae, live in clusters and explode as supernovae (right top).

Low mass stars form slowly, live alone and become planetary nebulae (right bottom).

We are interested in knowing how stars and planets form and why they form in these two very different ways.

All stars begin to form from cold molecular clouds that are opaque at optical wavelengths. Telescopes that operate at millimetre wavelengths can probe inside these clouds and detect emission lines from molecules and thermal emission from dust grains.



Data obtained from telescopes like the James Clark Maxwell Telescope, Hawaii is deceptively difficult to interpret. Physical and chemical effects such as fractionation, shock heating and depletion can affect the gas phase abundances of species. Dynamical effects such as gravitational collapse, rotation, outflow and turbulence, coupled with the density and temperature, define the line shape and strength.

We use a state of the art radiative transfer code to help to untangle all these physical and chemical effects (bottom left) and to perform simulations (bottom right). The aim is to understand how star and planet formation takes place and also to gain insights into important basic astrophysical processes.

Selected Recent Publications:

- Carolan, P.B., Redman, M.P., Keto, E. ‘CO abundances in a protostellar cloud: freeze-out and desorption in the envelope and out flow of L483’, *Monthly Notices of the Royal Astronomical Society* 383, 705, 2008.
- Bell, T.A., Whyatt, W., Viti, S., Redman, M.P. ‘A search for CO⁺ in planetary nebulae’, *Monthly Notices of the Royal Astronomical Society* 382, 1139, 2007.
- Redman, M.P., Keto, E., Rawlings, J.M.C. ‘Oscillations in the stable starless core Barnard 68’, *Monthly Notices of the Royal Astronomical Society* 370, L1, 2006.