

**Society of Biology response to the Dowling Review of collaborations between businesses and university researchers
March 2015**

1. The life sciences sector in the UK is both historically and increasingly collaborative. Many multi-national R&D companies have research sites in the UK because of its excellent science, and alongside economic and regulatory considerations, science plays a vital part in keeping very many skilled jobs in the country. However, collaboration can be costly and risky, and international academic competition is becoming ever-stronger. We therefore welcome this review of collaborations between businesses and university researchers and its timely contribution to enhanced understanding of this area.

The Society of Biology is a single unified voice, representing a diverse membership of individuals, learned societies and other organisations. Our individual membership includes researchers from universities, government research institutes and industry from across the spectrum of the biosciences; from the pharmaceutical sector to forestry. In fact these two disciplines help to illustrate the disparity of collaborative patterns in bioscience research; the pharmaceutical sector with a wealth of collaborative models and partnerships, and forestry with very few collaborations and virtually without industry-led research. Yet in all cases, more specific interventions are needed to maximise research outputs of both academia and business at the disciplinary level and to improve research literacy in some companies that have little or no research capability'.

2. The House of Commons Business, Innovation and Skills Committee report on Business-University Collaboration¹ states 'there is no single model of effective collaboration and few generally applicable solutions to the barriers that challenge interaction', however, there are common overarching themes, as well as challenges and opportunities for collaborative research partnerships which this response will explore.

Building the collaboration

3. Our members tell us that a productive research partnership between business and academia is built on established trust, clearly defined goals and deliverables in terms of the science and timescale, and regular and good communication. Central to this is having adequate time to find the right partner with synchronous and timely interests, and to have open discussions about expectations, cost, ownership and in-kind support.

Time

4. Industrial and academic timescales are often not aligned, which can bring challenges to joint working. A 'long-term' collaboration can also be defined very differently for business and academia, can vary according to sector, and even within a business itself. Industry is typically quicker to react

¹ <http://www.publications.parliament.uk/pa/cm201415/cmselect/cmbis/249/249.pdf>

to new developments and can change strategy rapidly; for instance pharma has a fairly short term approach to research topics. The difference in timescale expectations could make organising collaborative PhD funding and support challenging although evidence from the BBSRC's highly competitive ICP and iCASE programmes shows that many companies (e.g. GSK, AZ, Syngenta, Unilever, Oxitec, UCB) place significant value on this type of collaboration and have overcome potential barriers to enable participation in these schemes. Related to this is the need for academic staff, including Ph.D. students to be able to publish if they are going to maintain their reputations and ability to obtain further funding. While this may not be a problem with precompetitive work, after this, it can be a significant challenge.

5. It is common for individuals to have intermittent collaborations with a company over many years however consistency in strategy and staff on both sides of the collaboration is important for success.

Intellectual Property & Regulatory Policy

6. Disagreements about the management of IP in universities and industry can and do, seriously impede and prevent collaborative research; establishing the framework on IPR and confidentiality at the outset of the collaboration is vital. The impact of company takeovers on jointly-relevant IP was also raised as a concern by our membership, particularly where companies are taken over by non-European competitors and their IP shifts overseas. More pre-competitive collaborations and greater openness to sharing the IP and risk of delivering the projects is needed to overcome this barrier; a good example of a mechanism which encourages exactly this is the BBSRC Industrial Partnership Award. Some companies overcome this barrier by focussing work with a small number of academic institutions, developing an umbrella agreement that covers all future collaborations and discussions. The Society explored the IP issue in some depth in our response to the Select Committee inquiry on the Commercialisation of Research².
7. There is a role for 'intermediaries' or third parties who sit between the researchers and researchers and are literate in both worlds. This intermediary role could be adopted in a range of ways including incorporating this expertise and support into the role of the Catapult Centres; and developing forums to facilitate industry, universities and researchers to discuss IP and other issues. Learned Societies and professional bodies can play a role in the latter. The development of standard agreements for research collaborations (for instance the Lambert toolkit), also has a role to play in overcoming some of these challenges.
8. Up-skilling academic researchers in entrepreneurial skills and commercial sense, as well as industry processes and legalities will help to bridge this gap. To this end, we welcome the Research Councils' efforts to broaden the experience of PhD students outside of the academic lab, specifically the Industrial CASE Studentships and Partnerships, which are highly competitive, and the three-month BBSRC DTP Professional Internship for PhD Students (PIPS) which help researchers understand the context of their research and expose them to the range of settings in which they can apply the knowledge acquired during their PhD.
9. The uptake of new technologies and techniques is variable according to industry. Universities have a role to play in educating non-research savvy businesses, and can add real value here. Regulatory guidelines must also keep pace with emerging technologies in order for business and academics to benefit from research efforts.

Funding & Current Initiatives

² https://d1g8qexchac5be.cloudfront.net/images/SB_response_commercialisation_of_research.pdf

10. Industry members tell us that the UK's many mechanisms that foster collaborative research between academia and industry (i.e. the aforementioned CASE Studentships, Industrial Partnership Awards (IPA), LINK³, and Innovate UK competitions for example), make the UK stand out as a place to invest in R&D by allowing a combination of public and private funding. Expansion of these schemes, and designing and choosing further tailored initiatives might therefore help retain companies in the UK and attract new R&D-based businesses, and in the case of IPAs for instance, an expansion to fit with more applied industry interest would be welcome.
11. In certain sectors, business typically now provides in-kind support rather than cash funding, adding value through intellectual input, project management, and access to materials, libraries or processes and equipment. Our members tell us that while it is relatively easy to find a research funding grant scheme to apply for, the overall low success rates associated with sought-after schemes can compromise the project in both scale and speed. Despite the good science and attractive collaboration opportunities, feedback frequently raises questions such as 'why is industry not paying for its R&D?' More complex discussions about the points at which research transitions through fundamental, pre-competitive and near-translation also arise.
12. Schemes such as IPAs do not use public money to fund research that a company would do anyway with its own money. In the experience of our industry members, these mechanisms allow industry to conduct more speculative, long-term projects that would not succeed against projects that have more immediate, measurable business benefits in companies' internal research reviews. The research must be precompetitive, and projects stand a better chance of being funded if several companies contribute jointly. We recommend that the Dowling Review investigates the provision for collaborative research funds further to develop recommendations that could maximise benefit for both the public purse and the health of the UK research base in the long term.
13. Industry members tell us current initiatives and funding streams could be more efficient and less complex. Currently they require significant resource at the application stage, with little knowledge about the likelihood of success. This is a significant hindrance to effective collaboration. More focus on strategic calls, a variation in duration of collaborations, and schemes that pre-approve collaborations between organisations would all help to make the route to funding more straightforward.
14. There is also an appetite for some companies to be involved in Innovate UK projects, but who do not want or need funding (for example retailers). A simple, non- bureaucratic way for these groups to work with funded researchers and industry would be welcome.

Small and medium-sized enterprises (SMEs)

15. SMEs are an important part of the UK industry landscape; SMEs account for 99.9% of all UK businesses, 60% (15.2 million) of UK private sector employment, and have a combined turnover annual turnover of £1.6trillion, 47% of turnover in the private sector⁴.
16. SMEs face different challenges than large industry when collaborating with university researchers, and may require distinct intervention. Government's support for small businesses to date has been largely financial, and while this is welcome, support could be expanded to include mechanisms to build intellectual capital in SMEs. Knowledge intermediaries have a role to play here also, opening

³ <http://www.bbsrc.com/business/collaborative-research/stand-alone-link.aspx>

⁴ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/377934/bpe_2014_statistical_release.pdf

up access to academic research for SMEs, and making partnerships with SMEs more attractive for researchers. Incentives are needed that reward collaboration at the research institute, research team and individual researcher levels; these incentives can be financial and reputational.

17. The definition of an SME⁵ can hinder access to government support and initiatives for smaller businesses that are wholly owned subsidiaries where a large corporation share is greater than 25%. This definition doesn't take into account instances where these operations are fully devolved and independent, with funding flows similar to that of getting money from an external investor, or the bank.

Maintaining the academic research landscape

18. Industry is increasingly prepared to look widely across the global academic landscape to find the areas of excellence that are relevant to them. The UK has a winning combination of excellent universities, a supportive government, vibrant private sector and reasonably efficient existing systems and processes to bring them all together. This is a difficult ecosystem to copy and significant efforts should be made to maintain and build upon this valuable position.
19. A well-funded research landscape and broad adaptable skills base is therefore imperative for future collaborations and to ensure that the UK remains supportive of creativity, innovation-ready and competitive in today's global collaboration market.

Case Studies

The following case studies illustrate the range of collaborative research in the life sciences; including drug discovery and biotechnology, land use and planning, and food fortification. Please contact the Society if you would like more information on these collaborations.

1. The GLAZgo Discovery Centre⁶
Society for General Microbiology Policy Committee member Dr Maria McPhilips stated 'The GLAZgo Discovery Centre represents an exciting partnership between the University of Glasgow and AstraZeneca. The partnership is based on an agile and highly-integrated collaborative model. This has helped to create a dynamic and flexible environment bringing together established drug development capability with high-quality basic, translational and clinical research to drive forward the creation of future medicines. The Centre will also train the next generation of researchers at the interface between academic and industry science through an active PhD programme with joint supervisors from the two partners.'
2. NCIMB Specialist Microbiological and Chemical Services⁷
NCIMB Ltd was spun out from the University of Aberdeen in 2006, and provides range of commercial microbiology services to industry, including the oil industry. One such service is the enumeration of sulphate reducing bacteria (SRB), which sour the oil, using modern molecular enumeration methods that are faster and more accurate than traditional methods. Although extremely valuable, the uptake of this technology is being hindered by several factors including

⁵ http://bookshop.europa.eu/en/the-new-sme-definition-pbNB6004773/downloads/NB-60-04-773-EN-C/NB6004773ENC_002.pdf?FileName=NB6004773ENC_002.pdf&SKU=NB6004773ENC_PDF&CatalogueNumber=NB-60-04-773-EN-C

⁶ <http://www.glazgodiscoverycentre.co.uk/aboutus/thecentre/>

⁷ <http://www.ncimb.com/>

ignorance of the new method, misunderstanding of the value of the new method, and regulatory guidelines that are based on old techniques.

3. Beneforte Broccoli⁸

Benforte Broccoli is a broccoli variety developed in the UK that has three times more glucoraphanin, a nutrient which studies indicate may offer protection against cancer and cardiovascular diseases. Beneforte Broccoli emerged from the research of Professor Richard Mithen, a research leader at the John Innes Centre (JIC) who discussed his idea with technology transfer company Plant Bioscience Limited (PBL), also located on the Norwich Research Park. With assistance from Kathy Faulkner, a PhD student with funding from BBSRC, a patent was filed and the product was later marketed successfully by PBL in the UK and Monsanto in the United States. It was launched in British supermarkets in 2012, and more research is being undertaken into the health effects of its nutrient glucoraphanin.

4. Land Use and Planning

Academic-industry collaborations are increasingly important in the land use, planning and environment sector, where the UK's robust long term datasets and skills base are a principal component of sustainable business and resource planning;

- a. The Flood Risk Management Research Consortium⁹ is an interdisciplinary grouping of university partners and research institutes, supported by Halcrow - a multinational engineering consultancy company, based in the UK. This consortium has provided a 'significant step forward' in evidence-based understanding of land management impacts on flood flows.
- b. The Flood Hazard Research Centre (FHRC) at Middlesex University partners with industry on a range of projects; the CIRIA – Guidance on communicating local flood risk¹⁰ is a partnership of FHRC with Arup (an engineering firm), funded by government and water companies.
- c. The Moors for the Future Partnership¹¹ (a government, NGO and industry partnership) has been collaborating with leading UK universities and academic research institutions since 2003. This has enabled baseline biodiversity survey data and chemical and physical analysis of the moorland environment to be done, assisting monitoring and allowing for 'our collaborators, partners and other organisations to assess the impact of physical conservation on moorland habitats.'
- d. The Defra research project on environmentally and economically sustainable grazing regimes¹² brought together several universities, research institutes, NGOs and ADAS UK Ltd to enable the restoration and maintenance of heather moorland habitats such as upland heaths and mires.

5. Antikor Biopharma Ltd

Antikor Biopharma Ltd is a multidisciplinary spin-out from Imperial College London now based at the Stevenage Bioscience Catalyst on the world-class Innovation Campus (a centre set up by UK Government/Innovate-UK/Wellcome Trust/GSK). Antikor's technology builds on over ten years of experience to develop novel and disruptive approaches that utilises antibody fragments to target potent cytotoxic drugs for cancer (called Antibody-Drug Conjugates-ADCs). These ADCs have the potential to treat cancer more effectively with fewer side effects. Antikor's R&D is based on

⁸ <http://www.superbroccoli.info/>

⁹ <http://web.sbe.hw.ac.uk/frmc/>

¹⁰ <http://www.mdx.ac.uk/our-research/centres/flood-hazard/projects/ciria>

¹¹ <http://www.moorsforthefuture.org.uk/science>

¹²

discoveries made in the Departments of Life Sciences and Chemistry and Imperial College and Antikor still collaborates with Imperial College and UCL. Antikor receives funding from Innovate UK and private equity, and has collaborations with other European institutions.

6. GSK Discovery Fast Track Challenge¹³

Members inform us that the Discovery Fast Track Challenge, which partners academic researchers with a drug discovery concept with a team of GSK scientists, is very well run and managed. The GSK team provides screening platforms, and works with the academic researcher to triage and interpret the data output to identify and confirm chemical probes, ultimately accelerating the drug discovery path to success. There is however a role here for government to provide matched funds for the supporting work of university researchers.
7. Professor George Lomonosoff¹⁴ and Medicago
Research by Professor George Lomonosoff of JIC and Dr Frank Sainsbury (a PhD student at JIC now at Laval University in Canada) on the development of a system for the rapid production of vaccines and pharmaceutical proteins in plants is being used by Medicago, a Canadian biotechnology company. Lomonosoff's long-standing research interests in plant viruses was developed and commercialised with PBL, and has most recently been used by Medicago to explore alternate production methods for Ebola antibodies¹⁵.
8. Reducing fresh produce waste
Ethylene is known accelerate the ripening of many fruits and as a consequence, if not controlled can increase wastage. In conjunction with Johnson Matthey Plc (JM) and Its Fresh!, Cranfield University has helped to develop a novel ethylene adsorbing material (E+™ Ethylene Remover) which is now sold commercially across the globe. The work stream first began with contract work in 2006, publications (Terry et al., 2007), and then a fully funded JM studentship. This was followed by Defra FoodLINK project in 2010, a EPSRC CASE studentship, and two MSc by Research funded by ItsFresh! in 2012. The timeline from research to commercial exploitation took less than five years and demonstrates the advantages of both industrial contract and public funding.
9. Dr Curtis Dobson
The post-doctoral studies of Dr Curtis Dobson at the University of Manchester on anti-infective peptide technology lead to the spin out company Ai2 Ltd¹⁶ in 2005. Between 2005 and 2009, Ai2 worked closely with the global medical device industry and carried out over ten funded R&D projects with US and EU companies, and in 2011 Ai2 secured its first major commercial deal with Saflon Pharmaceuticals, receiving £1.75m investment. Dr Dobson's research group is supported by grants from the BBSRC, MRC, and industry, and has also lead to a second spin-out company, Microbiosensor Ltd¹⁷.
10. The Manchester Collaborative Centre for Inflammation Research (MCCIR)¹⁸
MCCIR is a collaboration between GlaxoSmithKline, AstraZeneca and the University of Manchester established in 2012. It addresses current priorities in inflammatory disease in an open innovation, pre-competitive collaboration between academia and the pharmaceutical industry. MCCIR brings together clinical, industrial, and academic scientists to innovate at this interface and in this interactive environment.

¹³ <http://www.openinnovation.gsk.com/>

¹⁴ <https://www.jic.ac.uk/staff/george-lomonosoff/index.htm>

¹⁵ http://www.medicago.com/files/documents_news/2015/Ebola-PR_USA_-English-Final_v001_j1v036.pdf

¹⁶ <http://www.a-i-2.com/about-ai2/>

¹⁷ <http://www.microbiosensor.co.uk/>

¹⁸ <http://www.mccir.ls.manchester.ac.uk/about/>

11. The James Hutton Institute (JHI) has a strong reputation for working with industry, namely:
 - a. Blackcurrant breeding for use in Ribena since the late 1980s. This was originally for Beechams, then GSK and now LR Suntory. JHI have pioneered the use of molecular markers in blackcurrant breeding, and as a result of this industry collaboration, varieties bred by JHI account for an estimated 50% of the world's blackcurrants and over 99% of the UK crop.
 - b. Potato breeding for a wide range of customers both in the UK and internationally. Long-term customers include McCain Potatoes for the frozen french fry market and Greenvale AP (formerly Dalgety Produce Ltd) for the fresh market. Successes include Lady Balfour, the number one organic potato in the UK and Mayan Gold, the first phureja (diploid potato plant) variety commercialised in the UK. McCain Potato have partnered with the James Hutton Institute in several Innovate UK projects, including projects looking at free living nematodes and developing molecular markers for use in breeding.

The Society of Biology is pleased for this report to be publicly available. For any queries, please contact The Society of Biology Policy Team at Society of Biology, Charles Darwin House, 12 Roger Street, London, WC1N 2JU. Email: policy@societyofbiology.org

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