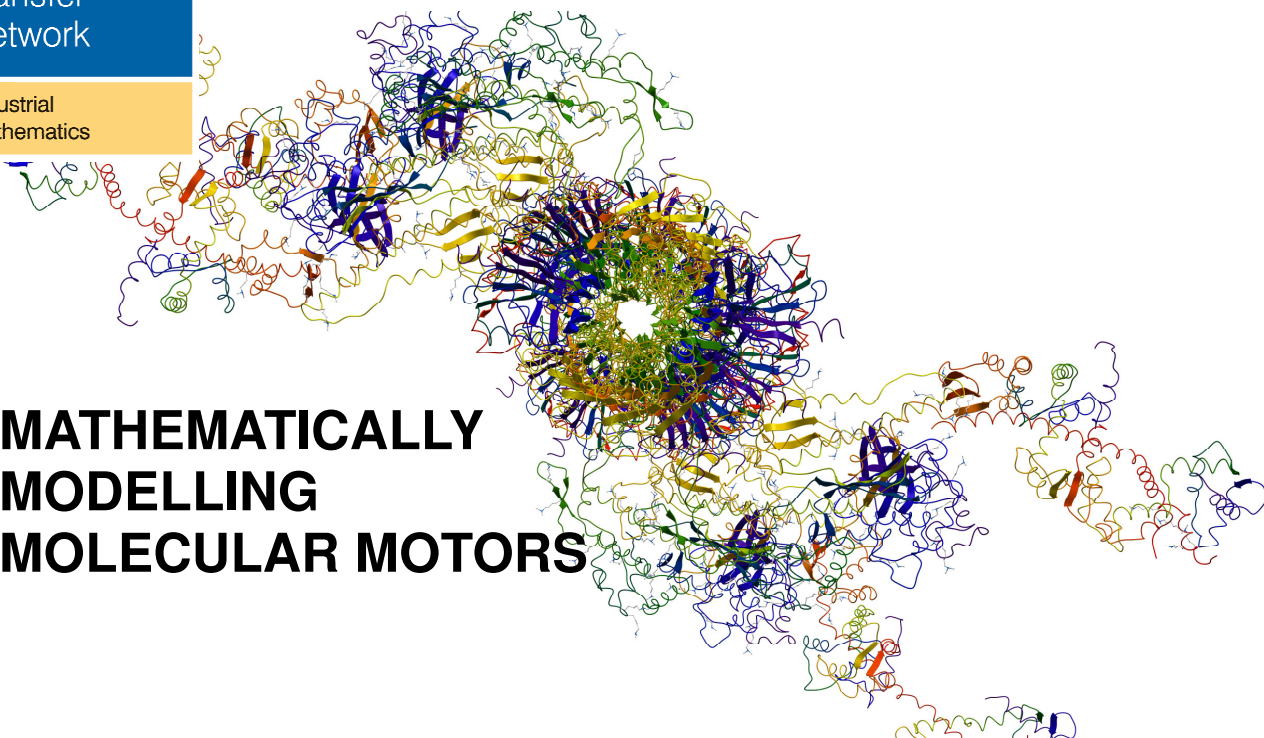


# MATHEMATICALLY MODELLING MOLECULAR MOTORS



**TakeAIM Winner 2012:**  
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A molecular motor is the nano-scale combustion engine of the inner cell: it utilises a chemical reaction to drive motion. These proteins are fundamental to many cellular process such as intracellular transport or gene transcription and understanding their behaviour is vital in understanding how we all function. There exist many different types of molecular motor, in my work I am concerned with stepping motors that walks hand-over-hand along a track within a cell.

Experiments tell us how molecular motors can potentially function but in order to describe this precisely one uses the language of mathematics. Unfortunately as they are so small there is some controversy and thus many competing descriptions, or 'models', exist. In order to decide which models are better one needs to compare them against experiment. Converting a model into results that can be measured experimentally can be quite mathematically involved. My work focusses on creating general and simplifying methods to do this.

Understanding how molecular motors function is essential in understanding the inner workings of the cell and how to replicate it. With these proteins fully understood treatments for conditions such as Griscelli disease can be formulated and synthetic biological motors can be created as part of nano-scale machinery. In this work I help solve part of this complex puzzle and therefore the study will ultimately have important technological and medical implications upon society.

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The use of mathematics has profound consequences in all walks of life, but the opportunities that it opens up often go unrecognised or underexploited. The Industrial Mathematics KTN, enabled by the generous sponsorship of NAG, HP, Tessella, Lein Applied Diagnostics and GCHQ, ran the second TakeAIM competition in 2012 to make visible the crucial role that mathematics will increasingly play in all aspects of our lives. The competition was open to all undergraduate and postgraduate students working in the mathematical sciences who wished to convey the potential influence of their work. Authors of the best two entries each received an HP Ultrabook .