# Microscopy Focus

## QUEEN MARY'S INVESTIGATE TERMITES INSIDE AND OUT

Victoria Laws

***The School of Biological and Chemical Sciences at Queen Mary, University of London, is utilising an inverted microscope for research into termites. Termites produce as much as 4% of the world's $CO_2$. This important greenhouse gas is produced by micro-organisms living in the termite's intestines. However, despite the importance in the global carbon cycle, it is not clear how this ecosystem functions.***

> ***"TERMITES HAVE BEEN AROUND FOR MORE THAN 240 MILLION YEARS AND ADAPT TO EVER CHANGING ENVIRONMENTS AND ARE IMPORTANT IN BREAKING DOWN AND RECYCLING DEAD WOOD"***

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Queen Mary is one of the largest multi-faculty colleges of the University of London. It has its roots in four historic colleges: Queen Mary College, Westfield College, St Bartholomew's Hospital Medical College and the London Hospital Medical College. The College has over 11,500 students and an academic and support staff of around 2,600.

Within the School of Biological and Chemical Sciences, the Evolutionary and Organismal Biology Group is internationally recognised for using post-genomic approaches to investigate the evolution and functions of genes and proteins at an organismal level using a range of model organisms, including plants, invertebrates, fish and mammals. This research utilises a range of methods including bioinformatics, analysis of cell and tissue structure, analysis of gene and protein expression, the impact of gene-knockout on phenotypes, in vitro physiology and pharmacology and analysis of whole-organism behaviour.

### WORKING WITH TERMITES

The work of Dr. Mark van der Giezen, Lecturer in Microbiology, focuses on understanding the function of cells from various micro-organisms which live in environments with little or no oxygen. The intestines of termites are such an environment. Termites have been around for more than 240 million years. They adapt to ever changing environments and are important in breaking down and recycling dead wood. A group of micro-organisms, known as protists, living within the intestines of termites are one of the research lines in Dr. van der Giezen's laboratory.

For this research, it is important that the protists from the termites are isolated in the correct environmental conditions because they can not tolerate high levels of oxygen. Once the guts have been extracted from the termite, the conditions within the guts will change rapidly so it is important to work as fast as possible to preserve their internal structure.

*Figure 1* shows how the termites are kept. Great skill is required in catching and manipulating these insects because of their small size in the termite hindgut and before the work can commence, these have to be separated. This process uses a micromanipulator which is used to pick individual cells in order to separate different species. This process needs to be repeated until up to 50 organisms are collected from each different species. DNA from these organisms is then used to distinguish different species at the molecular level and to understand their biochemistry.

Ultimately, such information from these protists will provide key information on how the termite intestines function, producing high levels of methane ($CH_4$) and $CO_2$, but without the use of oxygen.

Once the protists have been isolated, they are observed and analysed for their morphology, behaviour and for any contamination that may have occurred during the isolation process.

### THE DX61 INVERTED MICROSCOPE

The DX61 inverted microscope was chosen to assist in research projects such as the function of protists in termite intestines. Dr. Mark van der Giezen, Lecturer in Microbiology, explains why he chose the DX61.

*Figure 1. Shows how the termites are kept*

"When the system was demonstrated to us, we requested custom modifications to the stage to incorporate a recess for a Petri dish for example. The final decision was based on the good interactions we had, the additional benefit of the modular design and the Isis eyepiece. As the DX61 was modular, it would allow us to add observation modes and image capture options at a later date". 'The purchase of this microscope has been made possible by generous grants from the Royal Society (2004/R2) and the Systematic Research Fund.'

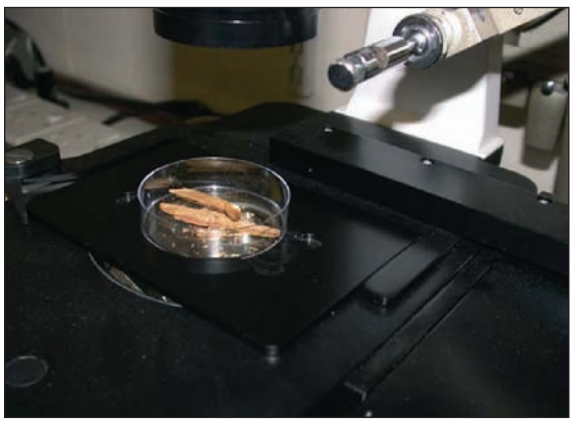


*Figure 2. Shows how securely the Petri dish fits into the stage of the inverted microscope.*

It is important for Dr. van der Giezen's research that the stage of the microscope is very stable, especially when they are being used with other equipment such as micromanipulators. Any sudden movements can ruin the isolation process because pick-up and release of the protists is achieved through controlling a vacuum across a micro-tube attached to the end of the micromanipulator.

*Figure 3. Shows the DX61 being used within the laboratory.*

The thin glass micro-capillaries at the microscope end of the micromanipulator, which are used to draw up and dispense the liquid that contains the cells, are very fragile. They can easily break if stability is not maintained throughout the process. It is important that image capture and analysis is incorporated into the observation and dissection process. The advantages of any microscope system incorporating image process capabilities are the possibility to archive images and the evaluation of cellular morphology. This allows for a more objective overall process.

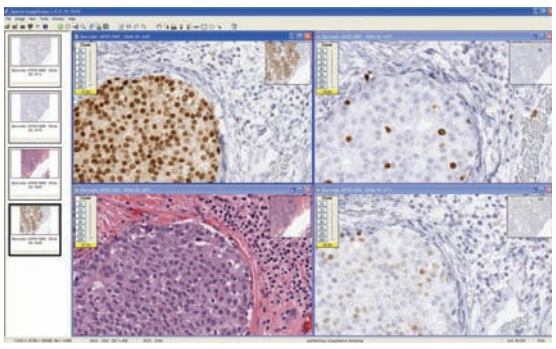
*Figure 3* demonstrates how the modular inverted microscope benefits from optional accessories like the Isis eyepiece. The Isis eyepiece is an important feature for projects like this where comfort is absolute for operators that need to spend several hours looking through the microscope.

The Isis uses patented optical technology designed to enhance the ergonomics of the operator. Expanded Pupil technology allows a much greater freedom of operator head movement which can dramatically reduce operator fatigue. This is achieved by expanding the ray bundle exiting the eyepieces, which results in a four-fold increase in working distance between the operator's eyes and the Isis eyepieces.

The School of Biological and Chemical Sciences at Queen Mary continues to invest time and resources into important projects such as these. Striving to understand natural phenomenon like the humble termite's role in the global carbon cycle will lead to greater understanding of our planet. This will inevitably generate greater knowledge which can then be used to address issues such as global warming.


*Figure 4. The DX61 Laboratory Inverted Microscopes offers modular versatility and superior observational comfort.*

## FDA Approval Received For HER2 Image Analysis Application



**Aperio Technologies, Inc** has received clearance from the US Food and Drug Administration (FDA) to market the HER2 image analysis application available through its patented ScanScope® slide scanning system. The FDA-cleared immunohistochemistry (IHC) image analysis application is intended to be used as an aid to pathologists in detecting and quantifying HER2 protein expression from digital slide images created by Aperio's slide scanning systems.

Aperio's FDA clearance encompasses the company's complete digital pathology system, including ScanScope® scanners for creating digital slide images from microscope slides, the Spectrum™ digital pathology information management system for managing, viewing, and analysing digital slides, and the specific image analysis application which performs the automated scoring of IHC HER2 breast cancer digital slides.

Circle no. 194

## Extension of Range of Standards for Particle Characterisation by Image Analysis


Microscopy with Image Analysis is one of the fastest growing new methods of particle characterisation, offering the additional measurement of particle shape as well as size. In support of this increasing trend, **Whitehouse Scientific** has developed a new range of glass calibration microspheres. These include standards for Image Analysis in a variety of new weights, and an extension to the range of single size Monospheres. The Monosphere range now covers sizes from below 10 micron to over 1 mm. Furthermore, a 1 - 10 micron Polydisperse standard can now be used to test the resolving power of the analytical system at very small particle sizes.

Circle no. 195



## New InSight 3D Atomic Force Microscope


**Veeco Instruments** has introduced its new InSightTM 3D Automated Atomic Force Microscope (AFM) Platform, the only metrology system available with the accuracy and precision required for non-destructive, high resolution three-dimensional (3D) measurements of critical 45nm and 32nm semiconductor features, with the speed to qualify as a true fab tool.

Veeco's InSight 3DAFM was designed specifically to address Critical Dimension (CD), depth and chemical mechanical planarisation (CMP) metrology in a production environment.

John R. Peeler, Chief Executive Officer of Veeco, commented, "With three times the throughput (30 wafers per hour) and two times the measurement accuracy and precision of our previous AFMs, Veeco's InSight represents an entirely new approach for semiconductor 3D metrology.

It is the only tool on the market today providing in-line, accurate, non-destructive 3D information, to drive shorter process development and manufacturing ramp times, improve our customers' cost of ownership and decrease their manufacturing risk."

Circle no. 196