In This Issue . . .

- John Mottershead is the New Director
- The current situation of Nuclear Industry and Research in Germany
- Risk mitigation & Human errors
- Dog Bites: Perception and Prevention
- The 13th International Probabilistic Workshop
- Centre for Doctoral Training Activities
- Symposia in International Conferences
- Funded CDT Research Projects Available

Prof John Mottershead is the new Director of the Risk Institute

John Mottershead is the Alexander Elder Professor of Applied Mechanics, Director of the Liverpool Institute for Risk and Uncertainty and Editor-in-Chief of the journal 'Mechanical Systems and Signal Processing'. His main research interest is in vibrations in machines and structure, particularly inverse problems, stochastic model updating, image processing of full-field vibration and strain measurements, active vibration control and aeroservoelasticity. John has published several hundred articles in scientific journals and international conferences and his plenary keynotes include the upcoming UNCERTAINTIES2016 in Brazil. John’s appointment coincided with the opening of new premises in the Chadwick Building, in a central location in the university precinct adjacent to the Stephenson Institute and the CDT in Photovoltaics.

The newly refurbished building has dedicated workspaces for the accommodation of PhD students of the 'EPSRC and ESRC CDT in the Quantification and Management of Risk & Uncertainty in Complex Systems & Environments' in cohorts. The second cohort of CDT students were welcomed in September 2015 and are now settling into the early stages of research projects ranging from the fragility of nuclear installations in seismically-active regions to the identification of hidden structures in financial markets using network theory. A unique feature of the Risk CDT is that first-year MRes students are expected to produce a research paper of international journal/conference quality - we look forward to seeing excellent results, providing first-class preparation for years 2-4 of their studies at the PhD level. Projects for the 3rd cohort of CDT students are presently being advertised on the Risk Institute web site and can be also found at the back page of this issue. The web site is presently being re-designed and will include a forum for open discussion as well as a repository of recorded lectures, including Easter and Summer School lectures by invited speakers etc. The year ahead will see a refocusing of CDT research around four or five themed activities to be developed in collaboration not only with academic colleagues from the many disciplines that contribute to the Risk Institute, but also with our industrial partners. There will be a concentration on developing deep understanding of industrial problems and designing research programmes that address them. John and all of us at the Risk Institute would like to wish our readers a Very Merry Christmas and a Happy and Successful New Year.
The current situation of Nuclear Industry and Research in Germany

Professor Bruno Merk¹, New Chair in Computational Modelling for Nuclear Engineering

About Prof Merk:
In October this year, Professor Bruno Merk has taken up his post as Chair of Computational Modelling for Nuclear Engineering at the School of Engineering. The Chair is supported jointly by the National Nuclear Laboratory (NNL) and the Royal Academy of Engineering (RAEng). He will be located part time at the University and part time at the NNL to keep close contact to the nuclear industry in UK.

He joins Liverpool after working for almost 20 years for different research centres of the Helmholtz Association in Germany. His last post was at the Institute of Resource Ecology at Helmholtz-Zentrum Dresden-Rossendorf.

His research interests include: Development and application of modern calculation methods for reactor physics and reactor safety; advanced computational modelling for fuel management in existing light water reactors; general reactor physics; safety considerations for innovative reactor concepts and transmutation of transuranium elements as an alternative to direct final disposal of nuclear waste with a special focus on the burning of Plutonium, and last but not least communication of complex technical topics to the public.

b.merk@liverpool.ac.uk

In Germany, the nuclear phase out decision is in action and will be irreversible. Immediately after the Fukushima accident in 2011, 8 reactors were closed down, while the remaining 9 reactors will be shut down gradually within 2022. Last year, the close down of the first big, commercial size pre-KONVOI plant with about 1300 MWe was accomplished. The future plan for the phase out is given in the figure below.

In Germany, the nuclear reactor research is mostly carried by the Helmholtz Association and the Gesellschaft für Anlagen und Reaktorsicherheit (GRS) as German reactor safety expert organization.

The research budget of the research program Nuclear Waste Management, Safety and Radiation Research (NUSAFE) of the Helmholtz Association has got a small increase within the third research period for 2015-2019. However, it is to be expected that the program NUSAFE will not be continued in the same form in the Helmholtz Association in the following research period beginning in 2020. Prof Merk has moved to the United Kingdom to support the “Nuclear Renaissance” of the country. His specific interest lies in the possible conflict area of nuclear energy and the improvement of the communication with the public. In his experience, the history in Germany has shown how quickly the support for the nuclear sector and industry can vanish. This has twice led to the political decision to phase out nuclear. Prof Merk is sure the Institute for Risk and Uncertainty can support him to communicate the role and importance of nuclear energy to a broad public. He would like to motivate students and researchers to consider other issues beyond the scientific work of direct relevance to their studies. Together we can support the Nuclear Renaissance in UK.

¹NNL/RAEng Research Chair in Computational Modelling for Nuclear Engineering; School of Engineering, Centre for Materials and Structures, University of Liverpool; https://news.liverpool.ac.uk/2015/10/06/university-welcomes-nuclear-computing-expert/
Risk mitigation: Human errors, preventive design and project management in offshore installations

Raphael Moura, PhD Candidate (year three)
Supervisors: Michael Beer, Edoardo Patelli, John Lewis and Franz Knoll

This project is supported by the Brazilian National Agency for Petroleum, Natural Gas and Biofuels (ANP), which is the watchdog for biofuels and petroleum-related activities and associated pipeline systems in Brazil. The Agency’s responsibility includes the development of regulations for risk mitigation for offshore facilities and onboard safety audits. Brazil is currently the 9th largest petroleum producer and the leading country for deepwater oil and gas production worldwide. The work has the potential to (i) foster enhanced regulations in the safety field; (ii) disseminate lessons from past accidents; (iii) improve risk assessment approval procedures; (iv) develop a design evaluation framework considering the human factors influence; and (v) improve offshore audits.

Therefore, the outcomes would challenge oil & gas producers and drilling companies to improve their operations and deliver a safer offshore environment. To deal with uncertainties related to data collection and overcome the “less-than-adequate” data problem, the initial part of the research comprised a large-scale analysis of human errors based on real projects from around the world. Data was collected from reliability and failure databanks, forensic engineering laboratories, major accidents reports analysis; insurance and re-insurance companies; and consultation with executives and experts involved in sorting out the consequences of errors. The outcome was the development of the Multi-attribute Technological Accidents Dataset (MATA-D), a remarkable collection of major accidents in high-technology industries, which has been contributing to different aims within the human error analysis and mitigation field. Among the most recent achievements, the MATA-D allowed the comparison of the major-accident information with data extracted from offshore safety audits, revealed opportunities for improving the effectiveness of quality control procedures, and supported the development of design failures prevention schemes. The resulting work “Learning from major accidents to improve system design” has been recently published at the Safety Science Journal.

About Raphael:
Raphael joined the Brazilian regulator for the Oil & Gas Industry (ANP) as a Risk/Regulation Engineering Specialist in November 2005, and was appointed as General Manager for Operational Safety in April 2007. He is on leave from the ANP since October 2013, when he joined the Liverpool’s Institute for Risk and Uncertainty as a PhD candidate. Raphael has a Master’s degree in Offshore and Ocean Technology (Cranfield University, UK), a Master of Business Administration (FGV-RJ, Brazil), a postgraduate diploma in Offshore Systems Engineering (UFRJ, Brazil) and a Bachelor’s degree in Production Engineering (CEFET-RJ, Brazil).

rmoura@liverpool.ac.uk

---

2Professor and Head: Institute for Computer Science in Civil Engineering, Leibniz University Hannover, Germany
3Lecturer in Uncertainty and Engineering, Institute for Risk and Uncertainty, University of Liverpool, UK
4Member of Technical Committee, University of Liverpool, UK
5Vice President, NCK Inc., Montreal (Quebec), Canada
Dog Bites: Perception and Prevention

Sara Owczarczak-Garstecka, MRes Student (CDT cohort II)
Supervisors: Carri Westgarth, Francine Watkins and Rob Christley

Dogs that bite often experience poor welfare and biting can have a detrimental impact on human-dog bonds. As a consequence, a number of dogs are either euthanised by their owners or relinquished to animal shelters, where between 10 and 40% are subsequently euthanised. Thus, the welfare implications of bites to dogs are serious. Dogs Trust is keen to learn more about preventing dog bites and managing risk around dogs and, therefore, partly finance this project.

Dog bites are a serious public health problem. In 2009/2010, being 'bitten or struck by a dog' was responsible for 5,194 episodes of hospital admissions in England alone, amounting to an NHS bill of almost £2.5 million in bedtime. This figure does not include loss of income due to an employee being off sick, any cost of further rehabilitation, or emotional distress. The hospital admissions are likely to capture only the tip of the iceberg, as the majority of dog bites go unreported. The risk of dog bites is particularly acute for workers who need to enter private properties on a regular basis, such as postal workers, energy company employees, or delivery workers. Between April 2014 and April 2015, 2,960 postal workers were attacked across the UK. In the next few years, I will be working with The Royal Mail Group and their Health and Safety Executive, who are also industrial partners on this project, in order to understand how to reduce the number of dog bites to their employees. There are two main strategies to reducing dog bites in the UK: i) the Dangerous Dogs Act 199, and ii) informal educational campaigns, usually delivered by charities. The premise behind the educational campaigns is that a poor understanding of dog body language leads to greater risk-taking behaviours around dogs. Therefore, education in dog behaviour will decrease the number of bites.

However, a recent study indicated that individuals often perceive dog bites as unavoidable, which may pose a barrier to instilling changes in their behaviour around dogs and the effectiveness of education. Most research around dog bites uses traditional epidemiological approaches, which have not offered many insights into differences in individuals' perceptions of bites. Applying qualitative approaches to the study of bites, and in particular, using sociological models of risk is a novel and exciting way to approach this problem. Through the industrial placements with the Royal Mail Group and Dogs Trust, data collection will help to learn how individuals exposed to the risk of dog bites at work, and integrate different sources of information about bites with their own experience.

About Sara:

Sara holds a BSc in Anthropology from University College London (graduated 2010) and an MSc in Gender from the London School of Economics and Political Sciences (graduated 2011). After working for a number of UK not-for-profit organisations in both frontline and research positions, she completed an MSc in Clinical Animal Behaviour at the University of Lincoln, graduating in 2015 with distinction.

From 2010 she volunteered and later conducted research at Battersea Dogs and Cats Home, focusing on improving the welfare of shelter dogs. Sara has experience in dog training and behaviour consultations, and her main interests include animal welfare, human-animal interactions, and social studies of science, technology and medicine.

owczarz@liverpool.ac.uk
LIRU hosts and organises the 13th International Probabilistic Workshop (IPW 2015)

The workshop took place from 4th to 6th of November at the University of Liverpool. IPW2015 provided a multi-disciplinary forum for the exchange of knowledge and expertise, in the probabilistic methods, uncertainty quantification, safety and risk management. Overall, the conference programme consisted of 46 presentations and 5 keynote lectures by invited internationally renowned researchers. Around 100 delegates from 18 countries attended the workshops. Proceedings are freely available and can be downloaded at http://ipw2015.org/.

The event was aimed at specialised and synergetic developments in both theory and practice.

Next year the 14th edition of the IPW event will take place at the Ghent University in Belgium.
Training Activities

CDT Easter School, 4th - 8th April, University of Liverpool:

The CDT Easter School is an annual event that brings together world-leading experts, who are actively involved in research relating to aspects of uncertainty quantification and the analysis of complex systems, to provide focused training during a dedicated week.

This is a unique opportunity, provided through the CDT, to learn from experts, which are senior in their areas of specialism, and authors of fundamental textbooks. This year the CDT Easter School will once more take place at the the University of Liverpool, hosting the following three experts:

- Nicola Pedroni, assistant professor at the École Centrale Pairs and École Superieure d'Electricité, and chair of “System Science & Energetic Challenge”;
- Mike Pool, Senior Research Manager, Radioactive Waste Management Ltd;
- Ioannis Stratis, professor of Mathematics at the National and Kapodistrian University of Athens.

Uncertainty Quantification Training course: COSSAN and High Performance Computing, Hartree Centre, Spring 2016:

The Institute for Risk and Uncertainty in collaboration with Hartree Centre will run a training programme focused on Uncertainty Quantification and Management on High Performance Computing. This is in-line with the industry's needs of experts with an in-depth understanding of the modelling of real scale industrial applications and with knowledge of potentiality and opportunities offered by today's computing power.

A three-day workshop will take place at the Science and Technology Park (Daresbury Innovation Centre) in Daresbury, Cheshire. Each day of training will be dedicated to a specific topic focusing attention on HPC, UQ and UQ programming tools for the three days respectively. The first day teachers from Hartree will provide our students with the fundamentals for accessing and using the fantastic HPC facilities of the Science and Technology facility Centre. The second day, our teachers will show the performance of UQ tools using COSSAN-X and the easy-to-use general user interface. The third day, our demonstrators and developers will reveal the secrets of UQ tools by showing the OPENCOSSAN source code functionalities and dependencies.
CDT Summer School, 9th - 10th June 2016, Rhodes Greece:

The summer school this year will take place in beautiful island of Rhodes within the 2nd symposium on Quantitative Finance and Risk Analysis (QFRA2016).

The symposium provides a multi-disciplinary forum for the exchange of knowledge and expertise in the area of Quantitative Finance, Risk Analysis and Management. The event is aimed at specialised and synergetic developments in both theory and practice. Find out more here.

The objective of this symposium is to bring experts and decision makers from different disciplines but working on similar problems together to share information on current and emerging developments and to initiate advancements towards a solution to our challenges through cross-fertilisation. This symposium and subsequent publications will help transition intellectual discussions into robust frameworks for handling emerging vulnerabilities and risks, and provide the leadership and initiative required to respond to national and international financial crisis.

QFRA 2016 Symposium timeline:
- 1st March 2016: Abstract submission
- 1st April 2016: Decision notification
- 15th May 2016: Scientific programme
- 9th June 2016: Conference

CDT First Cohort MRes Graduation: Congratulations!

Congratulations to our 1st cohort students who all successfully completed the one-year MRes training programme, and graduated this December for the Master of Research in Decision Making under Risk & Uncertainty. We wish them every success for the three years of PhD study to come.
Symposia in International Conferences


**EMI 2016 / PMC 2016**

Symposia:

- **EMI-MS-01: Structural Identification and Damage Detection**
  Eleni Chatzi, ETH-Zurich;
  Costas Papadimitriou, University of Thessaly;
  Siu-Kui Au, Risk Institute, University of Liverpool.

- **PMC-MS-01: Advanced simulation-based approaches to uncertainty quantification and reliability analysis**
  Michael D. Shields, Johns Hopkins University;
  Siu-Kui (Ivan) Au, Risk Institute and Centre for Engineering Dynamics, University of Liverpool.

SIAM Conference on Uncertainty Quantification, SIAG/UQ.
SwissTech Convention Center, EPFL Campus, Lausanne, Switzerland.

Symposium:

- **Uncertainty Quantification with Vague, Imprecise and scarce Information organized**
  Edoardo Patelli, Risk Institute, University of Liverpool, UK.


Symposia:

- **MS 1302: Advanced Simulation Methods for Probabilistic Analysis**
  Edoardo Patelli, Risk Institute, University of Liverpool, UK;
  Konstantin Zuev, Risk Institute, University of Liverpool, UK;
  Enrico Zio, Ecole Centrale Paris LGI-Supelec, France & Politecnico di Milano, Italy.

- **MS 1303: Analysis and Design of Safety Critical Systems Under Uncertainty**
  Edoardo Patelli, Risk Institute, University of Liverpool, UK;
  Michael Beer, Leibniz University Hannover, Germany;
  Matteo Broggi, Risk Institute, University of Liverpool, UK;
  Francisco Alejandro Diaz De la O, Risk Institute, University of Liverpool, UK.
Asian-Pacific Symposium on Structural Reliability and its Applications.  
**APSSRA 2016**, Shanghai, China. Symposia:

- **MS-1**: **Epistemic Uncertainties in Engineering: Modeling, Methods and Applications**  
  Wei Gao, UNSW Australia;  
  Hao Zhang, The University of Sydney, Australia;  
  Michael Beer, Leibniz University Hannover, Germany;  
  Vladik Kreinovich, University of Texas at El Paso, US.

- **MS-3**: **Imprecise Probabilities**  
  Michael Beer, Leibniz University Hannover, Germany;  
  Edoardo Patelli, LIRU, University of Liverpool, UK;  
  Matteo Broggi, LIRU, University of Liverpool, UK;  
  Kok-Kwang Phoon, National University of Singapore;  
  Ser Tong Quek, National University of Singapore.

- **MS-4**: **Reliability of Large Systems and Structures**  
  Konstantin Zuev, California Institute of Technology;  
  Michael Beer, Leibniz University Hannover, Germany;  
  Athanasios Pantelous, LIRU, University of Liverpool, UK;  
  Matteo Broggi, Risk Institute, University of Liverpool, UK.

- **MS-5**: **Perception, Calculation and Communication of Risk under High Uncertainty**  
  Sara Waring, Risk Institute, University of Liverpool, UK;  
  Michael Beer, Leibniz University Hannover, Germany;  
  Enrico Zio, Politecnico di Milano, Italy and Ecole Centrale Paris LGI-Supelec, Paris, France  
  Terje Aven, University of Stavanger, Norway.

- **MS-7**: **Surrogate models for structural reliability analysis**  
  Francisco Alejandro Diaz De la O, Risk Institute, University of Liverpool, UK;  
  Sondipon Adhikari, Chair of Aerospace Engineering, Swansea University.

- **MS-8**: **Uncertainty Modeling & Propagation in Nonlinear Stochastic Dynamics: Current Status & Future Challenges**  
  Ioannis A. Kougioumtzoglou, Columbia University, US;  
  Michael Beer, Leibniz University Hannover, Germany;  
  Jianbing Chen, Tongji University, Shanghai;  
  Pol D. Spanos, Rice University, US.

- **MS-11**: **Numerical design for advanced engineering structures**  
  Wolfgang Graf, TU Dresden, Germany;  
  Michael Beer, Leibniz University Hannover, Germany.

- **MS-12**: **Risk Assessment of Complex Infrastructure Networks**  
  Konstantin Zuev, California Institute of Technology;  
  James Beck, California Institute of Technology;  
  Enrico Zio, Politecnico di Milano, Italy and Ecole Centrale Paris LGI-Supelec, Paris, France  
  Athanasios Pantelous, Risk Institute, University of Liverpool, UK.

- **MS 13**: **Reliability And Performance-Based Design Of Complex Structural Systems**  
  Hector Jensen, University of Chile;  
  Marcos Valdebenito, University of Chile;  
  Michael Beer, Leibniz University Hannover, Germany;  
  Edoardo Patelli, Risk Institute, University of Liverpool, UK.
List of Funded CDT Research Projects Available

The studentships are granted for 4 years and include, in the first year, a Master in Decision Making under Risk & Uncertainty. The projects include extensive collaboration with prime industry to build an optimal basis for employability.

Cohort 3 Studentships (commencing October 2016)

Click on the projects below to apply online and see the name of the supervisors.

1. Circular Layouts Representation of the Interbank Systems (Mathematical Sciences / Engineering);
2. Neural mechanisms of effort-based decision making (Psychological Sciences / Mathematical Sciences);
3. Development of a Robust Client Interface Design Decision Tool (Engineering / Architecture);
4. Development of Sensible Structural Restoration and Refurbishment Analysis Methods (Engineering / Architecture);
5. Reliability/Robustness-Based Approaches and Computational Tools for Multidisciplinary Systems under Mixed Aleatory and Epistemic Uncertainty (Engineering / Environmental Sciences);
6. Efficient and Energy-Aware Software for Stochastic Analysis on Large-Scale Systems (Engineering / Computer Science);
7. Reinforced Concrete Response to Near Field Explosions (Civil / Structural Engineering);
8. Stigmergy-based mapping of indoor hazardous environments (Computer Science / Engineering);
9. Quantification and management of the uncertainties of electric freight vehicle and failure modes analysis of aluminium foam structures (Engineering / Computer Science);
10. Modeling and measuring risk in the Context of the Business Use of Information and Communication Technology (ICT) (Management School / Mathematical Sciences);
11. Improving multi-agency risk communication in major incidents (Psychology / Electrical Engineering);
12. Balancing ethicality, legality, security and safety critical decisions (Computer Science / Psychology);
13. Fingerprinting sources of sediment pollution in agricultural river systems (Engineering / Environmental Sciences);
14. Training & Learning Evaluation Frameworks: Monitoring Skills & Knowledge Audits (Psychology / Computer Science);
15. Estimating Energy Efficiency of Applications on HPC Resources (Electrical Engineering, Electronics and Computer Science / Engineering);
16. Untangling Risk and Uncertainty in Socio-ecological Networks (Environmental Sciences / Engineering);
17. Big Data Adaptive Dynamic Route Planning for High-Sea Transportations (Electrical Engineering, Electronics and Computer Science / Engineering);
18. Hormone Analysis in Aquaculture and Laboratory Fish Culture (Electrical Engineering and Electronics / Institute of Integrative Biology);
19. Rapid Screening Mass Spectrometry for Detection of Marine Toxins in Aquatic Food Sources (Electrical Engineering and Electronics / Institute of Integrative Biology);
20. Drought Risk (Environmental Sciences / Engineering);
21. Testing the Robustness of the Base-Line Data Required to Assess and Mitigate Flood Risk in Lacustrine Environments Using Multi-Proxy Evidence (Environmental Sciences / Engineering);
22. In-situ Speciation of Trace Metals in Marine Systems (Environmental Sciences / Institute of Integrative Biology);
23. Uncertainties in Flood Risk Modelling: Effect of Changing River Morphology on Flow Resistance (Environmental Sciences / Engineering);
24. Predictive Modelling for Interbank Markets (Computer Science - Autonomous Systems and Robotics / Economics and Computation);
25. Risk and Uncertainties in Applying Process Based Morphological Model to Offshore Wind Farm Induced Coastal Erosion and Flooding Management (Engineering / Environmental Sciences);
26. Risk and uncertainties in prediction of scour around offshore wind farm foundations (Engineering / Environmental Sciences);
27. Deposition of Charged Particles via Preparative Mass Spectrometry (Electrical Engineering & Electronics / Engineering);
28. Fatigue Risk Management in the Workplace (Electrical Engineering & Electronics / Psychology / Engineering);
29. Farming in transition in East Africa: financial risk taking and agricultural intensification (Infection & Global Health / Sociology);
30. Food Resilience by Aquaponics (Integrative Biology / Computer Science);
31. Living and Future Tools for Risk Assessment: An Examination of the Possibilities for Fusion (Sociology / Mathematical Sciences);

Acknowledgement:
The support of the Engineering & Physical Science Research Council (EPSRC) and the Economic & Social Research Council (ESRC) is gratefully acknowledged.