SYSTEMS BIOLOGY/ DOCTORAL TRAINING CENTRE

First Year Project Proposal - 2010

Supervisor(s): **Project 1 (3rd May-16th July)**

Dr Vicente Grau, Dr Boguslaw Obara (OeRC)
Prof. Keith Gull (Dunn School of Pathology)

Title of Project / Field of research:

BioImage Informatics for Systems Biology

Investigating flagellar behaviour via image analysis

Description of project / Current research interests:

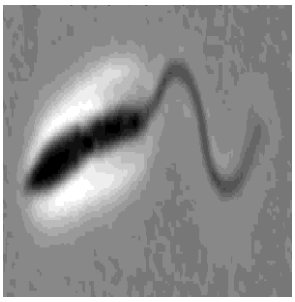
The single flagellum of the Trypanosoma parasite plays key roles in attachment to insect host epithelia, mitochondrial DNA segregation and cell division, and can also be used as a representative model for general analysis of flagellar function.

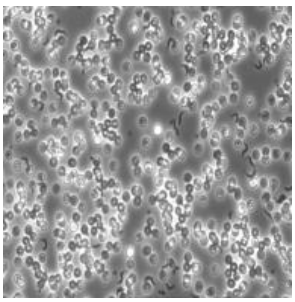
High-speed video, electron, fluorescence and confocal microscopy have recently been used to study the structure and behaviour of the flagellum (see accompanying Figures). Image analysis techniques make it possible to measure fundamental parameters of flagellar behaviour on a cell-by-cell basis with high throughput.

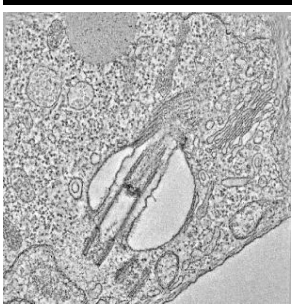
The general aim of these projects is to develop automatic image analysis methods to measure complex parameters from the images, and to use these parameters to analyse flagellar function of Leishmania major cells. The student will work in collaboration with the team of Prof. Keith Gull in order to learn about sample preparation and image acquisition, and to optimise the combination of image acquisition and image processing techniques.

Possible projects include:

- Developing automated image analysis techniques to extract the cell and flagellum from microscopy images and videos acquired using different techniques.
- Using the detected shapes to estimate relevant structural and functional parameters: mean amplitude and wavelength for the beats of individual cells, beat frequency, presence of different mutants in cell cultures, relative geometry of important structures, etc.
- Participating in the definition of experimental protocols to image flagella of Leishmania cells using high-speed video, electron, fluorescence and confocal microscopy (at Prof. Keith Gull's laboratory).
- Validation of proposed approaches using captured images and videos.
- Application of developed image analysis techniques to full-scale experiments (at Prof. Keith Gull's laboratory).







Location: Oxford e-Research Centre in collaboration with Prof. Keith Gull in Sir William Dunn School of Pathology

Any other specific points:

Backgrounds: cell biology, imaging techniques, image analysis and processing.

For more information, please visit: http://www.oerc.ox.ac.uk/research/iapsb