

### Profile:

*The BIO-EXPLORE research group is a team of inter-disciplinary scientists from the Departments of Biological Sciences Chemistry and Maths & Computing. They are committed to developing and implementing platform technologies to underpin their core research areas of diagnostics, bio-analysis, anti-microbial screening, bio-informatics and peptide engineering. The group is made up of 6 principal investigators and 26 post-graduate students many of which are engaged in inter-disciplinary projects.*



## New Genome sequence published by CIT researchers

Researchers at Cork Institute of Technology have recently found a new virus in soil that kills different types of mycobacteria.

Many well known pathogens such as the causative agents of tuberculosis and leprosy are mycobacterial in nature. Mycobacteria are also responsible for causing many serious infections in animals also.

Unfortunately current drugs used to treat mycobacterial disease are becoming less effective and new drugs are



*Marine Henry EMBARK scholar who discovered the virus.*

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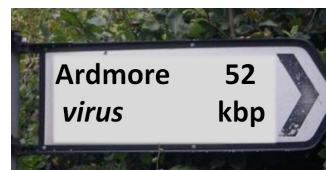
proving difficult to discover. Using a different approach BIO-EXPLORE researchers went looking for a novel solution and found it in an unlikely source.

During the study, post-graduate student Marine Henry tested many environmental samples from different locations but the one containing this new anti-mycobacterial virus was sourced from soil recovered in Ardmore Co. Waterford.

In collaboration with scientists at the Moorepark Research Centre, the 52,000 base pair viral genome was sequenced allowing the team at CIT to study what makes the new agent so deadly to mycobacteria.

The project which is being led by Dr. Jim O'Mahony along with Dr. Aidan Coffey and Dr. Roy Sleator

uses conventional biology and modern computer analysis to study the properties of the virus. In particular the group are inter-

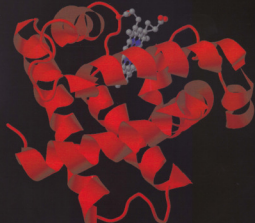


ested in a protein which is made by the virus called a "lysin" which is very toxic to mycobacteria but harmless to humans.

Although the prospect of developing a new anti-mycobacterial drug from this work is a long way off, sourcing new agents which are capable of treating infectious disease is an important first step in the process. The results of this work were recently published in the international scientific journal "Gene".

## New inter-departmental Bio-informatics group initiated at CIT

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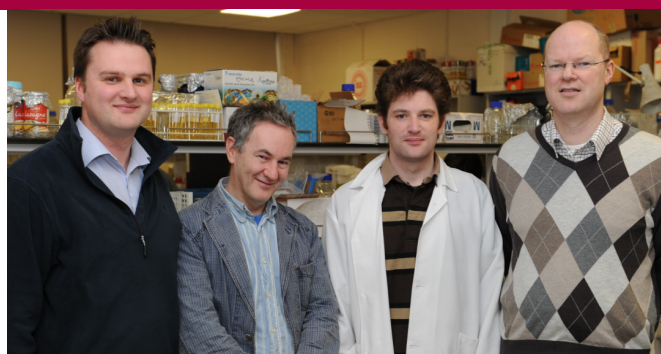


**Recent journal cover depicting the protein myoglobin as created by members of the group**

CIT has recently created a new interdisciplinary Bio-informatics team consisting of Roy Sleator (Department of Biological Sciences), Paul Walsh and Paul Rothwell (Department of Computer Science) and MSc candidate John Carroll.

Bioinformatics - combines ICT and biotechnology within a new biology based information science; one in which high end computing is applied to identify new genes, predict new protein structures and even to design new and improved drugs.

The group which was formalised



**Group members Dr. Roy Sleator, Paul Rothwell, John Carroll and Dr. Paul Walsh**

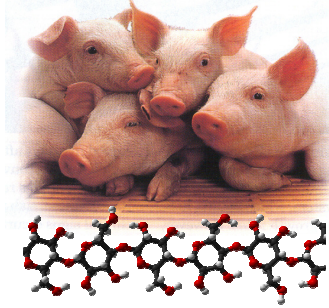
this year with the support of Michael Loftus head of the Faculty of Engineering and Science and Departmental Heads, Hugh McGlynn and Jim Dwyer, has already had a number of joint

peer reviewed publications including a journal cover in "Science Progress" and a bio-informatics paper in the March issue of the scientific journal *Archives of Microbiology*.

## As happy as a pig - CIT research improves animal health

A variety of different microorganisms exist in the large intestine of mammals. These can be broadly divided into beneficial microbes such as *Lactobacillus* and *Bifidobacterium* and those which have the potential to cause illness such as *Salmonella* and *E. coli*. Recent work in CIT, in collaboration with Prof John O'Doherty at the Department of Animal Science in University College Dublin has shown that supplementing the diet of pigs with  $\beta$ -glucans promotes a greater diversity of *Lactobacillus* and *Bifidobacterium* species in the colon, but reduces pathogenic coliform

numbers by up to 1000 fold.  $\beta$ -glucans are complex sugars, found commonly in plants, cereal grains, fungi and algae. Over the past two decades  $\beta$ -glucans have been recognized as functional, bioactive food ingredients. It has been reported in animal studies that  $\beta$ -glucans when used as nutritional supplements stimulate growth, improve nutritional retention and immune system function. In the CIT/UCD study, the effect of algal and yeast  $\beta$ -glucans on the porcine gastrointestinal microflora, specifically the populations of *Lactobacillus*, *Bifidobacterium* and coliforms



*DGGE system used in the pig study (above) and molecular structure of  $\beta$ -glucan (left)*

was evaluated. Many analytical methodologies were used in the study including a highly specialised strain identification system known as Denaturing Gradient Gel Electrophoresis. This technology was set up and optimised in CIT by postgraduate students

Padraigin Murphy and Ann Forde under the supervision of Dr Aidan Coffey. The project which is still ongoing is being funded by the Department of Agriculture, Fisheries & Food.



## Technology Spotlight: Real-time PCR

Molecular diagnostics features strongly within the BIO-EXPLORE research team. One of the flagship technologies available to the group is the Roche Light-cycler 480 real-time PCR instrument. It is designed to detect specific DNA targets, but unlike conventional PCR, it can also quantify the target allowing the researcher to determine exactly how much material is in a given sample. This has obvious applications for detecting infectious agents in

food, water or clinical samples, but can also be applied to detect alterations in levels of cellular gene expression under different conditions. Post-PCR analysis which analyses changes in fluorescence under subtle temperature shifts also makes the instrument ideally suited to detecting mutational changes in a DNA target. This can be applied extensively in genotyping analysis for any cell type especially in clinical diagnosis.



*The Roche Light cycler 480 real-time PCR instrument - a recent acquisition by the BIO-EXPLORE research team at CIT*



*Anne Curtin who recently graduated with an MSc at the Autumn CIT conferring (supervisor Dr. Jim O'Mahony)*

## Eastern Promise

BIO-EXPLORE scientists including Dr. Ambrose Furey, Dr. Helen O'Shea, Dr. Roy Sleator and Dr. Hugh McGlynn played a very significant role in the recent Institutional delegation to India. The purpose of the trip was to build upon and strengthen academic links between strategic departments at CIT and The University of Pune; one of India's leading third level institutions which boasts over 650, 000 students. The intensive week

long trip involved a number of Academic and Industry visits and presentations, and has set the stage for further collaborations between the two institutes including a number of planned staff and student exchanges and research collaborations. Other significant participants from CIT included Dr. Michael Loftus head of the Faculty of Engineering and Science and Dr. Eamon Cashell, head of School.



*Picture includes Dr. Ambrose Furey, Dr. Sharon Keogh, Dr. Helen O'Shea, Dr. Hugh McGlynn & Dr. Roy Sleator during the CIT visit to India*