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Science for Policy: A European Perspective

POST-EVENT REPORT

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Professor John Tucker FLSW MAE, Deputy Pro-Vice Chancellor for Science and Engineering, Swansea University

Introduction

I was delighted to host and chair the expert debate on *Science for policy: a European perspective*, at the new Bay Campus at Swansea University. Organised by Academia Europaea's Knowledge Hub in Wales, it was one in a series of panel discussions (begun in 2016) on key issues in research.

Academia Europaea was founded 30 years ago, its inaugural meeting being held in September 1988, in Cambridge. It was created to serve the academic community across the whole continent of Europe. Its headquarters are still in London and it has a network of hubs across Europe, including one based in Cardiff. Today, Academia Europaea has nearly 4,000 members, from all academic disciplines. They are world-renowned research leaders, and include more than 70 Nobel laureates.

Professor John Tucker FLSW MAE
Deputy Pro-Vice Chancellor for Science and Engineering, Swansea University

Summary

On 4th September 2018, a six-member panel of experts, convened by Academia Europaea's Cardiff Knowledge Hub, provided a range of insights into the relationship between science advice and policymaking.

The new Chief Scientific Adviser (CSA) for Wales, Professor Peter Halligan, opened the session with insightful reflections on his first six months in the role. Since March, he has already met his UK, Scottish and Irish CSA counterparts, as well as the incoming CSA for Canada. He presented at the SAPEA (Science Advice for Policy by European Academies) science advisory conference in Bulgaria in May and the 4th European Science Advisors Forum in Estonia in June.

Professor Ole Petersen (Academia Europaea) gave an overview of the role played by academies in the European Scientific Advice Mechanism (SAM), through the Horizon 2020-funded project SAPEA. SAPEA's achievements were illustrated by two case studies. The first, on *Carbon capture and utilisation*, presented by Professor Mike Bowker (Cardiff University), highlighted the contribution made by experts on catalysis at Cardiff. The other, on *Food from the oceans*, was delivered by Wendy Sadler (science made simple), who powerfully demonstrated how to translate complex science into key messages for the general public.

The final two panellists provided a research perspective on the evolving field of science for policy. Dr Dion Curry (Swansea University) explored the role of scientific research in informing public policy, highlighting the IMPACKT (Initiative for Managing Policymaker-Academic Cooperation and Knowledge Transfer) initiative. Professor Robert Evans (Cardiff University) emphasised the values of science in supporting democracy through the two-way interaction between science and society, developed in his co-authored book, *Why democracy needs science* (Collins and Evans 2017).

The presentations sparked an interesting and lively debate, with the audience expressing their views on a variety of issues. These included the challenges faced by researchers in navigating the policy process, the understanding of science by policymakers, the relationship between science and the media, and diversity within the sector.

Image courtesy of Swansea University

Left to right: Professor Ole Petersen, Dr Dion Curry, Professor Mike Bowker, Wendy Sadler MBE, Professor John Tucker, Professor Peter Halligan and Professor Robert Evans

Science for policy: a UK perspective

Professor Peter Halligan FBPS FPSI FRSB, Chief Scientific Adviser for Wales, Welsh Government

Professor Halligan reflected on his initial six months in the post of Chief Scientific Adviser for Wales, which have been shaped by his interactions with a wide range of stakeholders.

He highlighted that science was making great strides in embedding itself in society and is increasingly seen as a vital tool for national governments and international development. Here, the focus is very much on *science for policy*, in the belief that an accurate, unbiased synthesis of relevant science evidence is one of the most valuable contributions a research community can offer democratic decision-makers. Also, there is a growing public support for science to inform government policy. Public surveys (e.g. Amárach Research 2017; Lamberts 2018) show that the public appreciate the input of expert science advice to inform government policy.

With an explosion in the availability of knowledge, the potential supply chain for advice has also grown and therefore one of the challenges is to synthesise scientific knowledge and bring it into government in a form that can inform policymaking. There are few areas of government that do not have a need for science.

Broadly defined, science advice is the exercise of harnessing and synthesising scientific knowledge in support of public decision-making whereas policymaking is about making choices between options, each of which can have different implications. As policy development is a complex and frequently contested exercise, science advice is one of several valuable and essential considerations employed by decision-makers.In providing advice on cross-cutting policy problems, Professor Halligan indicated that he will secure evidence from all disciplines including the natural and physical sciences, mathematics, engineering, technology, social science and the humanities.

These are also challenging times for science advice. A recent report, *Abandoning science advice* (Union of Concerned Scientists 2018), warns of a trend in the US Trump administration for some science advice committees to be side-lined, or for their membership to be changed.

Science advice is not confined to chief scientific advisers but involves a landscape with a range of key actors involved, from well-trained university scientists to national science advisers. There are a number of ecosystem models, but most countries typically employ (either individually but often collectively) a variety of advice streams:

1. **A chief scientific adviser**; examples include the US (since 1957), the UK (since the 1960s), Canada and Australia
2. **Advisory councils**; for example, the UK Science and Technology Council, Japan's Council for Science, Technology and Innovation (CSTI)
3. **National academies**; for example, the Royal Society, the Learned Society of Wales
4. **Supranational**; for example, SAPEA (Science Advice for Policy by European Academies) and the ESAF (European Science Advisors Forum)

A recent article critiqued advisory models for the communication of science to government, based on criteria such as objectivity, responsiveness by government, and degree of public trust (Hutchings and Stenseth 2016). The UK's science advice ecosystem is highly regarded and comprises a range of actors. The UK Government Office for Science provides input to the Council of Science and Technology and the Prime Minister. The current Government Chief Scientific Adviser, Professor Patrick Vallance, also heads up the Office for Science and chairs the UK-wide network of departmental Chief Scientific Advisers, which also includes CSAs from the devolved nations. Scotland has had its own Chief Scientific Adviser since 2006, Wales since 2010. The Welsh Chief Scientific Adviser provides advice to the First Minister, the Cabinet and the administration. The Wales Science and Innovation Council (WSIAC) and the Science Strategy Group (SSG) provide advice to the CSAW.

In terms of research impact, Wales did very well in the last Research Excellence Framework (REF) in 2014. An independent report, commissioned by the Learned Society of Wales and undertaken by King's College London (Hewlett and Hinrichs-Krapels 2017), provided useful insight into the extent and geographical reach of Wales' academic research over the previous decade.

In conclusion, Professor Halligan noted that Chief Scientific Advisers are not and should not be perceived as decision-makers but rather play the key and trusted role of informing relevant parts of government policy. This provides for a role as a trusted 'knowledge broker', not an advocate. In matters of contested science, the CSA cannot resolve value conflicts and Professor Halligan highlighted the need to recognise the challenges that policymakers face when having to come up with decisions, given time constraints and when the policy cycle is short.

SAPEA: Science Advice for Policy by European Academies

The current model for European science advice contrasts with that of the UK. A seven-member Group of Chief Scientific Advisors operates and is supported by a secretariat, the SAM (Scientific Advice Mechanism) Unit.

The European Commission is also funding five pan-European organisations, one of which is Academia Europaea, to undertake evidence reviews. The resulting consortium, called SAPEA (Science Advice for Policy by European Academies), started its operations late in 2016. Of the five, Academia Europaea is unique in having elected individual members, rather than being an umbrella organisation. Academia Europaea is 30 years old, having been established in 1988, and is the longest-established partner within SAPEA.

The President of the Royal Society, Sir Venkatraman (Venki) Ramakrishnan, speaks of the importance of Europe as a scientific power. The Horizon 2020 Research & Innovation Programme, which funds SAPEA, is the largest of its kind in the world.

Academies have a long history. They are independent, self-governing and not subject to commercial interests. They have a tradition of excellence and have considerable convening power. Individual national and regional academies throughout Europe are able to participate in SAPEA. They can suggest topics, nominate Fellows to working groups, host outreach events and generally raise the visibility of their work.

Professor Ole Petersen CBE FMedSci FLSW MAE FRS, Vice-President, Academia Europaea

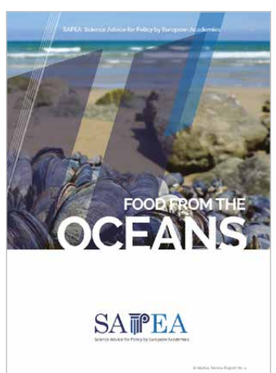
SAPEA's principle task is to produce evidence review reports, and it has published three to date. These are:

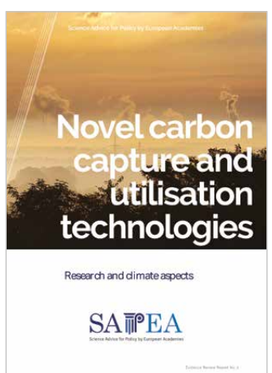
- *Food from the oceans* (SAPEA 2017). This was a substantial report, the work on which was coordinated by the Academia Europaea Cardiff Knowledge Hub. It asked how we can extract more food from the oceans in a sustainable manner.
- *Carbon capture and utilisation* (SAPEA 2018c). See the next presentation from Professor Mike Bowker for details.
- *Plant protection products* (SAPEA 2018b). This report covered the politically-sensitive area of pesticides.

On the basis of these reports, the Group of Chief Scientific Advisors formulates policy recommendations to the European Commission. Importantly, all reports produced under the European Scientific Advisory Mechanism (SAM) are in the public domain.

SAPEA is currently undertaking evidence reviews in three topic areas:

- *Making sense of science* (European Commission 2018b). The work on this being led by the Academia Europaea Cardiff Knowledge Hub and stems from a request made by the Group of Chief Scientific Advisors.
- *Transforming the future of ageing* (European Commission 2018d).
- *Micro- and nano-plastic pollution* (European Commission 2018c).





Chemical storage of solar energy (SAPEA case study 1)

Professor Bowker and his colleague, Professor Graham Hutchings, both provided input to the SAPEA Evidence Review Report, *Novel carbon capture and utilisation technologies* (SAPEA 2018c). In his presentation, Professor Bowker highlighted the reasons why the Cardiff Catalysis Institute was particularly well placed to make such a contribution.

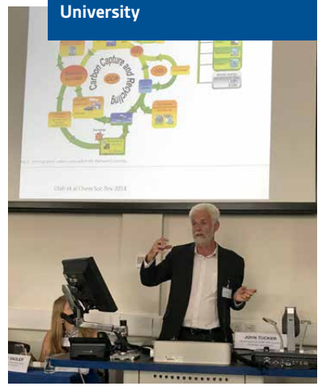
There is a considerable risk posed by climate change. Professor Ed Hawkins of Reading University has shown graphically the rise in global temperatures and the correlation with the increase of CO^2 in the atmosphere since 1850, through his *Climate spiral* (Hawkins 2017).

New thinking is required if we are to meet the Paris Climate Change Agreement (United Nations 2015) and limit temperature rise to below 2 degrees. To do so, it requires carbon capture and other novel technologies to be employed. In the UK, wind is by far the most efficient source of energy. Professor David MacKay, a former Chief Scientific Adviser in the UK, has published a useful e-book (Mackay 2009) and accompanying website for non-specialists, which explains the efficiency of different sources of energy.

CO^2 can be captured and utilised, creating commercial value. CO^2 can also be used as an energy carrier, by reacting with hydrogen produced via a process called electrolysis from renewable energy (e.g. wind). The SAPEA Evidence Review Report examined ways of using CO^2, minimising its release into the atmosphere. It took evidence from a wide range of sources. The SAPEA Working Group included a large number of catalysis experts (around 50% of the total). Catalysis is a way of making chemicals, using less energy and is a very important technology.

Cardiff University is involved in several other projects, expertise from which fed into the SAPEA work. They included Mef CO^2 (2016), which is a demonstrator for the synthesis of methanol from captured carbon dioxide using surplus electricity, which is part of SPIRE (Sustainable Process Industry through Resource and Energy Efficiency).

In the meantime, each of us can take action on CO^2 emissions, by driving significantly less by car each year.



Professor Mike Bowker FLSW, Deputy Director, Cardiff Catalysis Institute, Cardiff University

Krill and chips: how to engage the public with science policy (SAPEA case study 2)

This presentation focused on engaging the wider public with the *Food from the Oceans* Evidence Review Report (SAPEA 2017). The challenge was to convert a 160-page report into a set of clear messages.

As scientists, we have to convey to the public why something matters and make it personal to them. Therefore, always put the 'why?' before the 'what?' as it is essential that people *care* about an issue. Ask why it matters to them - 'so what?' The Eurobarometer survey (European Commission 2018a) is a good source of information on public attitudes; the Wellcome Trust (Wellcome Trust 2018) conducts a similar survey in the UK. Look for the 'people' element within the policy issue. Ask them to take action and do something differently.

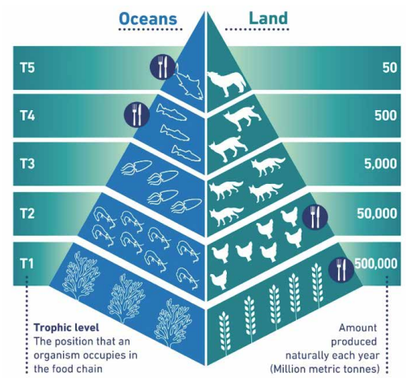
Wendy's science team worked closely with a graphic designer, focusing on the key messages of the report. The first task was to highlight the scale and impact of the Earth's growing population.

The SAPEA report talked extensively about 'trophic levels'. Such terms need to be explained. We do not need to dumb down but rather make it simpler, without losing accuracy. Wendy's team came up with a visual way to show trophic level and provided information about food lower down the trophic level. By including an attractive colouring sheet, they gave the material a long life and a reason for people to keep it.

All the materials are downloadable from a dedicated website (SAPEA 2018a), where it is also possible to obtain more information or add comments.

Food from the oceans has presented a huge opportunity to bridge to the public, particularly given the impact of the BBC's *Blue Planet II* (BBC 2018).

Wendy Sadler MBE, Founding Director, science made simple



Scientific engagement in uncertain political times; challenges for expertise and policymaking in post-Brexit Britain

Dr Curry's presentation focused on the public policy angle, specifically the IMPACKT project (Curry 2018), which looks at how to embed scientific evidence within policy, both within Wales and beyond. Many other initiatives are 'top-down', whereas IMPACKT works directly with researchers in a bottom-up fashion to link that research with public policy.

Dr Curry looked at some of the issues affecting the use of scientific research in policy. The famous Michael Gove quote that we have 'had enough of experts' demonstrates the challenges of linkage between scientific expertise, its role in policy and the view taken by the public. We should ask if science should be involved in *all* policymaking. There is already a shift in the policy realm from evidence-*based* to evidence-*informed* policymaking, with the possible downplaying of scientific evidence.

Paul Cairney has conducted work into why scientific evidence is not used more effectively or more often in policymaking (Cairney 2016). Firstly, policymaking is inherently political, with other non-science issues feeding into the policy process. Early engagement between science and policymaking is therefore vital, based on a proactive rather than a reactive approach. There are differing views on what makes 'good' evidence. Rather than peer-reviewed publications alone, politicians often utilise a wide of sources, including grey literature and public opinion. There can also be a tendency towards cognitive shortcuts in policymaking, instead of relying on the full spectrum of evidence. Finally, policymaking has become much more complex, involving many more actors and factors to consider. This makes it extremely challenging for researchers to be heard.

Dr Curry proposed a number of potential solutions, stemming from IMPACKT.

Image courtesy of Swansea University

Dr Dion Curry, Senior Lecturer in Public Policy, Swansea University.

Researchers

1. Firstly, academics should highlight the relevance of their research. It is critical to convey to policymakers why they should care about what we are doing.
2. Researchers must engage with the public and create a groundswell that their research actually matters. The impact measures in the REF are a step in the right direction towards real-world impact. There are different forms of *how* research is disseminated, *when* and *to whom*. Indeed, academics need to engage with *all* stakeholders, not just government. Consider NGOs and think-tanks, for example.
3. Academics must recognise the challenges of the policy process and where they can feed into it. Researchers must think carefully about whether to be an advocate or a more neutral arbiter.
4. Finally, the rise of interdisciplinary approaches to tackling cross-cutting issues must be further encouraged.

Policymakers

1. Policymakers should show greater recognition of the time needed to achieve the necessary level of quality of evidence, as well as the cross-cutting nature of research and of policy.
2. They should recognise the pressures on academics. They are not only researchers but also teachers and administrators.
3. Policymakers could look not only towards world-renowned professors, but also early- and mid-career researchers who may offer cutting-edge perspectives.
4. Policymakers can make academics and universities more aware of suitable avenues of influence.
5. Finally, policymakers must engage properly with research and not just cherry-pick headlines.

Both academics and policymakers

1. Both academics and policymakers should interact throughout the policy process, keep talking and build relationships. These relationships need to be built over time and not just when results are disseminated or evidence is needed. These avenues of communication really need to be institutionalised, both within government and within universities.
2. Reconcile the needs of policymakers and scientists.
3. Recognise both the short-term and long-term implications of both policy and evidence, and when time is needed beyond the usual policy cycles.

Like oil and water: mixing science and politics for policy advice

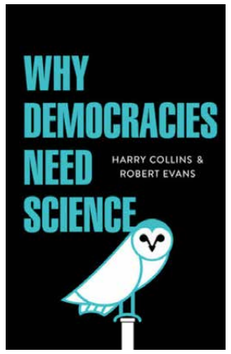
Professor Evans' work is based on the sociology of science, the nature of expertise and science, and how they relate to policy. He suggested that developments in the field of science studies could be characterised as moving through three 'waves':

1. **The age of authority**, often seen as the mythical or ideal state, where science is seen to present some form of autonomous, objective truth, which is transmitted to policymakers and lay people for them to act upon.
2. **The age of democracy**. A social constructivist 'turn', which argues that there is nothing special about science. Instead, cultural groups hold particular beliefs that they regard as valid. This blurs the boundaries between science and other ways of knowing, leading to arguments for democratising science. In this, the views of other communities would count equally with science. It gives rise to 'post-normal' science. The problem with it is to ask why we would want to give special weight to science.
3. **The age of expertise** considers the nature of experience. People who have interacted with a particular domain will have expertise on it. It may not only be scientists but others, such as expert patients and local community groups. Their contribution could be considered 'scientific' even if not produced by scientists. Rather, they are a peer group to scientists in the field (Collins and Evans 2002).

Professor Evans asserted that it is crucial to focus on the *values* rather than *methods* of science. In this, there is some overlap with democratic values but also some unique aspects. Science has certain practices, such as replicability, that make it different. At the same time, science supports democratic values. Generating knowledge through the scientific method is desirable, as is being open to criticism, supporting honesty and integrity.

Society should also be involved in framing scientific research. For example, society could help to shape the type of research questions, programmes and priorities we set for our scientists.

In their book, *Why democracies need science* (2017), Collins & Evans explore how we might get scientific advice into society and into policymaking processes. The book argues in favour of a role for scientific advisers. At the same time, the authors see a need to be more open to heterogeneous types of expertise. For example, non-scientists could be invited onto expert committees, which could open up new ways of seeing an issue or question. It may lead to less consensus, but it is an opportunity to examine exactly where people agree and disagree. Brexit and its associated economic predictions are a good example of this.



In summary, Wave 1 could be termed the *technocratic* approach, where science is presented as the ultimate truth that cannot be ignored. Wave 2 could be called *technological populism*, embodied by President Trump and 'alternative facts'. In this scenario, science has no particular status. Collins and Evans argue instead for Wave 3, termed 'elective modernism', where science advice is legitimate but capable of being ignored by policymakers. Where there is consensus on an issue, policymakers should not justify another policy option on the basis that there is controversy. Where there is a range of views and no real consensus, policymakers cannot justify a particular option on the grounds that there is no real alternative. In truth, there are lots of alternatives. In this case, science advice would not determine the actions of policymakers but rather place limits on why they may justify a course of action.

Professor Robert Evans, Professor of Sociology, Cardiff University

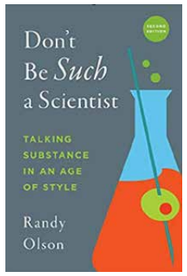
Audience interaction

The audience had the opportunity to interact with the panel, ask questions or comment. The following themes were explored:

Science literacy

A questioner asked about the role of science in children's education. In response, Wendy Sadler acknowledged that scientists do not have much input into school curricula. Nonetheless, scientists definitely have a role in education. The curriculum should acknowledge the process of science, such as peer review. Science should not be just a list of facts. Professor Bowker added that the general public could choose its preferred policy through elections. Public opinion matters. For example, pollution was a serious issue in China but there has been popular pressure to tackle it. Another questioner asked about scientific reasoning, and how to deal with policymakers who do not appreciate or understand science. Professor Halligan responded that, as knowledge brokers, scientists need to understand how policymakers see their role and to build trusted relationships. Professor Evans also questioned attitudes of trust towards science. Science can be mobilised by an elite, as demonstrated at the Brexit debate. It is crucial to rescue science from potentially being seen as the 'enemy of the people' but instead as part of a robust system of checks and balances. Professor Petersen added that science would always be 'used' by someone, for example, where there are commercial interests. It is in the public interest to ensure that science gets to and is used by policymakers.

Science and the media



A questioner noted that the BBC programme *Blue Planet II* had propelled the issue of plastics pollution into the public debate. The problem was not new, but had previously been ignored, which was frustrating. Should we instead focus on influencing the public, rather than policymakers? Professor Petersen responded that it was critical to use all opportunities, as scientists were not in a position to control the media. Scientists could try out different approaches and models. Wendy Sadler emphasised that scientists needed to understand the media, craft stories and tap into peoples' emotions. Sir David Attenborough is expert at this. She recommended the book, *Don't be such a scientist* (Olson 2018). Politicians listen to public opinion. Dion Curry urged universities to recognise impact and public engagement as vital to the promotion of their work.

Professor John Tucker takes questions from the audience

Effectiveness of European policymaking

A questioner asked what the European Commission had done well in policymaking and what might change. Professor Petersen responded that the European Commission needed long-term thinking, citing the example of gene-editing technology. Dr Curry emphasised the importance of research for its own sake, with the discovery of graphene as a prime example. He felt that cross-cutting research was vital, together with wider societal impact. Bureaucratisation was a challenging issue, and the solution was to place emphasis on dialogue and a 'bottom-up' approach.

Legal aspects of policymaking

A member of the audience was concerned about the role of the law and legal constraints on policymakers. Professor Petersen emphasised that lawyers are involved in SAPEA's work. Professor Bowker added that the law had certainly been involved in environmental policy, for example, the development of catalytic converters.

Scientific consensus and interest groups

A member of the audience pointed out that excessive climate change could be catastrophic but that, nonetheless, the debate was ongoing. Should scientists disengage from the debate? Professor Evans spoke about levels of trust. Consensual advice could be seen as 'good enough'. It was necessary to educate people about the nature of science and to spot when controversy is manufactured. Professor Bowker thought it essential to report the facts. Climate change deniers have special interest groups and we should ask who funds them.

Diversity in science

A member of the audience remarked that science has an image problem. There is a lack of diversity and too many white males. We needed more 'positive discrimination' grant awards, for example, for women. Women needed to push back against barriers. Professor Bowker agreed, adding that the men were also of a certain age. Change is not happening fast enough. Wendy Sadler believed there should be more role models for science in schools. It should improve over time, with targeted initiatives. However, societal culture needed to change. Professor Petersen also agreed that progress had been too slow. There is a desire to reach out to early-career researchers in SAPEA, for example, through the inclusion of the Young Academies.

References

2016. *MefCO2* [Online]. Available at: http://www.mefco2.eu/mefco2.php [Accessed: 28 September 2018].

Amárach Research. 2017. *Attitudes to science* [Online]. Available at: https://amarach.com/news-blog-articles/attitudes-to-science.html [Accessed: 28th September 2018].

BBC. 2018. *Blue Planet II* [Online]. Available at: https://www.bbc.co.uk/programmes/p04tjbtx [Accessed: 28 September 2018].

Cairney, P. 2016. *The politics of evidence-based policy making*. Basingstoke: Palgrave Macmillan.

Collins, H. and Evans, R. 2017. *Why democracies need science*. Cambridge: Polity Press.

Collins, H. and Evans, R. 2008. *Rethinking expertise*. University of Chicago Press.

Collins, H. and Evans, R. 2002. The third wave of science studies: studies of expertise and experience. *Social studies of science* 32(2), pp. 235-296.

Curry, D. 2018. *IMPACKT* [Online]. Available at: https://www.impackt.org.uk/ [Accessed: 28 September 2018].

European Commission. 2018a. *Eurobarometer*. European Commission.

European Commission. 2018b. *Making sense of science* [Online]. European Commission Science Advice Mechanism. Available at: https://ec.europa.eu/research/sam/index.cfm?pg=science [Accessed: 28 September 2018].

European Commission. 2018c. *Microplastic pollution* [Online]. European Commission Scientific Advice Mechanism. Available at: https://ec.europa.eu/research/sam/index.cfm?pg=pollution [Accessed: 28 September 2018].

European Commission. 2018d. *Transforming the future of ageing* [Online]. European Commission Science Advice Mechanism. Available at: https://ec.europa.eu/research/sam/index.cfm?pg=ageing [Accessed: 28 September 2018].

Hawkins, E. 2017. *Climate lab book. Open climate science. Climate spirals.* [Online]. Available at: https://www.climate-lab-book.ac.uk/spirals/ [Accessed: 28th September 2018].

Hewlett, K. and Hinrichs-Krapels, S. 2017. *Impacts of academic research from Welsh universities: a comprehensive review of the REF 2014 impact case studies*. The Policy Institute, King's College London.

Lamberts, R. 2018. *The Australian beliefs and attitudes towards science survey*. Canberra: Australian National University.

Mackay, D. 2009. *Renewable energy—without the hot air.* Cambridge: UIT Cambridge.

Olson, R. 2018. *Don't be such a scientist: talking substance in an age of style*. Washington DC: Island Press.

SAPEA. 2017. *Food from the oceans: how can more food and biomass be obtained from the oceans in a way that does not deprive future generations of their benefits?* Berlin: SAPEA, Science Advice for Policy by European Academies.

SAPEA. 2018a. *Food from the Oceans. Making the most of our oceans together.* [Online]. SAPEA, Science Advice for Policy by European Academies. Available at: https://www.sapea.info/oceans/ [Accessed: 28 September 2018].

SAPEA. 2018b. *Improving authorisation processes for plant protection products in Europe: a scientific perspective on the potential risks to human health*. Berlin: SAPEA, Science Advice for Policy by European Academies.

SAPEA. 2018c. *Novel carbon capture and utilisation technologies: research and climate aspects*. Berlin: SAPEA, Science Advice for Policy by European Academies.

Union of Concerned Scientists. 2018. *Abandoning science advice: one year in, the Trump Administration is sidelining science advisory committees* Union of Concerned Scientists.

United Nations. 2015. *Paris Agreement.* United Nations.

Wellcome Trust. 2018. *Public views on science and health*. Wellcome Trust.

Speakers' biographies

Professor John V Tucker FLSW MAE

John Tucker is Professor of Computer Science and Deputy Pro-Vice Chancellor at Swansea University, where he deals with high performance computing. A theoretical computer scientist, he also researches and teaches the history of science and technology. In connection with policymaking, he is one of the founders of the Learned Society of Wales and was its first General Secretary (2010-17), a trustee of the Institute of Welsh Affairs (2006-14) and a member of the REF 2014 and REF 2021 Computer Science Panels.

Professor Peter W Halligan FMedSci FBPS FPSI FRSB

Peter Halligan is Chief Scientific Adviser for Wales and Distinguished Research Professor. He was the founding Director of Cardiff University's Brain Research Imaging Centre (CUBRIC) and Dean of Interdisciplinary Studies. In 2012, he joined Universities Wales as Head of Strategic Futures and in 2015 he became Chief Executive of the Learned Society of Wales. He is co-editor of the international journal *Cognitive Neuropsychiatry*, has published over 200 papers and edited 10 books. He is a former Director of the British Neuropsychiatry Association, and a member of QS World University Rankings Advisory Board and Science Advisory Council for Wales. In 1993, he was awarded the British Psychological Society's early career Spearman Medal for outstanding published research and in 2005 the BPS Presidents' Award for outstanding contributions to psychology. From 2010-2014, he was Chair and Academic Lead of the Welsh Crucible, a flagship researcher development programme which won the Times Higher Education Award for Outstanding Contribution to Leadership Development in 2013.

Professor Ole H Petersen CBE FMedSci FLSW MAE FRS

Ole Petersen is Professor of Physiology in the School of Biosciences at Cardiff University. As one of the world's prominent physiologists, he leads a research group on disease of the pancreas. Petersen was elected Fellow of the Royal Society in 2000, Member of the German National Academy of Sciences Leopoldina in 2010 and gave the Leopoldina Lecture in 2012. He received the Nordic Insulin Foundation's Jacobaeus Prize (1994), the Czech Academy of Sciences' Purkyně Medal (2003) and was appointed Commander of the Order of the British Empire in 2008 for 'Services to Science'. In 2017, he was elected Honorary Member of the German Society for Gastroenterology, Digestive & Metabolic Diseases. More recently, he received the American Physiological Society's Walter B Cannon Memorial Award (the Society's top award). Professor Petersen is Vice-President of Academia Europaea and Academic Director of the AE Cardiff Knowledge Hub. He is a member of numerous editorial boards and one of the executive editors of the *Journal of Physiology*.

Professor Mike Bowker FLSW

Michael Bowker has worked in both industry and academia. He is currently Deputy Director of the Cardiff Catalysis Institute (CCI), and is a senior member of the UK Catalysis Hub network, working both at Cardiff and at the Research Complex at Harwell (RCAH). He has been involved in research across a spectrum of activities in heterogeneous catalysis, nanoscience and surface imaging/reactivity, ranging from selective oxidation catalysis and photocatalysis, to atomic resolution imaging, to nanofabrication. Recently his focus has shifted to catalysis applied to environmental protection, including energy storage. He is part of a European consortium (www.mefco2.eu) aimed at storing solar energy in a chemical form (mefCO2). The evidence review for *Novel Carbon Capture and utilisation technologies* was conducted by the SAPEA consortium, in which Cardif University was heavily involved through Academia Europaea. Professor Bowker was involved in the expert workshop.

Wendy Sadler MBE

Wendy Sadler is the founding Director of science made simple – an award-winning social enterprise that offers science shows and public engagement training across the UK and internationally. Since 2002 they have worked in over 30 countries and are currently part of two H2020 science education projects. Wendy is a former Welsh Woman of the Year (for Science and Technology) and an EU Descartes Laureate for Innovation in Science Communication. Wendy is also a lecturer at Cardiff University and a former member of the Science Advisory Council for Wales, advising Welsh Government on STEM issues. She delivers public engagement training for researchers and has worked with Royal Society, the Royal Academy of Engineering and the Institute of Physics to train their members to become better at engaging diverse audiences with their work. She is passionate about increasing the diversity of people engaged in STEM issues.

Dr Dion Curry

Dion Curry is a Senior Lecturer in Public Policy in the Department of Political and Cultural Studies at Swansea University. He previously held positions at Erasmus University Rotterdam and worked as a policy consultant for the European Commission with the Public Policy and Management Institute in Vilnius, Lithuania. His current research focusses on the intersection of political trust and legitimacy and their effects on (and by) governance processes, including citizen-led governance initiatives and the role of experts in policy-making. Along with James Cronin (Medicine) and Enrico Andreoli (Engineering), he is the founder of the Initiative for Managing Policymaker-Academic Cooperation and Knowledge Transfer (IMPACKT), which aims to connect academic research with policymakers at Welsh, UK and EU levels. His book, *Network Approaches to Multi-Level Governance*, is available with Palgrave Macmillan.

Professor Robert Evans

Robert Evans is Professor of Sociology at Cardiff University's School of Social Science. He specialises in science and technology studies and, in particular, the nature of expertise. His empirical work has examined macroeconomic forecasting, sustainable development and medical genetics. Since 2002 he has worked closely with Professor Harry Collins in developing the Third Wave of Science Studies or Studies of Expertise and Experience (SEE). Work on SEE has led to the development of a comprehensive theory of expertise based around the idea of tacit knowledge, the development of a new research method known as the Imitation Game and an argument that science should be valued for its moral qualities rather than its epistemic ones. Key publications include *Third Wave of Science Studies* (*Social Studies of Science*, 2002), *Rethinking Expertise* (University of Chicago Press, 2007 and University of Chicago Press, 2007) and *Why Democracies Need Science* (Polity, 2017).

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Academia Europaea Cardiff Knowledge Hub
www.aecardiffknowledgehub.wales

Founded in 1988, Academia Europaea now has almost 4,000 leading scientists and scholars as members, including over 70 Nobel laureates. Promoting research excellence across all fields of scholarship, Academia Europaea exists for the public benefit and to highlight the value of scholarship and scientific evidence. The Cardiff Hub is hosted by Cardiff University.

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Alliance for Useful Evidence

Alliance for Useful Evidence
www.alliance4usefulevidence.org

The Alliance for Useful Evidence is a network, hosted by Nesta, that champions the smarter use of evidence in social policy and practice. They do this through advocacy, organising events, sharing ideas, and delivering training and support.

IMPACKT

IMPACKT
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The Initiative for Managing Policymaker-Academic Cooperation and Knowledge Transfer (IMPACKT) is an interdisciplinary project based out of Swansea University that aims to create sustained and proactive dialogue between policymakers and academics working in a variety of fields. It looks to establish an iterative dialogue between government, universities, industry and other partners, drawing on expertise from politics, public policy, medicine and engineering.

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The Learned Society of Wales celebrates and encourages excellence in all of the scholarly disciplines. A Royal Charter charity established in 2010, the LSW is an independent source of expert scholarly advice and commentary on matters affecting the wellbeing of Wales and its people. The Society draws upon the expertise of nearly 500 distinguished Fellows based in Wales, the UK and beyond.

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science made simple has a passion for science and all things associated with it! It offers a selection of inspirational and educational experiences that are tailor-made for schools, festivals, adult audiences and the public. Their mission is to inspire the next generation of scientists and engineers, to engage the wider public with STEM (Science, technology, engineering and maths) as part of popular culture, and to strengthen connection between researchers and the public.

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Wales Centre for Public Policy
www.wcpp.org.uk

The Wales Centre for Public Policy was established in October 2017. Its mission is to improve policymaking and public services by supporting ministers and public services to access rigorous independent evidence about what works.

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