

## DEPARTMENT OF MATHEMATICS

**Professor Alexandra Rodkina, MPhil, PhD *Kiev*, DSc *Moscow***  
– Head of Department

### WORK OF THE DEPARTMENT

**R**enovation of the Department's building is almost finished. Members of staff have moved into their offices in December 2009. The preparation of the Computer Laboratory has begun.

**Dr. Nagarani Ponakala** received the Principal's award for the best publication of the article entitled "Effect of boundary absorption on dispersion in Casson fluid flow in an annulus – Application to catheterized artery".



### Research Output

Since August 2009 to July 2010, the Department published 15 articles in refereed journals, published 2 books and gave four invited conference presentations.

At present the most developed part of the research activity of the Department of Mathematics can be characterized as "*Mathematics and Modelling*". It comprises three groups of research: **Stochastic Analysis, Physiological Fluid Dynamics, and Mathematical Physics**. In addition, to the Department's monthly seminar, each group has its own research seminars.

**Dr. Conall Kelly** has completed his work for the New Initiative Grant.

**Dr. Conall Kelly** and PhD candidate Mr. Peter Palmer visited the Department of Mathematics at Heriot-Watt University, Edinburgh, UK in June 2010 to collaborate with the research group of Dr. Evelyn Buckwar

on the topic of 'Linear Stability Analysis of numerical methods for stochastic differential equations'. The visit was preceded by two semesters of preparatory research seminars and was funded by a New Initiative Grant. "Overall, the project resulted in 3 articles accepted for publication in 2010; one article submitted for publication and currently in review, one further article in draft form; and one draft chapter in Mr. Palmer's PhD thesis which will be adapted for publication in an International Journal."

### **Summer School**

The Department's summer school, which was coordinated by Dr. Samuel McDaniel, offered nine courses and was once again successful.

### **Mathematics Bridging Programme**

The 2009/10 Mathematics Bridging Programme, designed to improve the basic mathematics skills of incoming FPAS students, took place each Thursday afternoon for 8 weeks in Semester 1. Twenty-eight (28) students participated, of whom 3 were recipients of the Mathematics Bridging Programme Award. Diagnostic testing was used upon entry and exit, and exiting participants showed an average improvement of 37% of their score upon entry resulting in one student almost tripling his score. Plans are in place for future success.

### **Mathematical Olympiad**

In 2009, the Department initiated a set of activities designed to improve the mathematical learning outcomes in Jamaican high schools, which included the launching, in collaboration with Sterling Asset Management Limited, of the Jamaican Mathematical Olympiad in February 2010. Over a three month period, National Mathematics Champions in each of the Grade 7-11 was crowned after four rounds of examinations from which a Jamaican Mathematical Olympiad team of high school students was selected to compete in the XII Central American and Caribbean Regional Mathematical Olympiad. First time competing internationally, they placed 11<sup>th</sup> out of 14 participating countries. In the future, the Department will continue to organize the Olympiad and form national teams to compete internationally.

## **Organization of School and Workshops**

Dr. D. Batic and Prof. Winklmeier (Universidad de Los Andes, Bogota D.C., Colombia) organized the 2<sup>nd</sup> School in Mathematical Physics: “Functional analytic methods in general relativity and quantum mechanics” aimed at undergraduate and graduate students and researchers. The school took place from the 31st of May to the 4th of June 2010, at the Mathematics Department of Universidad de los Andes, Bogotá and had 150 participants.

## **Research Day**

Research Day preparation in 2009 was coordinated by Mr. Richard Plummer. Three posters about the research at the Department were prepared for the exhibition. A Mathematics Competition for 2<sup>nd</sup> and 3<sup>rd</sup> year students was held prior to Research Day and the winners were awarded at the Departmental Booth. Short quizzes for students were conducted at the booth for two days and attracted a lot of students. Presentations on research and career were given at the Department.

## **Outreach Activities**

The Department continues to participate in outreach activities, in collaboration with the Faculty Office, promoting our Department and recruiting students. Visits were also made to a few non-traditional High Schools and workshops conducted. Plans are on the way to strengthen our relationship with one of our feeder Colleges, CASE.

## **MSc Programme**

The MSc in Mathematics Programme was restarted in Semester II, 2009/10. It was preceded by two qualifying courses taught in Semester I. Two graduate courses were taught in Semester II and 1 graduate course was taught in June-July 2010.

## **Curriculum Revision**

A new undergraduate double major programme “Mathematics and Modelling Processes” was approved in 2009/2010. Several students have registered for this programme.

Five new 2<sup>nd</sup> and 3<sup>rd</sup> years courses as well as three 1st year 3 credit courses for the mathematics major students have been developed and approved by AQUAC. One first year course, specially designed for Physics students, was also approved.

## **Staffing**

Two new members of staff were employed at our department. They have already become active members of our team: Dr. Davide Batic joined the department in November 2009 and Mr. Richard Plummer joined the department in January 2010.

## **Faculty Outreach Work & Community Colleges**

The Department was well represented at both the Western and Eastern Fairs, organized by the University and the Faculty of Pure and Applied Sciences, resulting a record number of intakes in the Department and the Faculty.

We worked with and monitored a number of Community Colleges that offer our Preliminary Mathematics courses, resulting in a review of the generally low pass rate among the Community Colleges. Weekly problem papers and worksheets have been forwarded to these institutions to address this. We will be making recommendations to ameliorate our relationships.

## **Editorial And Reviewer's Activity**

**Nagarani Ponakala** – was the reviewer for the following journals: Applied Mathematics and Computation, Mathematical Bioscience, Applications and Applied Mathematics, Chemical Engineering Communications.

**Alexandra Rodkina** and **Conall Kelly** – were reviewers for the following journals: Computers and Mathematics with Applications, Discrete and Continuous Dynamical Systems, Applicable Analysis, Stochastics, Mathematical Problems in Engineering and Automatica, among others.

**Alexandra Rodkina** - was editor for the journal: International Journal of Difference Equations.

## Distinguished Visitors

In January 2010, **Prof. Girija Jayaraman** (Applied Mathematician for over 30 years) from Indian Institute of Technology, New Delhi, India visited and presented two lectures “Partnership between Mathematics and Cardiovascular Research” and “Modeling Aquatic Ecosystems”.

**Prof. Marek Nowakowski**, Departamento de Fisica, Universidad de los Andes, Bogota, Colombia, visited the department in March 2010. His visit was carried out with a grant received from Facultad de Ciencia, Universidad de los Andes. Prof. Marek Nowakowski gave a seminar and performed research activity in the framework of the project “Metrics on manifolds inspired by Quantum Gravity” together with Dr. Davide Batic.

In April, the Department hosted a “*Distinguished Lecture*” in Mathematics, by **Prof. Xuerong Mao**, Head of the Department of Statistics and Modelling Science, University of the Strathclyde, Glasgow, a Fellow of the Royal Society of Edinburgh, UK. Prof. Xuerong Mao has a long history of research collaboration with Prof. A. Rodkina and Dr. C. Kelly.

## PAPERS PRESENTED

- **St. Elmo Whyte**. International Association of Black Actuaries in New York August 4 to 7 2010.
- **Conall Kelly** and **Alexandra Rodkina**. 8<sup>th</sup> AIMS Conference on Dynamical Systems, Differential Equations and Applications, May 25 - 28, 2010, Dresden University of Technology, Germany.
- **Conall Kelly**. TWAS-ROLAC Caribbean Young Scientist & Technologist Conference, January 2010, Ocho Rios, Jamaica.
- **Conall Kelly**. XVII International Symposium on Mathematical Methods Applied to the Sciences, February 2010, University of Costa Rica, San Jose, Costa Rica.
- **Nagarani Ponakala**. TWAS-ROLAC Caribbean Young scientist and technologist Conference, Ocho Rios, Jamaica, W.I, January 20-22, 2010.

## PUBLICATIONS

### Books & Monographs

- \* **McDaniel, S.** “Cape One Mathematics”. Bushy Head Series, Phoenix Printery, 2011
- \* **McDaniel, S.** “Cue Cards and Multiple Choice Questions”. Bushy Head Series, Phoenix Printery, 2011

### Refereed Journals Articles

- \* Guerrero, I. A., **D. Batic** and Nowakowski, M. “A non commutative model for a mini black hole”, *Class.Quant.Grav.* 26, 245006 (9pp), 2009;
- \* **D. Batic** and Nicolini, P. “Fuzziness at the horizon”, *Physics Letters B* 692, 32 (4pp), 2010;
- \* Guerrero, I. A., **Batic, D.** and Nowakowski, M. “Maximal extension of the Schwarzschild spacetime inspired by noncommutative geometry”. *J. Math. Phys.* 51, 022503 (17pp), 2010;
- \* Santacruz, C. A., **D. Batic** and Nowakowski, M. “On the existence of certain axisymmetric interior metrics”. *J. Math. Phys.* 51, 082504 (27pp), (2010);
- \* **Nagarani, P.** “Peristaltic transport of a Casson fluid in an inclined channel”, *Korea Australia Rheology Journal*, 22(2), 2010, 47-63.
- \* **Nagarani, P.**, Sarojamma, G. and Jayaraman, G. “Effect of boundary absorption on dispersion in Casson fluid flow in an annulus - Application to catheterized artery”. *Acta Mechanica*, 202, 2009, 47-63.
- \* Buckwar, Evelyn and **Kelly, C.** “Towards a systematic linear stability analysis of numerical methods for systems of stochastic differential equations,” *SIAM Journal on Numerical Analysis*, 48(1):298-321, 2010.

- \* Appleby, J.A.D., **Kelly**, C., Xuerong Mao, and **Rodkina**, A. “On the local dynamics of polynomial difference equations with fading stochastic perturbations”, *Dynamics of Continuous, Discrete & Impulsive Systems. Series A*. 17 (3), (2010), 401-430.
- \* Appleby, J. A. D., **Rodkina**, A., and Schurz. H. “On the Oscillation of Solutions of Stochastic Difference Equations”. *Matematicas: Ensen'anza Universitaria, Revista de la Coproraci'on ERM*, (2009).
- \* Appleby, J. A. D., and **Rodkina**, A., “Stability of Nonlinear stochastic Volterra difference equations with respect to a fading perturbation”. *International Journal of Difference Equations*, 4 (2), (2009) 165-184.
- \* **Rodkina**, A., and Schurz, H. “On Positivity and Boundedness of Solutions of Nonlinear Stochastic Difference Equations”. *Discrete and Continuous Dynamical Systems. Supplement* 2009, pp. 640-649.
- \* Appleby, J. A. D., **Rodkina**, A., and Schurz, H. “Non-positivity and oscillations of solutions of nonlinear stochastic difference equations with state-dependent noise”. *Difference Equations and Applications*, 6 (7), (2010), 807-830.
- \* Appleby, J. A. D., Riedle, M. and **Rodkina**, A. “On Asymptotic Stability of linear stochastic Volterra difference equations with respect to a fading perturbation.” *Advance Studies in Pure Mathematics*, 53, ICDEA2006, (2009), pp. 281-292.
- \* **Rodkina**, A. “On Nonoscillatory Regime for Stochastic Cubic Difference Equations with Fading Noise”. *Proceedings of the 14th International Conference on Difference Equations and Applications*. Istanbul. Turkey, ISBN 978-875-6437-80-3, (2009), 283-290.
- \* Appleby, J. A. D., McCarthy, M. and **Rodkina**, A. “Growth Rates of Delay-Differential Equations and Uniform Euler Schemes”. *Proceedings of the 14th International Conference on Difference Equations and Applications*. Istanbul. Turkey, ISBN 978-875-6437-80-3, (2009), 117-124.

- \* Appleby, J. A. D., Guzowska, M., **Kelly, C.**, and **Rodkina, A.** “Preserving positivity in solutions of discretised stochastic differential equations”. *Applied Mathematics and Computation*, 217 (2010), 763-774.

## **INCOME GENERATION**

### **UNESCO Project**

In October 2009, The Department obtained a contract with UNESCO valued at US\$12,100.00 for “Mathematical Intervention into the Caribbean” to support a visit of the professor from India to enhance our Modelling programme and Bridging programme; a small part of the Olympiad activity, and to obtain statistical data about the CXC exams in the Caribbean. The Project is completed, but work in the CXC analysis has just begun.

## **PUBLIC SERVICE**

Collaboration with different units at UWI and outside of UWI

Dr. Samuel McDaniel assisted with the delivery of Biostatistics in the Community Health and Psychiatry Department’s PhD programme. He also offered statistical and data collection consulting services to the Ministry of Agriculture and Fisheries, developing and delivering training modules to agricultural extension officers and serves as a Mathematics external examiner for a number of courses at The Mico University and at The College of Agriculture, Science and Education (CASE).

### **Students**

PhD candidate, Mr. F. Arunaye (supervisors: Prof. A. Rodkina, and Prof. Bhatt, St. Augustine campus) successfully defended his dissertation in December 2009.

Two undergraduate students - Mr. Dujon Dunn and Mr. Nigel Johnson participated in a Mathematics Competition and were awarded prizes that were presented to them at the annual Research Day. Four undergraduates



also received prizes at the Faculty Award's Ceremony for outstanding work – Runako Williams, Joel Jackson, Kervern James and Dujon Dunn.

This year 37 students will be graduating with a major offered by the Department. The following data provides a breakdown by major:

<b>Major</b>	<b>No. of Graduants</b>
Mathematics (Major)	14
Actuarial Science	21
Mathematics with Education	2

### **Information on Students**

The following table indicates the number of Mathematics students registered by level and programme.

<b>Maths (BSc)</b>	<b>Actuarial Science</b>	<b>Maths with Education</b>	
Prelim.	170		
Level 1	422	34	2
Level 2	18	44	1
Level 3	10	34	2