University's teaching and learning awards were presented at this year's Teaching and Learning Conference where the Mathematics Programme Team (Department of Applied Mathematics) received the Programme Team Award.

The Mathematics Programme Team has engaged in a transformative process to review core components of the programme and so enhance the student experience. This has taken place over the last five years and has gradually resulted in improved student feedback as well as growing the size of the student cohort to more than double over that period of time. Innovative actions such as the introduction of credit bearing tutorial work, the development of integrative modules to teach critical skills, the design of leading-edge computer-aided assessment and the integration of the UG student conference have led to a significant and sustained positive impact that has been recognised by students and external examiners.

It is evidenced by the subject NSS scores and UKES results and a rise in the ranking of the LJMU Mathematics subject ranking in national League Tables.
The Football Exchange at LJMU for which Prof. Lisboa leads on analysis of data, won the Commercial Engagement Award for its work in enabling the football community to directly access the expertise of its world-leading staff and processes. LJMU have over the years successfully worked with many football organisations helping them with research, education and consultancy, including bespoke solutions.

Dr. Ian Jarman is the lead academic for the Mathematics & Statistics Support Centre. This is a University wide service to support any student experiencing a “mental block” with a particular mathematics or statistics problem, or even if more regular support is required. We offer one-to-one support, as well as targeted support for small groups. This service is used by a diverse range of students from: Nursing, Sports Science, Engineering, Mathematics and many other programmes and from all years. Although initially set up to assist struggling students who were in danger of failing, over the years the Maths and Statistics Support Centre’s remit has expanded and they now provide support to many students who are doing well but want to do even better The University is dedicated in supporting all students doing mathematics at whatever level to reach their full potential.
The culmination of a year's effort saw final year Mathematics students deliver talks and present posters on their final year projects at the Mathematics Student Conference. During this innovative annual undergraduate conference, now in its third year, LJMU students are challenged to present their project findings in three minutes in a plenary session, followed by a one-to-one question and answer session on their poster.

The prize for best poster, on ‘Health and Wellbeing of Non-Small Cell Lung Cancer’, went to Alix Crabtree, pictured above.

There were two prizes for best talk. One went to Jack Bennett (pictured below) for his talk on ‘Factor Analysis in Elite Football’.
Curriculum Development Project: Identifying key characteristics that make lecturers ‘amazing’ across disciplines

This project was prompted by the following questions:

a) What do recognised good teachers/lecturers consider to be necessary attributes/factors that improve the teaching and learning experience? Are these universally acknowledged by staff within the same school/department or different schools/departments?

b) What factors do students value in the teaching and learning experience? Are these factors universally acknowledged by students in different schools/departments? In different years? Placement/none placement students?

c) Is there agreement between students’ and teachers’ perceptions of what constitutes good teaching?

Natalie Allerton, a Mathematics student, spent her industrial placement year in the Department of Applied Mathematics carrying out research that would attempt to answer the above questions. The participants in the study were both students and staff within the Faculty of Engineering and Technology. Although this project focused on this faculty alone, it is hoped that similar studies can take place university-wide in the future.

Natalie was supervised by Vince Kwasnica and Ian Malabar but demonstrated real independence in both the collection and analysis of the data. Natalie presented the key findings from the data analysis at the LJMU Teaching and Learning Conference. Her presentation attracted the largest audience of the day and was extremely well received.

Scientific research has been revolutionized by Big Data in the recent years. The digitalization of all information, the continuous sensor tracking and the advancements in machine learning along with scalability and cloud management present an enormous opportunity. Dr. Sotiris Tasoulis Lecturer in Mathematics at the Department of Applied Mathematics organised and co-chaired EPSRC funded Workshop on “High Dimensional Big Data Engineering” within the Computer Laboratory, University of Cambridge. Aim of the workshop was to bring together the experts in computer science, statistics and mathematics in the leading institutes within and beyond the UK. A particular focus was given on establishing collaborative research directions on the state-of-the-art engineering and algorithmic solutions adopted in realistic and large-scale applications. A follow up industry funded workshop is scheduled for December 2016 in conjunction with the IEEE Big Data conference at Washington D.C., USA.
Research Centre for Data Science

The Data Science Research Group combines expertise from across the University, led by The Department of Applied Mathematics and involving also Computer Science and the Liverpool Business School. The Centre builds on 25 years of research expertise in the following key areas, each with a significant component of real-world applications.

The Centre has research expertise in advanced methods with real-world applications to Digital Marketing, Profiling and Inference in Public Health, Clinical Decision Support and Human Resources Analytics, Sports Analytics (see the following figure).

The figure shows the mean season long playing styles for EPL teams. Each individual possession is mapped onto playing styles with proprietary algorithms.

Student Prizes

The Institute of Mathematics and its Applications (IMA) Award goes to the two students with the highest overall mean mark for their degree. The winners of these awards were Debbie Barry and Alix Crabtree.

The Outstanding Performance in Mathematics Prize goes to those students nominated by the Department of Applied Mathematics for not only their outstanding academic achievements but also for their contributions within the department. The winners of these awards were Aimee Carmichael and Sean Cashman.

The Tom McClennan Prize goes to the student who has not only achieved academically but has shown real commitment and application in difficult circumstances. The winner of this award was Andrew Doyle.
LJMU once again hosted and sponsored the Liverpool Mathematical Society’s Pop Maths Quiz.

The Pop Maths Quiz is a TEAM competition that runs a bit like a Pub Quiz but without any alcohol!

Held this year on Saturday 12th March 2016, the event attracted 123 sixth-formers in 32 teams from 11 schools/colleges supported by LJMU Maths students and PGCE trainees plus Liverpool Maths Society members.

Teams consist of 4 students (under 19 years) who, during the Quiz, work as a team to attempt to solve a number of questions on a wide range of mathematical topics. Not all questions require specific A-level maths knowledge but all questions have a mathematical flavour.

Liverpool Maths Society’s President and LJMU Senior Lecturer Dr Ian Jarman said: “LJMU were delighted to host and support this event and as always the Pop Maths Quiz has been a tremendous success. I am always amazed that so many young mathematicians from all over the North West give up their Saturday mornings to take up this maths challenge to pit their skills against other schools.”

Prizewinners 2016:

- **1st prize** Liverpool Bluecoat School: Team 1
- **2nd prize** Runshaw College: Team 3
- **3rd joint** Stockport Grammar School: Team 1
- **3rd joint** Alsager School: Team 1

Runners up 2016:

- St. Edward’s College team 1
- Stockport Grammar School team 2
- West Kirby Grammar School team 1
- Liverpool Bluecoat School team 2
- Runshaw College team 1
- The Mosslands School team 1
EU Research

Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020) – in addition to the private investment that this money will attract. It promises more breakthroughs, discoveries and world-firsts by taking great ideas from the lab to the market. Prof Lisboa has been appointed co-chair of the H2020 Advisory Group on Health, Demographic Change and Wellbeing. Members of the Advisory Group should provide consistent and consolidated advice to the Commission services during the preparation of the Horizon 2020 work programme, regarding the Spreading Excellence and Widening Participation part of the Specific Programme.

Research within the Department

The Department of Applied Mathematics now has three research specialisms - machine learning, mathematical biology and data science.

Although our areas of expertise are diverse, ensuring our research has real-world application is a fundamental priority for all our work.

For example, in the latest research assessment (Research Excellence Framework 2014) we submitted to the Unit of Assessment 11, Computer Science and Informatics. 80% of our research impact within this unit was rated as being at international level.

To enhance our research, the Department of Applied Mathematics works with local, regional and national industries through consultancy and knowledge transfer partnerships. Recently the Department has collaborated with the University of Valencia, Whiston NHS Trust and Public Health England, University of Cambridge and Helsinki Institute for Information Technology.

SIGMA: a network for excellence in mathematics and statistics support

As part of this commitment, Liverpool John Moores University have assigned Dr Ian Jarman to be the regional co-ordinator for Sigma, a network for excellence in mathematics and statistics support. Sigma have established UK-wide and international dissemination activity to benefit those providing maths support in other HEIs. They provided leadership, and played key roles in relevant national projects. Their expertise and success has become recognised by the 2011 Times Higher Education Award for Outstanding Student Support. The sigma Network also organizes regular networking meetings and events where people working in maths support centers can share ideas and collaborate on the development of best practice.
Dr. Steven Webb was awarded phase 1 funding for the NC3Rs CRACK-IT Challenge: Defining skin xenobiotic metabolism using a combined in vitro/in silico approach. In collaboration with Prof Cronin and Dr Madden (both LJMU School of Pharmacy).

The development of new drugs is crucial for improved patient healthcare and personalised medicine. However, the discovery pipeline is protracted because those that pass initial in vitro tests often fail before market. A recent study found that a significant proportion of these failed due to skin toxicity as the skin, which like the liver, contains metabolising enzymes. This is of importance to bio-industry as chemicals applied topically or systemically may be metabolised in the skin and cause hypersensitivity, and technology is not currently available to accurately predict these toxic effects.

This project develops ways to measure the activity of metabolising enzymes and the quantity and location of metabolites in the skin. Experimental data will inform the development of a new computer-based mathematical modelling system developed at LJMU that will ultimately be able to predict the quantities and location of the metabolites produced from any given xenobiotic compound within the skin. Such a platform would have a substantial impact on shortening the discovery process thereby expanding the position of UK pharmaceutical and personal care industries as world leaders.

Dr. Steven Webb was awarded 4 yr BBSRC Industrial Case PhD Studentship in collaboration with Syngenta on Understanding the importance of UDP-glucoronyltransferase (UGT) induction in the liver for perturbing neuronal development using mathematical modelling. PhD to start Oct 2016.

There is increasing regulatory interest in the potential for new chemicals to adversely affect the development of the nervous system. Thyroid hormones are known to be essential for this development and, in many parts of the world, thyroid diseases have been shown to contribute to a number of childhood neurological impairments. Understanding whether new chemicals (e.g. drugs, pesticides, carcinogens etc) are able to exacerbate these effects has implications both for clinical practice and public health. The aim of this project is to work closely with scientists at Syngenta to use Mathematical and Systems Biology techniques to understand what circumstances chemicals can perturb thyroid hormone homeostasis sufficiently to produce an adverse effect to nervous system development (in utero and infant) in humans. This project is led by Dr Steve Webb in Applied Mathematics and will start in Oct 2016.
Thanks to the department of applied mathematics, new students this year got a chance to take an open top tour bus around Liverpool centre and have a sit down meal at Nandos to get to know everyone on their course.

We set off on our tour at around 10:30 on Tuesday with City Explorer, and after an hour of cheesy jokes about Liverpool, we all ran off to the restaurant to warm up and get ourselves fed. In the end, we had students from all years (including some eager PHDs) all chatting about maths and their experiences of the course together. This Directed study week was a great opportunity to bridge a few gaps between our Level 4, 5 and 6 students and after Tuesdays trip, our first year students have built some handy ties to keep them going through the academic year, and are looking forward to their next opportunity for everyone to get together again.

Come along to one of our maths applicants days to experience the department for yourself. Contact our admission team for more details.

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