

# RCUK Global Uncertainties Impact Conference

24<sup>th</sup>-25<sup>th</sup> March, Chicheley Hall

## Conference Report

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## Delegate List

**Professor Uwe Aickelin** Professor of Computer Science, University of Nottingham

**Dr Budi Arief** Senior Research Associate, Department of Computing Science, Newcastle University

**Suzanne Bardgett** Head of Research, Imperial War Museum

**Professor Richard Bowden** Professor of Computer Vision and Machine Learning, University of Surrey

**Dr Layla Branicki** Lecturer in Strategy and International Business, Department of Management, University of Birmingham

**Dr Jon Browning** Academic Outreach, Office of Cyber Security and Information Assurance

**Peri Cihan** Consultancy Associate, Cambridge Enterprise, University of Cambridge

**Alex CPNI**

**Dr Toby Davies** University College London

**Kristina Doronenkova** Deputy Team Head, Society Security and Development, Economic & Social Research Council

**Rowan Douglas** CEO Capital, Science & Policy Practice, Willis Group

**Tim Dowse** Intelligence Adviser, Foreign & Commonwealth Office

**Martin Emms** Research Assistant, Department of Computing Science, Newcastle University

**Professor Robert Gleave** Professor of Arabic Studies, University of Exeter

**Dr Ana Gonzalez Pelaez**

**Dr Mark Hansen** Research Associate, Centre for Machine Vision, University of the West of England

**Dr Peter Hotten** CEO, Ploughshare Innovations Ltd.

**Professor Dick Lacey** Home Office

**Sarah Lister** Head of advisory and policy team, BBC Media Action

**Dr Thomas MacManus** Postdoctoral Researcher, School of Law, King's College London

**Kevin Males** Head of i2 Product Innovation, IBM United Kingdom Limited

**Professor John McCanny** Director, Institute of Electronics Communications and Information Technology, Queens University Belfast

**Dr Roger Miles** Advisor & Researcher specializing in Risk perception, Regulatory Design, Public Trust and Governance

**Professor David Miller** Professor of Sociology, University of Bath

**Tom Mills** PhD Candidate, Department of Social and Policy Sciences, University of Bath

**Shayan Moftizadeh** College of Policing

**Mark Phillips** Policy Adviser for Security and Resilience, ADS Group

**Dr Volha Piotukh** Postgraduate Research Associate, Department of Geography, Durham University

**Professor John Preston** Professor of Education, Cass School of Education and Communities, University of East London

**Dr Wendy Pullan** Director, Martin Centre for Architectural and Urban Studies, Department of Architecture, University of Cambridge

**Professor Muttukrishnan Rajarajan** Professor of Security Engineering, School of Mathematics, Computer Science and Engineering, City University London

**Paul Redfern** Research, Analysis & Development, Department for Transport

**Henry Rex** Policy Assistant, RCUK Global Uncertainties Programme

**Dr Michelle Rigozzi** Policy Fellowships Programme, Centre for Science and Policy, University of Cambridge

**Dr Tristram Riley-Smith** External Champion for RCUK Global Uncertainties Programme

**Peter Sheridan** Co-operation Ireland

**James Smith** Head of Science and Technology, Office for Security and Counter-Terrorism, Home Office

**Neil Stansfield** Deputy Director of Strategy, Defence Science and Technology Laboratory

**Dave Tapolczay** CEO, MRC Technology

**Dr Heather Tewkesbury** Business Development Director, Smith Institute

**Steve Welsh** Head of Behavioural Science & Futures, Serious and Organised Crime Agency

**Professor John Wolfe** Professor of Religious History, Open University

## Executive Summary: Lessons for Impact

Here we present the top new lessons identified by stakeholders and researchers from the conference. For a summary of *lessons already learned* in the GU programme, please see Tristram Riley Smith's talk in *Session I* below.

### Finding the best stakeholders. Co-designing impactful research

- Co-design new research with stakeholders from the outset. Determine their requirements, co-create research questions and impact assessments. Identify who will profit from your insight or innovation - network to get to them. Then focus ruthlessly on them.
- Know how to pitch to a stakeholder. Understand their concerns, hone your pitch, and involve them from the *outset*, e.g. through seminar programmes.
- PowerPoint: Find out the length of a typical presentation and how proposals are reviewed by the organisation. Fewer slides is better. Communicate with pictures, including data visualisations relevant to your stakeholders. Add labels to charts to emphasize their meaning, and avoid jargon. Show takeaway points.
- You need to fully develop the “product”, but you also need to fully develop the “market”. If an innovation differs from existing systems, the world needs to adapt to be able to use it.

### Presenting research so it will be taken up by stakeholders

- Produce information about research that is impactful with reference to the “5 Rs”:
  - **Relevance:** Demonstrate the relevance of information to current policy challenges. If information isn't immediately relevant, it will slip to the bottom of inboxes.
  - **Readability:** Write short pieces without difficult terms.
  - **Realism:** Be realistic in what you can expect of your audience.
  - **Requirements:** Demonstrate that new tools or techniques emerging from research present a solution to unfulfilled requirements.
  - **Reliability:** Create a one-line summary. Then, to accommodate complexity, get across the *reliability* of the evidence behind that summary.
- Don't necessarily publish exclusively in peer reviewed journals. E.g. post online, use forums (or create these if they don't exist), publish in newspapers, magazines, white papers. These media circulate at a higher volume, are more easily accessed by stakeholders, stimulate public debate, and are faster to publish in than peer- reviewed journals.

### Fitting your research in with government

- Who in government works on areas connected to your research? What does the government currently do to get information? What do they do with that information?
- How can your research be adapted to be relevant to interests in government? Focus on *current* policy challenges as well as long-term issues. Write briefing papers tailored to specific audiences e.g. police, transport, urban planning, educationalists, officials in different regions etc.
- Know where your research fits in relation to the three time-horizons applicable to public sector operations, identifying ways in which your work can help “fill in the gaps”:
  1. **Horizon scanning (5-50y ahead):** Academia can help to make government aware of long term, **major trends** (as government corporate memory is very short), especially where there is a critical need (e.g. cyber). Horizon scanning is *led* by academia/private sector/NGOs – the opportunity is there to shape future research by pushing this notion.
  2. **Early warning (and situational awareness) (6 months - 5y ahead):** Researchers can **point to the next thing**, or **that something is missing**, as government is focused on the here and now.

Furthermore, policy makers and ministers need to be **challenged**. Early warning work is *balanced* between the public/private sectors.

3. **Tactical alert (and crisis response) (1h to 6 months):** Academics can offer **lessons learned from past events**. They can also be at the other end of the phone for advice. Tactical alert work is going to be *government* led, but academic experts need to have enough of a profile to be easily found in a crisis.

### Fitting your research in with industry

- If you wish to see a novel product or service adopted by a large corporation or system integrator, bear in mind that many innovations are delivered through *existing* products. Present your idea as: “I have an intelligent vision AND I know you are producing X AND I see that I could increase the value of it in this way”. You may need someone inside the organization (a ‘catcher’) who is willing to take it forward before you pitch.
- To create impact via a “start-up” or “spin-out”:
  - You need to demonstrate to prospective investors a desire to achieve sales and evidence (through multiple data-points) of the technical quality of your product;
  - Venture capitalists look first at the team, then at whether the product works: you need experts in IP strategy, product development, and business models;
  - You will fail if you do not have clarity and a plan, but what happens will be different from the plan anyway. Be resilient, keep the vision strong, but be pragmatic.

### Delivering Constructive Challenge:

*The following suggestions have been received by Professor David Miller in a follow-up note.*

1. Impact is a complex set of processes and it is clear that impacts can have variable and both direct and indirect routes. One route is to work with policy makers to improve whatever policy is in play at the time, while another is to provide evidence that may suggest that current policies need to change. We need in other words to be able to engage constructively but also to take a critical distance for this or that policy. **In terms of future impact work therefore, it may be an idea to run sessions that open up questions as to which government policies are not sufficiently evidence based, or which evidence suggests need to change.**
2. Another notion worth exploring is that of positive and negative impact. In much debate on impact it is assumed that impacts are always positive – meaning that they are beneficial. In fact, some impacts could be negative: harming social solidarity, sustainability or competitiveness, for example. While we might say that such impacts should be avoided, it is not always an easy matter. First because what has a positive impact in one area – say competitiveness – might as a result have a harmful effect on another area – say sustainability. Second because the question of what is positive for society is itself contested. Both points are of signal relevance to the Global Uncertainties programme, where what improves government security policy may also run the risk of alienating elements of society and encouraging what is referred to as 'radicalisation'. Moreover, government policy on 'radicalisation' (and indeed the concept itself) is not at all an uncontested field – as we are finding in our own project on expertise. If policy makers never hear about these issues, how will they be able to avoid any problems flowing from the use of such concepts? The Global Uncertainties Programme – if it is to fulfil the function of conducting excellent social science research and encouraging impact – must engage with a wide variety of beneficiaries and, where appropriate, challenge them, perhaps pushing them outside their comfort zone.

3. To do this we believe we must also include a wider range of stakeholders, ensure that they are listened to, whilst testing what they have to say. To do this we could include debate formats, frankly acknowledge contested areas and try and find ways in which engagement can lead to mutual understanding and/or change among beneficiaries.

### **Recommendations suggested for the Global Uncertainties programme:**

*The following suggestions were made in feedback forms or in the plenary sessions.*

1. The GU should show case studies of best practice in planning for impact, working with policy, working with business, and communicating impact online. Each case study should include the researcher's contact details.
2. Design a tool kit for *researchers* on demonstrating impact and publish other impact related resources on the GU/ESRC website.
3. RCUK should provide a "how to" guide for *stakeholders* asked to evidence impact, e.g. guidance on how to write impact letters and why it is important.
4. Help researchers understand the links between general impacts and impact case studies for the next REF.
5. Every theme in GU needs an intermediary (i.e. every theme needs a Tristram): a proactive spokesperson who will push it forward.
6. Help researchers with routes to the next stage, e.g. dissemination of results to relevant stakeholders.
7. GU could hold other events, focused on a theme. For example, GU could hold a conference on cyber a day before the conference held by the National Cyber Crime unit of the NCA.
8. GU could follow the US Connect Programme, which aims to make a vibrant environment for start-ups through workshops, networks.
9. GU could prod participants from time to time to see what has happened. We should continue the dialogue through a similar conference next year.
10. The ESRC should run a workshop for researchers outside the GU Programme, e.g. economists, on effective communications for impact, including a presentation by Roger Miles.
11. GU fellows can link their own events to the main GU ones; give more advance notice of events to facilitate this. Advance information about event attendees and format will also enable participants to better prepare. Ensure gender balance, including in the speakers.
12. Place greater emphasis on the involvement of "Civil Society" organisations in the GU Programme.

## Session I: Welcome and Introduction

### i. Presentation by Tristram Riley Smith (TRS)

1. Welcome. TRS introduced the (i) aims of the conference, (ii) a description the Global Uncertainties (GU) programme, including its six themes, and (iii) his role as the External Champion. TRS also presented the lessons already learned in the GU programme.

#### ***Lessons already learned in the GU programme:***

- Trust needs to be built between researchers and stakeholders
- Intermediaries play an important role (an example of an intermediary is the GU External Champion)
- Helpful approaches to working with stakeholders have been identified: Map out the stakeholder community; identify new or unvoiced requirements, and; undertake knowledge exchange exercises
- Questions to identify potential for impact (as used in the triage of GU projects):
  - Who are your stakeholders?
    - Ways you might engage with them: intermediaries, governance structures, workshops/conferences
  - What does impact look like for your project?
    - Operational/instrumental; intellectual; capacity building
- The GU programme has learned that:
  - There is an appetite from both sides to have help to connect with one another
  - It takes effort and time to produce material of appropriate quality
  - There is interest from stakeholders but they have limited bandwidth

#### ***Comment on the opening presentation: Alex (CPNI)***

2. If an innovation differs from existing systems, the world needs to adapt to be able to use it. You need to fully develop the product, but you also need to fully develop the *market*; the second takes longer and costs a good deal. This enables people to know how to use the innovation and fit it into normal operations. The Technology Strategy Board (TSB) has money for proving the market.

## Session II: Stakeholder Panels – Part I, Policy Makers

Synopsis: This Session presented what is wanted from researchers, from the stakeholder perspective.

Presentations were given by policy makers: **Neil Stansfield**, Defence Science and Technology Laboratory (DSTL), and **Tim Dowse**, Foreign and Commonwealth Office (FCO).

### What do policy makers want from researchers?

#### i. Presentation by Neil Stansfield (DSTL)

1. Neil introduced a time-line of the evolving relationship between science and technology and security over time. The term “uncertainty” relates to this relationship in three ways:
  - i. Firstly, the likelihood of an event is often considered in terms of probability. However, the term “low probability” in risk assessment (of threats) should be replaced with “high uncertainty”. Hence the focus should be on threats of high impact and high uncertainty;
  - ii. Secondly, there is uncertainty in what the main threats are, e.g. state-on-state conflict, cyber, terrorism, and natural disasters arose as key threats in 2010, and;

- iii. Thirdly, the role of science and technology is highly uncertain – in the past it had no clear value, and now it is front and centre.

There is a need to lower uncertainty/ambiguity. This is where science really matters. This is increasingly difficult to do within government as the government now spends a much lower proportion of its budget on defence.

2. Four challenges for the future:

- i. The world is flatter; the UK used to be dominant as a prolific source of intellectual property/publications - now the rest of the world is doing things in different ways and in big numbers (e.g. in Africa, India, Asia);
- ii. The role of the person will differ across the world. This will be uncertain and continue to change (e.g. technologically enabled Arab Awakening; contrast the way the unmanned car discussion has focused on risk in UK and on opportunity in Japan);
- iii. Big data revolution. The amount of data from dawn of time to 1987 is the same as the amount that is now produced every week. The types of information are different, the sources are diverse, and the information changes at a much more rapid speed. This presents particular challenges in defence and security. It imposes on privacy, and we see people trading security for convenience, for example in the use of social media, or Tesco club cards;
- iv. Science will continue to surprise us and deliver game-changing capability (e.g. second generation quantum technology for use in very precise timing and therefore precise navigation).

The only way forward is to harness UK research.

ii. **Presentation by Tim Dowse (FCO)**

- 4. Tim presented on the way the government is responding to the challenge of global uncertainty. He described this by breaking the response down into three time horizons (focusing on risk, although one could also focus on opportunity):
  - a. **Horizon scanning (5-50y ahead):** while the MoD and DECC think decades ahead, the FCO usually doesn't. The focus of cross-Whitehall work has been largely domestic; however there has been attention to a number of issues involving emerging powers, and recently the problem of 'resource nationalism' has risen up the agenda.
  - b. **Early warning (and situational awareness) (6 months - 5y ahead):** genuinely strategic shocks have been limited (e.g. there was some anticipation of 9/11, 7/7, and even the Arab spring). However, turning early warnings into a policy response is a challenge. It has traditionally been difficult for democracies to take pre-emptive action - particularly where military force is involved (the UN peacekeeping deployment to Macedonia in the 1990s was a rare - and successful – exception).
  - c. **Tactical alert (and crisis response) (1h to 6 months):** e.g. Response to terrorism and flooding. Having early warnings helps to not be taken completely by surprise. However, contingency planning and regular exercises are also needed.
- 5. How academia fits in on these three time-horizons(public-private balances):
  - d. **Horizon scanning: Academic/private sector/NGO led:**
    - i. A gap analysis survey showed horizon scanning work is largely led from outside government. However, in some cases there are gaps in knowledge across all sectors.
    - ii. In the FCO, government corporate memory is short (with staff turnover and the pace of change). Academia can help to make government aware of long term,

major trends. In particular, there is a need to draw on academia more where there is a more critical need (e.g. cyber).

**e. Early warning: *Balanced between the public and private sectors:***

- i. For early warnings, government tends to look first to its internal resources – though internal experts in turn often draw on external contacts. Whitehall expert analysts are encouraged not to depend wholly on official reporting – a rounded assessment needs to take account of multiple sources of information (including the media). But the Internet means government faces a growing problem of information overload, often of doubtful reliability. Academia can help by, e.g., publishing digests or commentaries pointing to the most reliable online sources.

There are other good ways in which academia can contribute. Policy makers and ministers are focused on current problems: they may need help to spot the next big issue, or the one after that – or the problem just below the surface. Researchers can also highlight if a longstanding issue is approaching a tipping point. Furthermore, policy makers need to be challenged.

**f. Tactical alerts: *Government led:***

- i. It is very hard for academic research to work towards this because the demand is almost always for very rapid action – e.g. to a terrorist threat. Government relies on its well-established and exercised in-house crisis response machinery: it is usually unrealistic to expect instant advice on the end of a phone (though that would be welcome). Only if a crisis becomes prolonged may there be scope for consultation with external experts. However, academics can offer lessons learned from past crises.

**6. Three R's for making an impact:**

**a. Relevance**

- i. There is a greater need for external input now than before: the world is more complicated and interdependent, but the government has fewer officials (e.g. in the FCO, there used to be four departments on Africa, now there are two). However if information is not immediately relevant, it will slip to bottom of inboxes. To get attention, research needs to relate clearly to current policy challenges.

**b. Readability**

- i. We suffer from information overload. Whitehall Departments now have access to more information than ever before, but their capacity to analyse and make sense of it is probably less than ever before (fewer staff, pressure of events, demands of the media and Parliament). (As an illustration, if William Hague gave equal time to all the documents he was given in an evening, each paper would get two minutes.) So research needs to be accessible: write short pieces without jargon. There are plenty of examples of good practice, but they are outweighed by the bad ones.

**c. Realism**

- i. Be realistic in what you can expect of your audience, both in terms of expertise and in terms of capacity for policy response. In particular: don't make recommendations without thinking of the resource implications!

**7. What can we do for each other? Tips on communicating with government:**

- Focus on current policy challenges as well as long-term issues
- Use established fora for exchanging views on topics of concern; where they don't exist, create them
- Involve officials in research projects through seminar programmes (preferably from the outset)

- Post online
- Give honest and constructive feedback. But when you do, suggest a viable alternative
- And if officials sometimes appear risk-averse, be aware that wrong advice can have real-world consequences.
- Challenge each other's preconceptions: government usually welcomes challenge when it is based on evidence rather than opinion

This can be summed up as increase communication.

## Q&A after Stakeholder Panel – Part I: Policy Makers

**Q1. John McCanny:** Are we fixated on technology for technologies sake, rather than on solutions?

- **A: Neil Stansfield:** (Yes – the UK is better at creativity than taking that creativity to solving problems) Economists have the following two definitions - Creativity is the generation of ideas from money; innovation is the creation of money from ideas. The UK is great at the first, but rubbish at the second. (Solution:) The TSB is making good steps to towards improving UK innovation, e.g. the quantum technologies roadmap. Germany might be doing better than the UK because their CEOs are engineers and scientists, whereas in UK they have legal and finance backgrounds.
- **A: Tim Dowse:** We are not very good at putting technology in the political context, e.g. there is a huge interest among technology experts and statisticians in making more use of Big Data to improve targeting of public services, but such aspirations have to take account of political realities, where the climate has become more difficult post-Snowden.
- **A: Roger Miles:** (Yes, and having information more beyond a certain level adds to the fog)
  - **A: Tim Dowse:** Each of us uses our own personal list of trusted sites to cut the total amount of information down to something manageable.
  - **A: Roger Miles:** The topic of "dynamic sense making" is relevant to this
  - **A: Neil Stansfield:** There is too much data that is not distilled into knowledge. In government, what we have is too much "lessons identified" rather than "lessons learned".
  - **A: Tim Dowse:** In the past, at least one knew which lessons one wanted to learn (e.g. D-Day). In threat analysis, there is a focus on data rather than on each other (e.g. financial crisis). Human behaviour isn't always reducible to formulae.
  - **A: Peter Hotten:** I would recommend approaching the Royal College of Art. They have specialists who are good at joining the dots between science and technologists, financial specialists, managers etc.

**Q2. Shayan Moftizadeh:** How does one produce simplicity without compromising on the complexity of the background of the material presented?

- **A: Neil Stansfield:** By indicating the **Reliability (4th R)** of the information. By providing a balanced account, showing what else was considered. Get across effectively that there is evidence behind the one-line summary.
- **A: Tim Dowse:** By, in part, getting to know your customer. Also by using plain English. Otherwise, be aware that readers will tend to impose their own interpretation on your words, based on what they think you are trying to say, rather than what you are actually saying.
- **A: Dick Lacey:** (By improving requirements:) **Requirements (5th R)** are often not articulated well enough. Answer what constitutes solutionizing.

## Session III: Stakeholder Panels – Part II, Industry

Synopsis: This Session continued to present what is wanted from researchers, from the stakeholder perspective, but this time from industry. In this session, presentations were given by three people from industry: **Rowan Douglas (Willis)**, **Peter Hotten (Ploughshare Innovations Ltd)**, and **Kevin Males (i2 IBM UK)**.

### What does industry want from researchers?

#### Introductory Presentations

##### i. Rowan Douglas (Willis, Insurance and reinsurance broker)

1. RD introduced that there are three areas that insurance/reinsurance needs to manage:
  - ii. Anthro-nature
  - iii. US lawyers
  - iv. People smashing stuff upIn research, where does the rubber hit the road?
2. Three things need to be in equilibrium/harmony for things to be running well/have resilience against extremes:
  - a. Science
  - b. Capital (and resources)
  - c. Policy (and regulation)These three correspond to science, capital and regulatory revolutions in 1992 (bust) which started the change
3. Three lessons from this:
  - i. It is all about relationships, communication and trust, and all people in different sectors are the same
  - ii. The modelled world politically integrates and unites us all. The UK has a special position in resilience to be the gearbox of standards, of modelling extremes. Allow the centre to serve the global periphery.
  - iii. As well as external uncertainties, we also need to understand the internal ones we face. Consider the values and institutions we need to strengthen and enable in the UK.It all comes back to resilience. We need to see issues from far in the future with very high resolution.

##### ii. Peter Hotten (Ploughshare Innovations Ltd)

PH discussed spinouts as one way of creating impact. To start a spinout, you need to want to see products being sold. To know it could be a good technology, one needs to see a lot of data points. You need experts in IP strategy, product development, and business models. Business plans tend to leave out critical details, such as the balance of stakeholders. The plan differs from what actually happens, but don't let things drift; act quickly and sometimes be cruel. You will fail if you do not have clarity and a plan, but what happens will be different anyway. Keep the vision strong, but be pragmatic.

##### iii. Kevin Males (i2 IBM UK)

1. How IBM relates to universities worldwide:
  - a. *Research.* Money doesn't go to external research (it goes to internal research) but it does go to resources (e.g. academics get free copies of software). To understand research in the

- company, one needs to understand how a piece of research relates to the commercial sides of the business. However, IBM thinks broadly, not just about research
- b. *Readiness.* IBM works with academia in many ways, including enabling skill development and recruitment
  - c. *Revenue.* IBM seed-funds downstream sales opportunities
  - d. *Recruiting*
  - e. *Responsibility.* IBM supports local communities
  - f. *Regions*
2. What's important to IBM (i.e. what it spends money on)
    - a. Technology Trends:
      - IBM Research: 12 labs, 10 countries, 3000 researchers
      - IBM produces a Global Technology Outlook report: Significant technology trends highlighted in 2013:
        - a. Growing scale / Lower barrier of entry
        - b. Increasing complexity / Yet more consumable
        - c. Fast pace
        - d. Contextual overload
 leading to game-changing products and services over 3-10 year horizon
      - Kevin described the major waves of technology over time to highlight where we are: 60s: Back-office computing. 80s: Client-service PC. 90s: World Wide Web and eBusiness. We are here: Confluence of Social, Mobile, Cloud, Big Data/Analytics.
    - b. IBM host Grand Challenges: Deep Blue, Blue Gene, Watson, Project Lucy:
      - How you need to pitch:
        - b. Most new things get delivered through existing products and markets
        - c. IBM doesn't like building new products, and it already has a lot of markets
        - d. They need to hear how an idea is going to be a product and taken to market
        - e. If say you have an intelligent vision AND I know you have product X AND I see this could increase the value of it by this way - then business ears prick up
    - c. Business Strategy: Smarter Planet; Smarter Cities
    - d. Intellectual Property: Top of US list for 20th successive year
    - e. Acquisition Strategy: One company a week
  3. Use networks to get to talk to the right person in IBM. There are 430,000 people in IBM. Nobody knows everybody, but everybody knows somebody. Most IBMers will happily make connections.
  4. Getting noticed:
    - IBM undertakes a lot of interactions with academia
    - Align with key technical and strategic goals:
      - Try to use the same technology
      - Helps the business see the commercial value
    - Less is more:
      - IBM executives like PowerPoint (and Symphony)
      - The like N slides where N is a small integer; 5 is good, 1 is better
      - High information density is OK e.g. quad-charts
      - Additional material is OK as long as it is called 'backup'
      - A typical exec review of an IBM Research proposal:
        - 15-20 mins for presentation +Q&A
        - Will expect some insight into business impact
        - May require business 'catcher' (someone willing to take it forward inside IBM)

- Likely to result in a 'no' answer there and then
    - FOAK board is an example of how executives review research proposals
  - Network!
5. Get involved
- f. IBM Universities Awards Programme:
    - Open Collaborative Research
    - Faculty Awards
    - Shared University Research
    - PhD Fellowship Program
    - Students for Smarter Planet Award

### Q&A after Stakeholder Panel – Part II: Industry

**Q: John McCanny:** How realistic is it for an academic to make a successful proposal when even \$2m or \$4m is noise compared to IBM revenue?

- **A: Kevin Males:** Mostly likely they will say no, unless an internal group shows interest; then success is more likely.
- **A: Rowan Douglas:** Read investor relations reports. Use the phone and play to their ego by saying I have read your speech. Role of government as a broker and as a lubricant is very powerful. People like being invited to Whitehall. Phone is the most important instrument. Formal routes are important, but informal routes are also key.

## Session IV: Impact Talks

Synopsis: This session presented on what researchers can deliver. An example of a researcher making their work have an impact was given by **Roger Miles**, researching on the behavioural psychology of bankers and the financial crisis. After dinner, **Dave Tapolczay**, the **CEO of MRCT**, a highly successful technology transfer organization, gave an example of success in the health sector, and discussed considerations for the security sector in the Q&A.

### i. Roger Miles

1. RM created impact through pursuing a very different type of publishing in contrast to what is normally done in academia (e.g. by publishing in the Financial Times, Thompson Reuters white papers), writing provocatively about things people wanted to read. This has a much larger readership and much faster turnaround. There is not the same quality control, but it can stimulate public debate. He wasn't looking for peer reviewed validation or a job as a professor. Instead he aimed to reach a commercial wide audience, of generalists and specialists, in an instant and accessible way, using accessible language. It is not all ideal – there is no quality guarantee and there is the risk of editorial "subbing" which removes details, but he could get volume out. He gave an example of producing an editorial about how the Financial Conduct Authority was pledging to "control behaviour" but they were missing any detailed understanding of behavioural science. He felt it was good to stimulate public debate, even if what he wrote is sometimes a contrarian stance for rhetorical effect.
2. RM presented many examples of ways to present to companies:
  - How to encapsulate in catchy headings
  - “Moving in the right circles”. Whilst doing the research, get people you know to recommend you to their professional friends to enable further research meetings (cascading)
  - Similarly on completing the research assignment, put the word out to any “friends of the project” (associations, gate keepers, research respondents)
  - Think who could profit from this insight (save or make money)? Focus ruthlessly on them.
  - Show clients "we understand". This happened to company x in your industry, how do you feel about that?
  - Businesses nearly always want (and will fund) new ways to:
    - Understand why controls fail
    - Anticipate bad stuff
    - Show stakeholders that they are risk aware
    - Avoid the regulator
  - Collect war stories
  - Costs of "wrong", profits of "right", and business lines at risk
  - Use frames (fear/greed/regulatory change)
  - Unique elevator pitch
3. RM then gave lots of examples of techniques with PowerPoint:
  - Using pictures (e.g. showing what risk means, or informal organisational behaviour, or relevant pop culture references. Also colour-fields or other techniques for rapid but meaningful summary of big data)
  - Charts should always tell their own story (with no, or minimal, extra explanation). Preferably through clear use of infographics but otherwise by adding very short narrative labels to “signpost” key points/sequences
  - Re-label using normal (non-expert) language; e.g. select examples narrated by respondents

- For complex charts, animate and step through a logical sequence
  - Illustrate any effect with an example your particular audience will know and can relate to
  - Show “takeaway points” at the end: So what?; what to do now
4. Final tips from RM:
- Tell some of it...but never all for free
  - Beware of new best friends – are they buying or selling?
  - Old topics often come back – be ready to re-use (good) material
  - It isn't business unless it is being paid for!

## Q&A

**Q: TRS:** How can other academics get access to skills you had going in?

- **A: Roger Miles:** Go to university skills development. Constantly engage with an audience – ask them questions – to find out what they want. Use research interviews to establish a wider understanding of circumstances, not just narrow set questions. Big fan of semi-structured, qualitative research for this reason; allows for more detailed probing and to encourage respondents’ “war stories”, which can be the most vivid, quotable material in subsequent conferences and editorials.

### ii. Dave Tapolczay (MRC Technology)

1. DT described how the MRCT started – a charity created by the Medical Research Council to help extract value and impact from research. Originally the university and industry sectors were similar, both focusing on upstream and downstream research, and then industry started focusing on downstream only. He knew about the pharmaceutical industry, but little about tech transfer or charities.
2. Now MRCT has done very well. He asked a question: How do you measure return on investment? Or the efficiency of research? He described how one former boss weighed the number of cards each researcher produced, where each card held a description of one piece of research. If you look at the return on their investment (primarily from licensing to industry) – MRCT has not done badly. He gave one example of a lucky break and now for each £1 invested, MRCT earns 37p/yr in perpetuity. The UK is more efficient than investment in the US. And compared to Japan, Japan doesn't do tech transfer. China has invested a lot but is not likely to see much return for 10 years because they are building infrastructure the UK already has. MRCT has built 15 companies and no longer depends on MRC funding. MRCT can now go until 2020-21 without input. They invest in grant programmes tangential to what their people are working on, and don't ask for royalties, just acknowledgement of where the funding came from. Now he just wants to do more of what they have come to do and move to endowment based funding system.

## Q&A

Q1.

**Q: TRS:** How do researchers get credibility with venture capital?

**A: Dave Tapolczay:** The first thing venture capital considers is do they believe in the team. Then, does the science work, is it viable? For the latter, they get tech experts to advise them. These experts advise on “what are the three experiments we would need to do check if the technology will hold up or fall down?”. You need access to non-conditional funding (e.g. gap funds, typically £10-15k, max £250k). VCs give funding to do the experiments, but then they own 60% of the company. If they are very generous they will take delayed stock, but otherwise they will take preferential stock, which means the VCs take

first (so one person got 30% of £9m instead of 30% of £100m). So MRCT protects researchers from investment by VCs too early.

Q2.

**Q: Dick Lacey:** Why has this not been replicated by other research communities?

**A: Dave Tapolczay:** The EPSRC doesn't own research, the university does. The MRC owns the research. STFC and BBSRC work in a way that is closer to the MRC and have their own tech transfer. The MRC said it needed to shift people over to universities; now 65% of the work comes from outside the MRC. Geographically 65% of the work comes from outside the UK - most are in the US, then Japan, and then the number from China is growing.

Q3.

**Q: John McCanny:** (?)

**A: Dave Tapolczay:** The standard route would be to go to your university tech transfer office. In the UK, these are generally under-resourced and not specialized (for example, there are 30+ people in life sciences in the University of Cambridge tech transfer office, but the MRC have 140 people working on life sciences). University tech transfer offices should work closely and collaboratively with MRCT as they are not in competition. We need tech transfer offices to be willing to say they need help; in the US asking for help is not seen as a weakness in the way it is in the UK.

Q4.

**Q: TRS:** Thinking about the Global Uncertainties programme, is there something special with the health market that makes it easier than in security?

**A: Dave Tapolczay:** Yes and no. On one hand, there has to be money in health. However, it is very expensive getting a drug to market, products fail, and there is large regulatory expense. For example, when high throughput screening is used to find targets, you start with 1 million compounds, which yield 1000 hits, giving 100 leads, 12 of which make it to phase 1, six to phase 2, and three reach phase 3. Two-thirds pass phase 3. In 1983 the search was 50,000 to 1; now it is 1 million to 1 drug.

Q5.

**Q: Peter Hotten:** Why would investors choose to invest in health rather than elsewhere, e.g. software?

**A: Dave Tapolczay:** It is now almost unfashionable to invest in pharma. Most VC funds need a return in 5 years, but most pharma projects take 7-10 years. There has been a move to asset-based funding, where they fund the study and ask for 70% of the asset. Are we looking at market failure? Yes for the biotech sector. There is a short-termism. As a charity, MRCT cannot be legally seen to be raising money (it was set up as an evergreen fund, which can go for 1.5y). Medical devices have a quicker turnaround.

Q6:

**Q: Alex (CPNI):** In security, the market is usually in millions rather than in billions - for example, screening systems for airports. Are there lessons from investment in pharmaceutical treatments for orphan conditions that affect smaller numbers of people?

**A: Dave Tapolczay:** Now orphan drugs are actually the norm. The days of the blockbuster drug are over. E.g. in the 1980-90s it was thought that a single tablet could fix each individual disease. But for cancer, there is no single disease or treatment, not even for breast cancer; disease is much more fragmented. MRCT focus on targets that are likely to be prevalent in other diseases (e.g. from hypertension across to Parkinsons). Think laterally for other applications. For example, a sniffer test has been created for bacterial infection, reducing test time from 5 days to 15 mins; this sniffer test could also apply to security.

## Session V: Breakout Groups

**Synopsis:** This session formed Day 2 of the conference. Attendees were divided into four groups containing a mixture of researchers and stakeholders. The researchers then presented to their breakout group and got feedback for 40 minutes. At the end all four groups reported their findings for guidance on impact in a plenary session. *N.B. the format of the individual breakout groups below varies to reflect different ways in which the session was reported.*

## Reports back from Breakout Groups (Plenary Session)

### Group 1: Spokesperson - Jon Browning

#### 1. Budi Arief and Martin Emms (University of Newcastle)

*'Potential vulnerabilities in the EMV payments system brought about by the introduction of Near Field Communications (NFC) payment technologies'.*

- Three potential impacts:
  - Responsible disclosure. Card vendors want to know or take the risk.
  - Research into future standards (owned by card providers). This would be proactive action rather than reactive.
  - Several units who doing similar research could combine under Global Uncertainties (e.g. Royal Holloway, Ross Anderson).

#### 2. Muttukrishnan Rajarajan (City University London)

*'The Uncertainty of Identity: Linking Spatiotemporal Information Between Virtual and Real Worlds'.*

- The group talked about big data, access to datasets (helps being an employee at Google), trusted identity suppliers, and dual use (in crime and security).
- We could have a Global Uncertainties conference bringing together leading thinkers and research students on cyber (e.g. could be a day before the conference held by the National Cyber Crime unit of the NCA).

#### 3. John McCanny (Queen's University Belfast)

*The Centre for Secure Information Technologies, Queen's University, Belfast.*

- *A global innovation hub for cyber security. 80 people (researchers, engineers, business development) doing tech transfer. Examples of research: data security systems, physical unclonable function, network security systems, intelligent surveillance systems.*
- Global Uncertainties could work to follow the US Connect Programme that aims to make a vibrant environment for start-ups through workshops, networks. This could be connected with the "Academic RISC Marketplace". Royal Academy of Engineering launching enterprise hub next week, and sponsoring an Enterprise Fellowship. The Royal Society has something similar.
- Research councils could bring units together by providing funding only when universities work together. This could reverse the way that now people have a loyalty to their universities, rather than their subjects.

## Group 2: Spokesperson - Michelle Rigozzi

### 1. David Miller and Tom Mills (University of Bath)

*'Understanding and explaining terrorism: Expertise in practise'*

- A potential output: A list of top ten independent experts outside of government. Incorporate a taxonomy of terrorism into the database from which these top ten are extracted (e.g. experts on radicalization, or experts on how to tidy up after an event). How can you exclude people from the database on the basis of them not being adequate as an expert? This database could be drawn on to challenge government experts (i.e. used to create a red team).
- A potential output: A corpus of what makes an expert, i.e. if you want to grow your own, then here is how.
- A potential shift in focus to be better aligned to the interests of government: Who are the Chinese, Japanese, Latin American experts so we know who to draw on there (at the moment the research is focusing on countries like Australia, for which it is already easier for the government to find experts).
- A potential shift in focus to be better aligned to the interests of government: Consider including people who live with terrorism in the database, versus those who write on it. Consider terrorists that become experts.
- Potential contacts as docking points inside government: JTAC, RICU, OSCT (Home Office). Less so would be the counterterrorism group focused overseas in the FCO, who have more of a focus on capacity building. (The stakeholders in the group put the researchers in touch with an internal government researcher).
- To develop the database, the following process measure could be used: Conduct a virtual world congress. Imagine whom you would invite to speak, e.g. 20 names, and then ask these people who they would invite.
- A consideration for the database: How long would it take for the database to go out of date? How long after an expert leaves are they still an expert? How labour-intensive to keep it up to date?
- A consideration for the database: Some witnesses are not identified by name. Is secrecy a difficult issue for a public database?
- Current practices by government: Government draws on people they already know, e.g. through industry bodies or their Chief Scientific Adviser. They also identify critical friends outside government as advisors, including people who were in government who are now in the open domain.
- A problem government has where this research can help: To get robust public policy, government needs external challenge, and that challenge needs to be reliable. Government also needs a process of selection for critical friends.
- A consideration for the database: What if someone calls in to complain that you can't say I'm not an expert?

### 2. Rob Gleave (University of Exeter)

*'Legitimate and Illegitimate Violence in Islamic Thought'*

- A potential shift in focus to be better aligned to the interests of government: Is there a history of a development of counter-narratives?

- A question of interest to government: Are there examples of where groups in similar positions went in different directions? What factors shaped the outcomes of those decision points?
- A question of interest to government: Does the different modern communication paradigm impact in a different way on how messages spread and how communities are brought together?
- A proposed output: Consider areas with different demographic makeup. Create heat maps of communities under tension?
- A potential shift in focus to be better aligned to the interests of government: Consider is there an overemphasis in the project on the role of argument/ideology vs other circumstances (e.g. harassment, torture, 16-17 year old leaders)? An alternative would be to identify and work with leaders. (The ideological view is only one part and not independent, but as a contribution Rob Gleave is taking the long view. Violence has been justified along only five different directions in the past, and it would be very hard to see a sixth new justification emerging).
- The project is already stimulating public debate through public art. A debate was held in the cathedral and a YouTube video of the art and interviews was created.

### 3. Wendy Pullan (University of Cambridge)

*'Centre for Urban Conflicts Research'*

- A potential shift in focus to be better aligned to the interests of government: Cities that rapidly develop in emerging economies are correlated with smart cities (in South East Asia, Africa) – would studying these cities provide a cleaner slate to study?
- An area of her work that government stakeholders encouraged her to emphasize: What is the relation between virtual/social media (e.g. mobile phones) and place (cyber-physical systems)? Focusing on the city as a common ground becomes useful. (e.g. robbery, plane missing, internet of things, smart cities). Can the virtual change the reception of the real and vice versa? There is a danger of separating thinking on the two.
- A potential outcome: Govt-to-govt export agreements (RISC). Currently the UK exports a lot of technology but we want to export more social and behavioural insights and advice. Qatar, UAE. The FCO is building capability overseas, and this could be done more holistically by considering architecture.
- A potential outcome: Working with the post-conflict reconstruction unit in the UK with the US for Syria, Damascus, Homs doing post-violence peacekeeping. The US provides more finance, and UK has more to offer in improving the solutions. The UK could offer architecture courses for students in those countries.
- The Centre is already producing briefing papers and creating a museum.
- A potential outcome: Creating targeted briefing papers for police, transport, urban planning, and educationalists, at both a regional and a national level.

### Group 3: Spokesperson - Paul Redfern

Common themes and lessons across the four projects:

- Large datasets, pattern recognition, and better use of data.
- Lack of awareness of exploitation routes. Research grants are still the primary route. Information about options is not reaching the research coal face.
- The more social science projects are more exploitable by the original funders, but there is a more diverse customer base that is not being directly targeted.
- University technology transfer units are not seen as a primary helpful resource.

### **1. Uwe Aickelin (University of Nottingham)**

*'Modelling Variation and Uncertainty in Expert Opinions for Safety Critical Decision Support'. Data mining, artificial intelligence. Medical diagnostics for infants. Experts have difficulty in interpretation. How can we be more systematic? GCHQ. Attack vector profiling. What is needed to get a consensus of opinion.*

- Where else could these technologies be used? How is the approach unique? How can we deliver to a wider user base?

### **2. Richard Bowden (University of Surrey)**

*Computer vision and machine learning, e.g. 'Learning to Recognise Dynamic Visual Content from Broadcast Footage'. Also, lip reading, police use of video data, and automatic contextual reading of web pages.*

- How do we commercialize the projects?
  - Difficulties with moving the projects to the next commercial level, and the reluctance of government to lead that.
  - University tech transfer is a small team with limited time
  - Requirement definition is an issue
  - Greater need to identify the intermediaries, from expert groups to users

### **3. Toby Davies (University College London)**

*'Crime, Policing and Citizenship (CPC) - Space-Time Interactions of Dynamic Networks'. Predictive policing using large datasets from the MET police. Modelling crime hotspots and patterns.*

- Impact
  - Ways police can use this research: resource implications/planning; checking compliance
  - How can we disseminate to wider police forces? College of policing?
  - Use of the same techniques in: MOD IED in theatre; maritime piracy
  - Applicability to private security firms
  - Discussion of decentralized police authorities
  - Is commercialization important?

### **4. Mark Hansen (University of the West of England)**

*Centre for Machine Vision and Face recognition using photometric stereo.*

- Problems with identifying requirements and applications that users would actually run with.

## **Group 4: Spokesperson - Suzanne Bardgett**

Recommendations from Group 4:

- Sometimes we are more impactful than we think, but it is hard to capture and get the message out.
- Impact evaluation should be part of each project's Impact Plan.
- RCUK could provide prominent guidance to persuade stakeholders why impact needs to be supported and recorded by them. The fact that RCUK comes under Business, Innovations and Skills can be emphasised – the UK wants to be at the competitive edge of research and impact is part of that.

- Provide guidance for stakeholders on how to write impact letters.
- Ways to achieve good relations with stakeholders, e.g. informal dinners.
- Co-design impact assessment with stakeholders.
- Every theme needs a Tristram: a proactive spokesperson who will push it forward.
- With the press, sometimes university press offices pick up a story and spin in ways researchers don't like. Writing pieces yourself can be a good way of retaining control of the story.
- Publish examples of best practice of short briefings and achieving impact on the web, and include the person's contact details on that page.

Summary of research by researchers in Group 4 (whose common themes were the human experience of oppression, religion and disaster):

1. **Thomas MacManus (King's College London):** *Civil society's resistance to state crime in Burma and Columbia.*
2. **John Preston (University of East London):** *Public response to critical infrastructure failure.*
3. **Layla Branicki (University of Birmingham):** *Rapid and real-time multi-disciplinary research about the 2013/14 UK floods that examines both recovery and future preparedness. Uniquely the project brings together disciplinary approaches from business and management, human geography and hydrological sciences to create a rounded understanding of how the needs of multiple stakeholders interact. The need for key stakeholder involvement and input throughout the life of the project was discussed, as was the need to build in impact evaluation (i.e. both positive and negative).*
4. **John Wolffe (Open University):** *'Religion and Global Uncertainties'.*

## Appendix I: Conference Agenda

### Day 1 – 24 March

11:00 Arrival & Coffee

12:00 Welcome and Introduction

12:45 Lunch

#### Stakeholder Panels: *What We Want from Researchers?*

14:00-15:00 Stakeholder Panel Part I: Policy-Makers

Tim Dowse, *Intelligence Adviser, Foreign and Commonwealth Office*

Neil Stansfield, *Deputy Director of Strategy, Defence Science and Technology Laboratory*

15:00-16:00 Stakeholder Panel Part II: Industry

Peter Hotten, *Chief Executive Officer, Ploughshare Innovations Ltd*

Kevin Males, *Head of Product Innovation, i2 IBM UK*

16:00-16:30 Coffee and networking

#### Impact Talks: *What Researchers can Deliver*

16:30-17:30 Talk 1: Roger Miles *'Bad behaviour' pays dividends: Putting my original research to work*

18:45 Pre-Dinner Drinks

19:30-21:30 Dinner and Talk 2 (After Dinner): Dave Tapolczay, *CEO MRC Technology*

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### Day 2 – 25 March

07:00-09:00 Breakfast

#### Breakout Groups: *Exploring Options for Impact from Current Research*

09:15 Scene setting

09:30-10:45 Breakout Group Session 1

10:45-11:30 Coffee and networking

11:30-12:45 Breakout Group Session 2

13:00 Lunch

14:00-15:00 Plenary discussion & Wrap up

## Appendix II: Biographies of Speakers

### Panel 1: Policy Makers



**Neil Stansfield**, Deputy Director of Strategy, Defence Science and Technology Laboratory. Neil Stansfield is the Director of the Defence Science and Technology Laboratory's Knowledge Innovation and Futures Enterprise (KNIFE). He has spent 25 years working in defence and security in a range of different roles, including as Deputy Director for Science and Technology in the Home Office's Office for Security and Counter Terrorism.



**Tim Dowse CMG**, Intelligence Adviser, Foreign and Commonwealth Office  
Tim Dowse joined HM Diplomatic Service in 1978, and has served overseas in the Far East, Middle East and the USA. Since 1996 he has worked mainly on national and international security issues from positions in the FCO, HM Treasury and Cabinet Office. Prior to his current appointment, he was FCO Director of Intelligence and National Security (2009-11) and Director Cyber Policy (2011-12). Tim is married with two daughters. His wife is HM Ambassador to Denmark.

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### Panel 2: Industry



**Rowan Douglas**, CEO Capital, Science & Policy Practice, Willis Group  
Rowan leads the Capital, Science and Policy Practice at Willis Group. The Practice confronts large scale challenges of risk, resilience and sustainable growth at global and local scales through public, private and mutual mechanisms. Willis Group is an insurance and reinsurance broker with approximately 20,000 personnel operating in around 100 countries.



**Peter Hotten**, CEO, Ploughshare Innovations Ltd. With 23 years at director level in both non-executive and executive, including CEO, roles in technology led SME companies Peter has built on his scientific training (PhD in microbial biotechnology) to develop a career in creating commercial value from intellectual property assets. Experienced in both private and public sectors Peter has used his skills in structuring, negotiating and closing deals to establish a number of new companies and business development opportunities.



**Kevin Males**, Head of Product Innovation, i2 IBM UK  
Kevin Males heads the Advanced Technology group in IBM's i2 brand. Building on i2's 20 year heritage of solutions for intelligence analysts the team explores the use of novel algorithms and hardware acceleration for high performance data visualisation. The team also develops Facial Recognition technology for i2's Law

Enforcement product line. In addition to running the team Kevin is responsible for i2's relationship with Academia and intellectual property development process.

Kevin has spent 30 years working in software development at a number of Cambridge software companies, starting out at Sinclair Research during the birth of the home computer revolution before working on intelligent weapons at Marconi Underwater Systems and Lisp development environments at Harlequin prior to joining i2 in 2004.

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### **Impact Talk 1**



**Roger Miles**, Advisor & Researcher specialising in Risk perception, Regulatory Design, Public Trust and Governance

Roger Miles PhD FRSA MSRA is an advisor and researcher specialising in risk perception, regulatory design, public trust and governance. He counsels public- and private-sector organisations at Board level and teaches behavioural risk at two postgraduate schools. In commercial practice, he leads development of tools for financial market behavioural risk analysis for Thomson Reuters worldwide. As a social entrepreneur he co-founded an initiative to de-risk financial markets through transaction-pricing of transparency; the resulting trading-screen app is in second-stage funding for commercial launch in the UK, US and Middle East in Q1/2014. He served two terms as Director and communications lead for the BBA in London, UK rapporteur at the Federation Bancaire in Brussels, and subsequently head of risk communications in a ministerial department of HM Government. He has enjoyed a long association with public resilience projects, teaching risk communications at, among others, Cranfield/UK Defence Academy, Cabinet Office Emergency Planning College, and City University.

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### **Impact Talk 2: After dinner speech**



**Dave Tapolczay**, CEO MRC Technology

Dave Tapolczay is the CEO of MRC Technology. He has widespread experience in larger pharmaceutical companies and smaller biotech research laboratories as well as technology transfer groups around the UK and the USA. He was previously Vice President, Technology Development at GSK Pharmaceuticals and CEO of StylaCats and Pharmophix.

MRC Technology is a company and charity, set up to commercialise research from the UK's Medical Research Council (MRC). The MRC is the UK's leading publicly funded biomedical research organisation, whose remit is to improve human health globally. Many of the world's widely known drugs or health discoveries have emanated from the MRC, including Watson & Crick's discovery of DNA's structure and the development of antibody humanisation technology, which has produced drugs including Avastin and Tysabri. MRC Technology (MRCT) is one of the most successful technology transfer companies in the world, solely focused on translating academic research.

## **Appendix III: Breakout Group Participants**

### **Group 1**

Budi Arief  
Jon Browning  
Peru Cihan  
Martin Emms  
Kevin Males  
John McCanny  
Muttukrishnan Rajarajan  
Heather Tewkesbury

### **Group 2**

Tim Dowse  
Rob Gleave  
David Miller  
Tom Mills  
Volha Piotukh  
Wendy Pullan  
Peter Sheridan  
Neil Stansfield

### **Group 3**

Uwe Aickelin  
Richard Bowden  
Toby Davies  
Mark Hansen  
Pete Hotten  
Dick Lacey  
Mark Phillips  
Paul Redfern

### **Group 4**

Suzanne Bardgett  
Layla Branicki  
Thomas MacManus  
John Preston  
Roger Miles  
Liesbet van Zoonen  
Steve Welsh  
John Wolffe