Research culture
embedding inclusive excellence

Insights on the future culture of research

THE ROYAL SOCIETY

Cover image
Young's Translator (2031), by Stephen Bennett and Amy Starmar,
from the Museum of Extraordinary Objects.

Research culture

Research culture encompasses the behaviours, values, expectations, attitudes and norms of our research communities. It influences researchers' career paths and determines the way that research is conducted and communicated.

The UK has a long history of shaping global research culture, from the times of the Enlightenment scientists, the foundation of the Royal Society and the frameworks of publishing and peer review, through to its recent leadership in championing science as an open enterprise.

Building on this history and the strengths of research culture today, the Society has started a programme of work to explore how the UK can promote the cultural conditions that will best enable excellent research and researchers here and elsewhere to flourish in the future[1]. The focus of this programme is on the assessment of research and researchers, researcher career development, and open science. The work builds on the recommendations of a project led by the Nuffield Council on Bioethics in which the Society was a partner[2].

The UK's research ecosystem is evolving in ways that provide new opportunities and new challenges. These include the creation of UK Research and Innovation, the development of an Industrial Strategy and the UK's departure from the EU. In a world where the research budgets of the US, China, Germany and many other countries are greater than the UK's, it is more important than ever to understand how the UK's research culture can be developed and used to its strategic advantage, to attract and retain talent and support continued research excellence.

This document captures the insights and ideas generated through twelve *Visions of 2035* workshops held across the UK, together with insights from a range of other conferences and discussion meetings held over the last year[3]. In total, over 1,000 individuals from government, industry, academia and the professional research services participated in what the Society hopes is just the beginning of a sustained national conversation.

The 12 workshops explored and reimagined[4] existing research funding and assessment systems. Five common themes emerged:

- Recognition and Esteem
- Setting Culture
- A Culture of Mobility
- Open Science
- Fostering Scientific Leadership

Each thematic area was typically explored through two lenses:

- 'Top-down' – the role that public policy, funding and research assessment frameworks play in setting the incentives that shape research culture;
- 'Bottom-up' – the potential for researchers to catalyse behavioural and attitudinal change at the level of research groups and institutions, and how this might bubble up to form new social norms.

The ideas and opinions presented in this document range from those expressed by single individuals to those that were almost universally held and we have tried to distinguish between these.

Participants made a number of assumptions about the future of research culture. For example, most assumed that the research community of 2035 would be much more diverse than it is today, including individuals from a wide range of backgrounds, perspectives and experiences. They expected that boundaries between scientific disciplines would be more permeable. The elements of culture discussed in this document would help to achieve these conditions.

There was clear consensus amongst participants that a change in today's research culture is necessary to ensure the conditions for excellence. Some aspects of the current research ecosystem that are essential for sustainable delivery of excellent research are undervalued. In setting out the needs and aspirations of the research community, this document begins to identify ways in which the Society and others can further support excellence in the research community. It highlights areas where action is needed and invites discussion on the forms that action might take.

1. www.royalsociety.org/researchculture
2. http://nuffieldbioethics.org/project/research-culture
3. A range of futures techniques were used to develop conversations, including using artefacts from the Museum of Extraordinary Objects. These are pictured throughout this document. More information on this can be found at www.royalsociety.org/changingexpectations
4. https://royalsociety.org/topics-policy/projects/research-culture/changing-expectations/visions-of-2035/

Recognition and esteem

A crucial strand to the discussions was to retain and enhance an environment where the best science can be pursued. Participants highlighted the importance of being given the time and the space to do blue skies, risky research as well as synthesis and replicability studies. Central to this being achieved was the need for the value of these activities to be more widely recognised.

Participants reported a perception that current measures of recognition and esteem in the academic environment were disproportionately based on quantitative metrics such as grant income, citation counts and the impact factor of the journals in which they published. There is widespread recognition that these metrics do not adequately capture research excellence, and many leading organisations, including the Royal Society, have signed the San Francisco Declaration on Research Assessment (DoRA) which sets out good practice in this area[5].

Narrow approaches to assessment based on publication metrics risk promoting an environment in which systemic pressures may incentivise individuals to compromise on the rigour and integrity of their research. Senior staff participants from a number of UK universities were clear that individuals' broader contributions to teaching, research and other strategic endeavours do inform decisions on promotion and advancement. Participants from the Early Career Researcher (ECR) community typically had a different perception of what is required of them: across the course of the workshop ECR participants spoke of the pressure to 'publish early and often' in order to secure promotion. The Royal Society has reinforced others' calls for transparent promotion and progression criteria for all research staff[6].

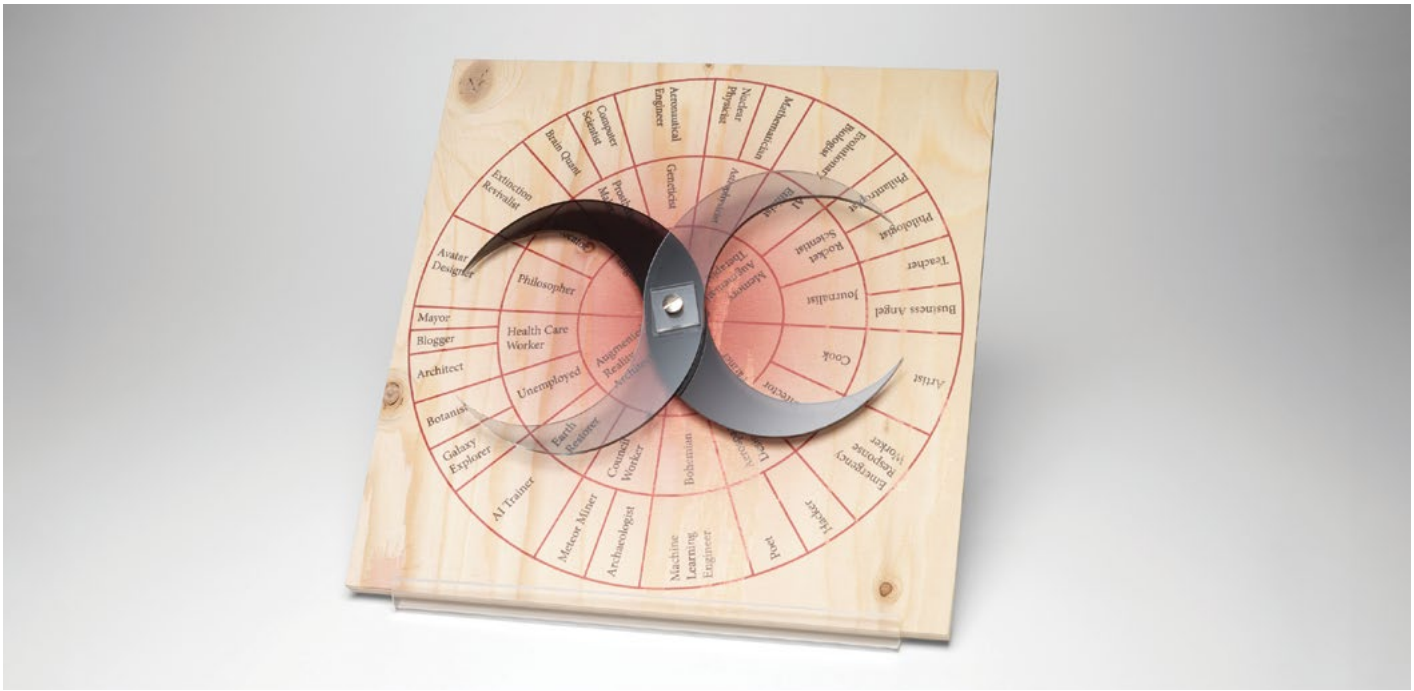

Image
Interdisciplinary Collaboration Wheel (2028), by Neus Torres Tamarit and Reggy Liu, from the Museum of Extraordinary Objects.

5. http://www.ascb.org/wp-content/uploads/2017/07/sfdora.pdf
6. https://royalsociety.org/topics-policy/publications/2017/consultation-response-second-research-excellence-framework-REF/

Some participants' beliefs that quantitative metrics of research impact were the only measures of their potential that mattered seemed to be influenced by their understanding of the Research Excellence Framework (REF). For example, the fact that the REF 2014 guidelines explicitly excluded consideration of journal impact factors did not appear to be well known. The engrained social norms about REF and their divergence from the rules by which the REF operates is discussed in the Nuffield Council of Bioethics 2014 report *The Culture of Scientific Research in the UK*[7].

The Royal Society has called for an institutionally-focussed REF, where a portfolio of outputs from the institution would be submitted. This portfolio, along with examples of research impact, would provide evidence of the quality of the research environment created by the institution. The uncoupling of publications from individuals might reduce pressure on individuals to produce 'REF-able' outputs, benefitting ambitious, longer-term and collaborative research. It would also emphasise the productivity of the institution as a whole, valuing the contributions of support staff and technical specialists as well as Principal Investigators (PIs).

"Diversity is being crushed by narrower and narrower criteria for assessing success."

Dame Ottoline Leyser FRS.

Example

Parent, Carer, Scientist[8] is a collection of 150 personal stories from scientists who are combining a career in research with their roles as parents and carers, each in their own way. Through this initiative the Royal Society is making visible the diversity of individuals who perform research, and their varied other commitments, to establish new norms and shape a more inclusive research culture.

Idea

A standardised short format academic CV: Most funders require a short version of an applicant's CV as part of grant applications. Some participants agreed that a sector-wide standardised short format CV that emphasises wider contributions to the research system could increase the value associated with these activities, but would need to be carefully introduced so as not to create additional burdens on researchers. Some of the activities that could be considered for inclusion in this are discussed in the European Commission's statement on *Evaluation of Research Careers fully acknowledging Open Science Practices*[9]. The use of DOIs[10] and the addition of a summary sentence for publications could reduce the emphasis on the journal in which a paper is published, and refocus attention on its contribution to the field. This short format CV could be incorporated into current contribution record platforms such as ORCiD[11].

7. http://nuffieldbioethics.org/wp-content/uploads/Nuffield_research_culture_full_report_web.pdf
8. https://royalsociety.org/topics-policy/diversity-in-science/parent-carer-scientist/
9. https://ec.europa.eu/research/openscience/pdf/os_rewards_wgreport.pdf (pp6 and 7)
10. A digital object identifier (DOI) is a unique alphanumeric string assigned by a registration agency (the International DOI Foundation) to identify content and provide a persistent link to its location on the Internet. The publisher assigns a DOI when an article is published and made available electronically.
11. https://orcid.org/

Setting culture

Leaders of scientific institutions play a pivotal role in shaping culture. Participants consistently spoke about how leaders who invest time in developing a positive research culture influence others to do the same. There was an appetite for such a focus to be an explicit and embedded part of the 'day job' for all researchers and research leaders.

Consistent messaging is crucial to catalysing a cultural shift. A number of participants suggested that individuals in leadership roles could better use the full range of communication channels open to them, from email signatures to governance and corporate social responsibility reports. Diversity of communication could ensure consistent and wide-reaching messaging and reinforce action to develop and embed positive values and behaviours.

Senior leaders need to practice what they preach. Participants gave a number of examples of research leaders taking small but impactful steps to improve wellbeing in the workplace. This included keeping regular hours to re-set the belief that only academics working long hours could be successful.

Research culture is also strongly affected by a changing funding landscape. For example, there is a movement in the UK towards fellowships and associated programme grants and away from project grants. A few participants felt the balance between these different types of funding should be carefully monitored to ensure the most effective promotion of excellent science.

"Cultures are not set by policy statements or by distributing a leaflet, but through the people with whom we meet in thousands of seemingly insignificant interactions on perfectly ordinary days. We should all ask ourselves whether we display the characteristics that we value and want to see embedded within the cultures in which we work. Some people are more visible than others, but none of us are invisible and we all have a part to play in developing an inclusive and supportive research culture for all."

Professor Tom Welton OBE.

Image
Memorial to Mars Mission, 2027 (2032) by Helen Cawley, Priya Odedra and Josh Bourke, from the Museum of Extraordinary Objects.

A culture of mobility

Mobility refers to the ability of individuals in the research community to move between roles and careers and, in some cases, to follow 'braided career paths' combining academic and other work at the same time. Participants saw mobility as including movement in and out of careers in charitable organisations, the public sector and teaching, as well as industry.

96% of science PhD graduates do not end up holding a permanent academic research position[12], and there was much discussion about how best to continue to encourage the brightest undergraduates to take on PhD studies while also designing environments that enabled them to make the best possible choices about their future careers during their graduate training. Individuals must take responsibility for their own careers and, to do this, they require the time and resource to understand the full and diverse range of career options open to them. This might be made available through greater institutional commitment to supporting non-academic careers or braided career paths inside and outside of academic research.

Enabling mobility

A culture that supports mobility would be characterised by opportunities for people to gain experience in different disciplines and organisations. Longer term industry-academic collaborations and external mentoring for researchers and research staff were given by participants as examples of what 'excellent' might look like. The value of these experiences in supporting career development as well as enabling research that crosses the boundaries between disciplines and organisations was highlighted in the British Academy's report *Crossing Paths: Interdisciplinary Institutions, Careers, Education and Applications*[13].

Supporting collaborations and interactions between researchers in different sectors could also help bridge a perceived cultural divide in terms of the timescales that individuals and their organisations work to. Academia was suggested as being 'too fast' for industry, with a focus only on the next publication and the next grant. This was thought to drive a culture of selfishness and short termism that would be prohibitive to productive collaboration. By contrast, academia was sometimes considered 'too slow' by government which could not often wait the lifetime of an academic 2 – 5 year grant for outcomes to address evidential needs.

Image
The New Career Map (2027) by Liv Bargman and Stephen Bennett, from the Museum of Extraordinary Objects.

12. https://royalsociety.org/~/media/Royal_Society_Content/policy/publications/2010/4294970126.pdf
13. https://www.britac.ac.uk/sites/default/files/Crossing%20Paths%20-%20Full%20Report.pdf

Example

The Royal Society supports the mobility of researchers between academia and industry through its Industry Fellowship Scheme. Since 1998, this scheme has helped nearly 200 scientists and engineers working on collaborative projects between a business and a university. Recently, this has been expanded with an award of further funding, offering more flexible Fellowships and to launch a new Entrepreneur in Residence programme. This will support senior industrial scientists and entrepreneurs to work at a university to impact research, teaching and commercialisation and help grow a more entrepreneurial culture within academia.

Engineering mobility

Rotating individuals through different disciplines and sectors as a core and embedded part of their research activities might begin to bridge the cultural divide between different research environments. GlaxoSmithKline hosting researchers in its Open Lab, BP's International Centre for Advanced Materials (ICAM) collaboration and the Heilbronn Institute, a collaboration between UK GCHQ and the University of Bristol, are examples of this[14].

A changing conversation

The 'push' to introduce structured mobility opportunities into the research system needs to be met by demand 'pull' if they are to deliver real and sustained change. There was a perception that institutional conversations around careers in research mitigated against generating this demand. Participants reported their being perceived as 'failing' should they decide to pursue a career outside of academic research. This was often reinforced by language around other career options being framed in terms of 'alternative', 'Plan b' or 'selling out' in the context of moving to industry.

Changing the language used to discuss research careers is a long standing issue, but it is important for both the community and the individual. The personal crush associated with moving away from academia was rationalised by 'scientist' being a strong part of researchers' identity. Changing career direction involved self-evaluation and uncertainty that act as a barrier. It also personalised failure and 'unsuccessful' research in a way that might incentivise poor practice and compromise research integrity. Workshop participants felt that normalising and valuing participation in a greater range of activities throughout research careers might help to dispel these attitudes.

Despite the sense that current incentives are not aligned to support mobility, individuals do transition from academic research to lead rewarding, productive and successful careers in other sectors. The Royal Society's *Changing expectations*[15] case studies showcase individuals who have benefited from pursuing non-traditional or braided careers. By focussing on diverse contributions, aligning cultures across research environments and changing attitudes towards "failure", we might empower a cohort of researchers to do the same. The Royal Society is working to achieve this, and is ready to build on these efforts with help from others invested in influencing research culture.

> "I think it's a little odd that in academia people talk about 'academia' and 'industry' as if they are the only two options out there, and everything that isn't academia is industry."
>
> Dr Amber Griffiths, founding director at FoAM Kernow.

Example

Where will your career take you? These 23 career case studies are the first stage of the Royal Society's *Changing expectations* project, and inspire researchers to think differently about blinkered definitions of success and to challenge ideas about what skills and achievements should be valued.

14. http://www.icam-online.org/about-us/the-icam-story/; http://www.openlabfoundation.org/about.html; https://heilbronn.ac.uk/about/
15. www.royalsociety.org/changingexpectations

Open Science

Open science encompasses research that is accessible to all, as discussed in the Royal Society's previous report *Science as an open enterprise*[16]. This includes making research papers available at zero cost to the reader. Openness also requires ways of enabling the public and other non-academic audiences such as decision-makers, to understand and engage with research. This in turn requires initiatives such as summaries tailored to the audience, and public engagement programmes[17]. A global push to make science more open is underway, driven both by demand for publicly-funded research to be publicly available and by the increasing ease with which individuals can share information digitally. These ideas underpin the Responsible Research and Innovation (RRI) framework approach[18].

Research is also being carried out in new environments and in new ways. This often does not align with traditional publishing models. Some participants felt there was an opportunity to reimagine the mechanisms for the dissemination of research findings, to prioritise their usefulness to the entire research community, to reduce delays involved in journal publication and break the links between publishing metrics and assessment. The Royal Society is helping to drive change in open science by publishing two fully open access journals, with strong data sharing policies and the use of open peer review[19].

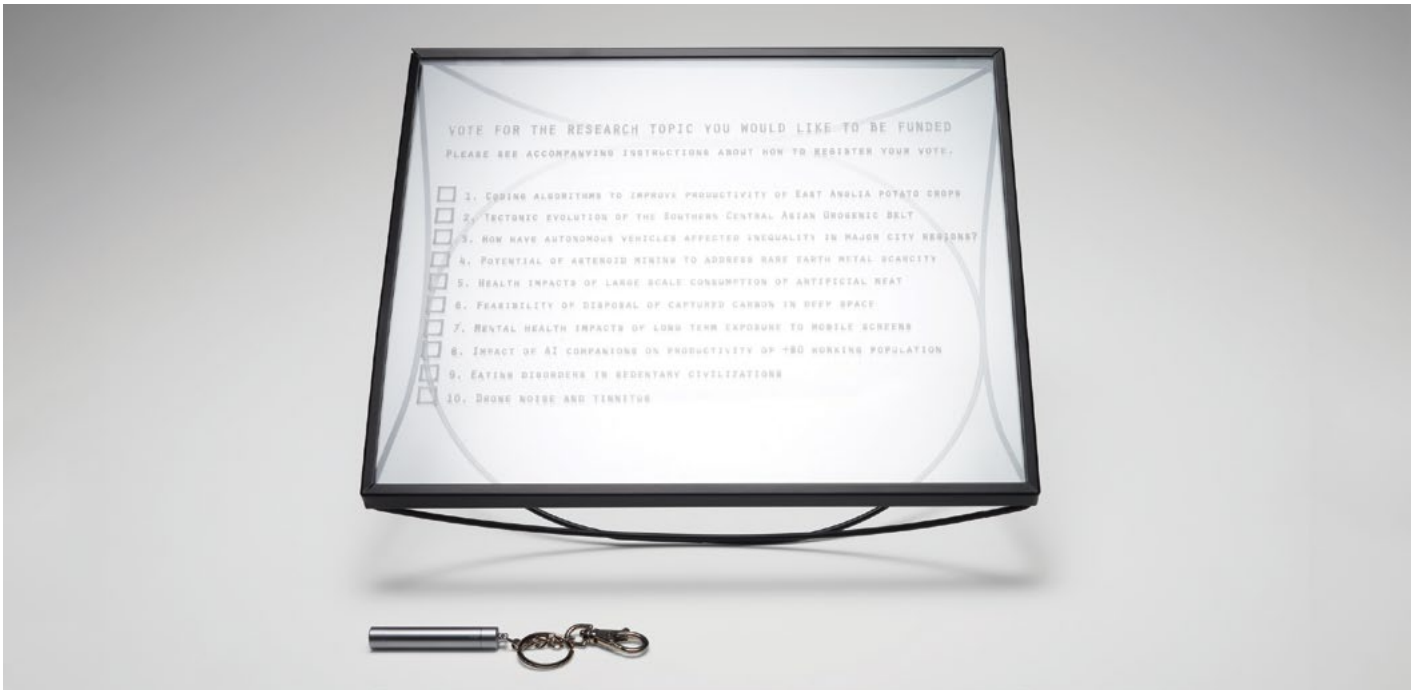

Image
Science Funding Referendum, Public Ballot Voting Form (2025)
by Tere Chad, from the Museum of Extraordinary Objects.

16. https://royalsociety.org/topics-policy/projects/science-public-enterprise/report/
17. http://www.rcuk.ac.uk/documents/documents/concordatonopenresearchdata-pdf/; http://www.rcuk.ac.uk/Publications/policy/perConcordat/; The Royal Society and Academy of Medical Sciences will publish a report on evidence synthesis for policy in 2018.
18. https://www.rri-tools.eu/about-rri
19. https://royalsociety.org/journals/; https://royalsociety.org/journals/ethics-policies/data-sharing-mining/; http://rsos.royalsocietypublishing.org/open-peer-review

Research findings are disseminated in different ways by different sectors and even disciplines. This means knowledge stock becomes available at different rates, with different time lags. In industry, there was a perception that research findings were primarily communicated internally, and that incentives to share them with the wider community were limited because of concerns about IP and commercial advantage. By contrast, whilst academic papers are widely available, there was a perception that they might sometimes be structured and presented with professional advancement and personal progression in mind. In discussions it was widely agreed that the primary incentives for disseminating research findings should be the benefit to the community as a whole, and the advancement of the research enterprise.

Integrity and emergent funding

In the UK, the outputs of all publicly-funded research must be made openly available. No such mandate exists for research funded by other routes, including new and emerging models such as the growing citizen science movement. Currently, researchers perceive some disincentives to open science given the time it takes to prepare and publish open data, and the lack of clarity in terms of its status in grant applications. Transparency, in terms of the research being done and the discrete contributions supporting it, was believed to be the best way to embed a culture of integrity in these new approaches[20]. It might also guard against supporting unnecessary duplication of research within the wider research system. Transparency was one important aspect outlined in the Royal Society's research integrity statement, which sets out the key principals and behaviours expected in a culture of scientific integrity[21].

Whilst existing governmental, industrial and major charity funding streams will continue to dominate the funding landscape, some participants raised the possibility that the diverse set of emerging, small-scale funding models could offer opportunities to open up the scientific endeavour in ways not previously possible. The emergence of crowdfunded research, with some platforms now having engaged over one million users, was thought to be a way to support research of immediate interest and usefulness to a wide audience. This might connect new audiences to the process of research, helping to convey the value of research and innovation as a whole.

Crowdfunding was not widely thought to be suitable for all kinds of research, for example speculative, ambitious research, and therefore it could only make a partial contribution to a balanced research portfolio. Participants were also concerned that research rigour might be put under pressure, given the need for accountability to many individuals and the demand to demonstrate short term progress. At the same time some participants suggested that crowdfunding platforms could benefit the integrity of such research, for example "crowd.science"[22] provides a buffer layer between funders and researchers and makes visible to users the research history of those involved.

Idea

Living publication: Many participants discussed 'Living' publications. These would be augmented and altered in real time and were proposed as having many benefits as a model of sharing findings. Moving towards this model, increasing numbers of researchers are using the preprints movement to share information. Rapid dissemination of research findings, transparent, continuing peer review, and greater visibility around the correction of unintentional errors were all identified as advantages. The increasing availability of data and power of algorithms might in the future allow AI to contribute to assessment of the rigour of the research published in this way.

Idea

Integrity kitemarks: Several participants suggested that for crowdfunded projects, the research idea and proposed methodology should be subject to expert peer review and approval conferring an 'integrity kitemark' before it received funding, as a way of embedding good practice from the earliest possible stages.

20. http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2012/the-concordat-to-support-research-integrity.pdf
21. https://royalsociety.org/topics-policy/publications/2017/research-integrity-statement/
22. https://crowd.science/

Idea

The academic filter bubble: Recommender algorithms sift vast numbers of papers to identify those that might be most relevant to a researcher, for example, the Mendeley 'Suggest' feature. It is possible that a facility could emerge in the future that effectively synthesised the key messages of many papers into a single document[23]. This could flag papers and findings that might otherwise be missed, but it should not be a mechanism relied on by researchers as it risks distorting how a field is depicted, and losing the nuance of different and divergent arguments. A few participants felt transparency around the application of these methods to filtering research information would be crucial to the integrity of the research system.

Research Workspaces

Research is an inherently creative endeavour. There are excellent examples of how large and central facilities such as DIAMOND, ISIS and CERN have supported staff to undertake ground-breaking research, to benefit from planned and serendipitous meetings with others from the same and different disciplines, and to build on the findings and approaches of current and future leaders in their fields.

Workspace design plays an important role in driving creativity and innovation. The academic and industrial laboratories where research has traditionally taken place will continue to dominate, but the growth of interdisciplinarity and emergence of new and highly-specialised skills and resources mean that workspace design is evolving to support researchers to perform all aspects of the work they undertake across an increasingly diverse research community.

Participants felt in the future, demand for flexible access to a variety of workspaces might best be served by a 'hub and spoke model'. Individuals primarily based in the research facilities of a core institution or organisation (the hub) would additionally access a network of specialised workspaces (the spokes). These 'spokes' could be tailored to specific activities ranging from public engagement to cutting-edge specialised analyses. 'Spokes' might be shared, in a similar way to existing regional or national research facilities; affiliated, as with the Reach Out lab on Imperial College London's South Kensington campus; or designed into the core institution, as with education outreach spaces within the Crick Institute. Harnessing the potential of these bespoke spaces would require them to have a strong relationship to their various hubs, as well as connections to the wider research system.

Dedicated workspaces for academic researchers to interface with businesses and investors are increasingly common. The growing appetite for entrepreneurship and commercialisation has contributed to a 110% rise in the number of UK incubators and accelerators since 2011[24]. Imperial College London's White City Incubator, which provides support for early stage technology led start-ups, and I-HUB, a shared workspace targeted at a later stage of translation and innovation are examples. Merging research with design and manufacture is taking place in dedicated Hackspaces and in the maker community. This has been enabled by easy access to equipment, new digital technologies and in some cases, dedicated technician support. Workshop participants wanted to leverage their existing research to explore translation, reducing the barriers to taking advantage of the benefits these spaces offer.

23. https://blog.mendeley.com/2015/11/03/new-research-features-on-mendeley-com/; https://buildingrecommenders.wordpress.com/2016/10/10/mendeley-suggest-architecture/
24. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/608409/business-incubators-accelerators-uk-report.pdf

Shared spaces

Many participants described how spaces for discussion and social interaction could have a particularly positive effect on creative, ambitious thinking during the early stages of a project. The possibilities for conversations that sparked collaborations or interdisciplinary work were cited as benefits of communal areas. Through the frequent conversations they enable, these spaces were also seen as beneficial for propagating good practice.

Teaching, mentoring and collaborating require access to meeting rooms and spaces. A number of participants reported that more of such spaces were needed. Coffee shops and other public spaces were being used for student supervisions and classes. Participants identified the TEF and corresponding emphasis on assessing the quality and value of teaching as possible incentives for the investment in new, dedicated teaching space.

Private workspace

Shared work spaces are necessary but not sufficient. A number of activities were identified as requiring access to quiet, personal space, such as management of data, writing grant applications and drafting manuscripts. It was suggested that an individual's home might be one 'spoke' available to meet this demand. However, normalising homeworking divided opinion. Some participants thought more should be done to unlock the benefits of home working for researchers, others saw it as a slippery slope to extending working hours further, which might negatively affect individuals' wellbeing. The Society commissioned work exploring the specific mental health needs of researchers, to develop understanding of how they might best be met[25].

The need for flexibility underpinned all these discussions. Access to workspaces that suit both research-focussed and non-research-focussed activities, personality type and personal circumstances was believed to support people to produce excellent research. Within the new research spaces becoming accessible, establishing a strong, consistent culture of integrity through an emphasis on training and learning was felt to be important – which might itself be designed into the research environment through provision of learning and development focussed workspace.

Idea

Library of things: An initiative suggested by one participant to support decentralisation of research into new environments, widening participation. Items from a collection of equipment and apparatus can be loaned to a local research workspace on writing a successful proposal. Users also input into how the collection is expanded, to tailor it to their needs. The set of suitable equipment and the range of disciplines this model would suit is limited.

"At the Institute of Making, we've seen first-hand how the open and collaborative nature of a makespace can dramatically reduce the friction to knowledge exchange"

Liz Corbin, researcher

Example

The Royal Academy of Engineering, through its Enterprise Hub which could itself be considered a 'spoke', supports entrepreneurial engineering at all stages of a research career. Enterprise Fellowships provide funding and support to outstanding engineering entrepreneurs. As Hub Members, they have access to the Taylor Centre, the Hub's physical space in London. They also receive continuing support and mentoring from the Academy's Fellowship, some of the most successful technology entrepreneurs and business leaders in the UK and beyond.

25. https://royalsociety.org/topics-policy/diversity-in-science/understanding-mental-health-in-the-research-environment/

Fostering scientific leadership

Participants often distinguished between the role of individuals as scientific leaders and as leading scientists. Leading scientists were described in terms of individuals pushing the boundaries of research in academia and industry. As examples of the latter, IBM and Microsoft have distinguished scientists whose deep technical expertise drives cutting-edge research across the organisation and beyond. There was general agreement that these individuals had a responsibility to be ambassadors for the research system they depend on, but ambivalence as to whether they should play any corporate role within their institution. Many participants suggested this model could also apply to senior researchers in academia who do not wish to become PIs. The possibility of a career of this type in academia was considered to have some distinct advantages as part of the wider mix.

By contrast, scientific leaders of research groups, programmes and institutions were identified as having a responsibility to advocate for the researchers of the future and develop the talents and skills of their research teams. Many participants reported an increasing expectation that researchers be both excellent researchers and excellent leaders, with the requirement to fulfil both these functions simultaneously.

Image
The Noble Award for Team Science (2030) by Hazel Ching-Hsuan Chiang, from the Museum of Extraordinary Objects.

The primary function of higher education and research institutions will always be excellent teaching and research. However, organisations are rightly embracing a broader agenda that includes, for example, enterprise and outreach. This means that scientific leadership often extends beyond an institution's borders. The Society has previously called for institutions to have strategies that enable their staff to connect and share their research with a variety of audiences, including the public, schools, industry and policymakers[26]. Workshop participants generally welcomed this proposition, and believed these activities could benefit both the research community and wider society. However, there was a perception that these activities may not be valued by their home institution or within the wider research system. Participants felt that social incentives, from personal thanks to departmental awards, would be one effective way to influence behaviour.

Leaders who had successfully founded companies, advised policymakers or undertaken public engagement projects were perceived as being the most effective in empowering others to do the same. In addition to leveraging professional networks, they gave ECRs confidence that pursuing these activities could have a positive impact on career progression, irrespective of whether their future career lay inside or outside of research. Participants suggested that a critical mass of individuals involved in activities from policy advice to public engagement and commercialisation was needed so as to normalise these roles and, in turn, foster respect for them.

Future leaders

There will always be a need to support talented individuals who pursue excellent research. Research institutions and funders provide training to support the development of core skills, for example, grant writing and review. This was consistently welcomed as invaluable in supporting career development.

Some ECR participants suggested that there was a need to complement the range of training developed with the independent scientist in mind, with training focused on enabling effective collaborations. This reflected a rise in 'team science' and a keenness to participate in international and interdisciplinary research programmes. Many of these themes have been highlighted for specific disciplines, for example in the Academy of Medical Sciences report *Improving recognition of team science contributions in biomedical research careers*[27].

In addition to conducting excellent research and showing leadership in research, ECRs often lead small teams. Some participants perceived that leadership and associated management skills (such as financial management) were not sufficiently valued in the academic environment. This is an issue that the Society is starting to explore, and one that is discussed in the RCUK's *Statement of Expectations for Research Fellowships and Future Research Leaders*[28].

ECRs require leadership skills in multiple aspects of their role. Beyond their leadership in research, ECRs are often expected to lead in roles such as teaching and outreach. A wider and deeper approach to skills development would further support them in these broader responsibilities as a researcher, and in pursuing and progressing their careers along diverse paths. This would connect up different sectors and roles in the research system, and would help to put the hierarchies of academic research and career pathways in a wider context.

26. https://royalsociety.org/topics-policy/publications/2017/consultation-response-second-research-excellence-framework-REF/
27. https://acmedsci.ac.uk/file-download/38721-56defebabba91.pdf
28. http://www.rcuk.ac.uk/documents/skills/fellowshipstatement-pdf/

Incentivising change

Participants recognised the benefits of investing in the talents of ECRs for career trajectories both inside and outside of academia. But many also highlighted that the complex and interdependent nature of the relationship between the ECR and Principal Investigator (PI) means that it can be difficult to dedicate time to professional development. Support for postdocs may not have an immediate pay-off for PIs, who often rely on short-term grants and might only employ them for 12 months.

It was suggested that 'soft' regulation could signal the importance of skill development and successfully shift behaviour. For example, postdoc contracts at Imperial College London include the right to 10 days training and development per year. This was thought to have empowered them to take up opportunities relevant to long-term career development, and created a helpful framing for conversations with their PIs. The introduction of the Teaching Excellence and Student Outcomes Framework (TEF) was cited as a signal about the importance of a skill set, teaching, which had led to institutions introducing formalised teacher education. The introduction of compulsory three month professional placements for BBSRC funded PhDs was also seen to be a positive step[29].

More generally, funders were identified as having an important role changing the research landscape and in incentivising uptake of activities beyond research. Ideas included providing opportunities for ECRs to apply for a grant extension (of weeks to several months) to participate in policy or public engagement work.

Sustaining and supporting science

Professional research service roles are essential to the whole research enterprise. They offer technical assistance and expertise, provide support with the 'business' aspects of conducting research, from finance to HR, and connect researchers to investors, industry and the public. Many participants felt that there were opportunities for better communication between researchers and these staff. Participants recognised the need for greater value to be placed on professional roles, such as technology transfer, enterprise or analysis, essential to support the delivery of excellent research, its reach and impact.

With respect to technical staff, there is great diversity in backgrounds and responsibilities, ranging from animal research technicians to those with deep technical expertise in one analytical technique. Participants discussed how the boundary between what technical staff do and what researchers do is often blurred, and suggested that shared responsibilities should be more widely acknowledged. The ambition of the Technician Commitment, launched at the Higher Education Technicians Summit, is to ensure better visibility and recognition of the roles and contributions of technical staff[30].

> "It's a prisoners dilemma – everyone could benefit, but the short term disincentives need to be bridged"
>
> Dr Richard Massey, Royal Society URF

29. http://www.bbsrc.ac.uk/skills/investing-doctoral-training/pips/
30. http://technicians.org.uk/techniciancommitment/

Example

As part of a broader training package, the Royal Society provides opportunities for its funded researchers to gain policy skills and experience. Through initiatives such as the Policy Associate Scheme, which offers ECRs the opportunity to work in government on public policy issues; the policy primer, which equips ECRs with the basic knowledge and skills to interact effectively with decision makers; and the pairing scheme, which connects researchers to individuals in government, the Society is supporting individuals to move between these two worlds[31].

Example

The Concordat to Support the Career Development of Researchers sets out clear standards that research staff can expect from the institution that employs them, as well as their responsibilities as researchers[32]. It is credited with having helped to develop the infrastructure that exists to support researchers in the UK higher education system. The Concordat is currently being reviewed to ensure it fulfils its intended purpose from 2018 onwards[33].

Driving cultural change

This document contains new and consolidated thinking from the breadth and depth of the research community. The insights and aspirations collected here are a record of some of the concerns that currently exist, the areas where change is believed to be most urgently required, and emerging ideas about how change can be driven.

The Society's programme is building throughout the year towards a conference in Autumn 2018, which will bring together intertwined debates around research assessment, career progression, researcher development, research dissemination and research integrity. This conference will showcase initiatives and work across the research landscape to continue to create and improve the cultural conditions and environments in which excellent research and researchers can flourish.

Image
Lab Cab, Transporter Container (2026) by Julie Light, from the the Museum of Extraordinary Objects.

31. https://royalsociety.org/grants-schemes-awards/policy-secondment-programme/; https://royalsociety.org/grants-schemes-awards/science-policy-primer/; https://royalsociety.org/grants-schemes-awards/pairing-scheme/
32. https://www.vitae.ac.uk/policy/vitae-concordat-vitae-2011.pdf
33. http://www.rcuk.ac.uk/skills/frameworks/review-of-the-concordat-to-support-the-career-development-of-researchers/

Changing expectations

Changing expectations is an ambitious programme of work that aims to understand how best to steward research culture through a shifting research landscape.

Through a national dialogue with the research community, by drawing on the experiences of our past and present, and exploring potential futures, Changing expectations will investigate the evolving relationship between the research community and the wider research system.

Research culture: embedding inclusive excellence

Across 20 events in 15 locations with over 1,000 people and 2,000 hours of face-to-face conversations the Royal Society has gathered together the ideas featured in this booklet on what a future research culture could look like. These ideas will be the platform upon which the Royal Society builds, working towards a landmark conference on research culture taking place in Autumn 2018.

To find out more about the programme, visit:
royalsociety.org/changingexpectations
or email: **researchculture@royalsociety.org**

Share your ideas on the future of research culture:
#SciCulture

The Royal Society is a self-governing Fellowship of many of the world's most distinguished scientists drawn from all areas of science, engineering, and medicine. The Society's fundamental purpose, as it has been since its foundation in 1660, is to recognise, promote, and support excellence in science and to encourage the development and use of science for the benefit of humanity.

The Society's strategic priorities emphasise its commitment to the highest quality science, to curiosity-driven research, and to the development and use of science for the benefit of society. These priorities are:

- Promoting excellence in science
- Supporting international collaboration
- Demonstrating the importance of science to everyone

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Registered Charity No 207043
January 2017 DES5126