**DSIT Engineering Biology consultation 2023
Call for input into Biochemical Society response**

# Introduction

The Society is planning to respond to [the [Department for Science, Innovation and Technology](https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.gov.uk%2Fgovernment%2Forganisations%2Fdepartment-for-science-innovation-and-technology&data=05%7C01%7Cpolicy%40biochemistry.org%7Cb798bf40e7374d5ea63808db944a10fc%7Ce10ebf3ea4c845168ec7b0f82ff828f8%7C0%7C0%7C638266819137923351%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=lxLzcNHqSV%2FS6G%2FWLmUpwwpoUFqh0e%2BQQ94D9ouHY7M%3D&reserved=0)](https://www.gov.uk/government/organisations/department-for-science-innovation-and-technology)’s consultation **on** [**Engineering Biology**](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1171823/engineering_biology_call_for_evidence.pdf), which is seeking views from the research community on how it can best support the engineering biology ecosystem in the UK, from foundational research through to consumer facing companies.

DSIT is responsible for fulfilling the government’s ambition to make the UK a science and technology superpower. Earlier in 2023, it published its [Science and Technology Framework](https://www.gov.uk/government/publications/uk-science-and-technology-framework/the-uk-science-and-technology-framework), which sets out 10 key actions to achieve this mission by 2030. This report identified Engineering Biology as one of five ‘critical technologies’ where the UK can pursue and achieve a strategic advantage.

Engineering Biology, is defined as the application of rigorous engineering principles to the design of biological systems enabling the construction of new or redesigned biological systems, such as cells or proteins.

Given the relevance of engineering biology to the molecular bioscience community, we are inviting all members with engineering / synthetic biology and other relevant expertise to this field (e.g., DNA sequencing and synthesis, ‘omic and data science, etc) to contribute their views, which will inform the Society’s response.

DSIT are seeking views across the following areas of the engineering biology landscape (but please note, there is no need for respondents to comment on every aspect):

* Public interest and uptake of engineering biology products
* The UK value chain (strengths, challenges, and sourcing inputs)
* The knowledge pipeline
* Talent and skills
* Business/innovation ecosystem
* Regulatory environment
* Future expectations

# How to contribute:

**Please include your responses in this word document, ideally in a different colour and return this to** **policy@biochemistry.org** **by EOD Friday 8 September 2023.** The Society will then compile response for the consultation deadline of 29 September.

We recommend reading the [full DSIT consultation document](https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Fassets.publishing.service.gov.uk%2Fgovernment%2Fuploads%2Fsystem%2Fuploads%2Fattachment_data%2Ffile%2F1171823%2Fengineering_biology_call_for_evidence.pdf&data=05%7C01%7Cpolicy%40biochemistry.org%7Cb798bf40e7374d5ea63808db944a10fc%7Ce10ebf3ea4c845168ec7b0f82ff828f8%7C0%7C0%7C638266819138079587%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=Y3mTA7SXyGm1FGg2%2FkWtYk58sdiL41AchqPftm9Hiq4%3D&reserved=0) before contributing. This document contains useful context, including:

* An introduction to engineering biology
* Current state of play of engineering biology research/application in the UK
* Next steps for engineering biology research/application in the UK
* Consultation questions

This word document includes all of the consultation questions below, but there is no requirement to complete the entire set - please answer as many or as few questions as you are able or are relevant to you.

# Questions:

## 1 Your information

* 1. Your name
	2. Your email

**1.3.** Affiliation

**1.4.** Please briefly describe your expertise and how this relates to engineering biology.

## 2. Public interest, and uptake of engineering biology products

**2.1.** How do you approach building the public’s interest and uptake of innovations and products derived from engineering biology? What are the factors to consider when going about this?

**2.2.** Where and how are government, industry and academia each best placed to build public interest, and more broadly uptake of products? How can we involve the public in this conversation? What can we learn from other countries?

## 3. UK value chain for engineering biology

**3.1.** With regards to the whole sector, what do you think the UK’s key strengths are in engineering biology?

**3.2.** With regards to the whole sector, what do you think are the UK’s key challenges over the next five years?

**3.3.** Detail your own personal experiences with the engineering biology value chain outlined below. Where do you source these inputs to your work? What difficulties have you experienced? And what do you think needs to change?

Please mention where appropriate any scientific and technical advances required. (any which apply)

* **Small scale equipment**: All hardware needed for proof of concept, from pipettes, glassware, benchtop centrifuges, through to autoclaves and automated platforms such as liquid handling robots.
* **Pilot scale assets**: The equipment and skills needed for running pilots and proof of scalability for engineering biology services and products.
* **Mass Manufacturing assets**: The infrastructure and the skills needed to construct and maintain the equipment required to produce engineering biology services and products at commercial scale (e.g. bioreactors >100 kL)
* **Biological materials and reagents**: Pre-processed intermediate commodities. This includes enzymes, chemicals, biological chassis, strains, and media supplements.
* **Feedstocks**: The largely unprocessed primary commodities and processed primary commodities for media. This includes biomass.
* **DNA sequencing and synthesis capabilities**: The equipment and suppliers for DNA sequencing and synthesis, as well as of other nucleotides.
* **Diagnostics**: The equipment for diagnostics including for quality assurance and control
* **Omics and compute**: Both the hardware such as servers, GPUs, and highperformance computer clusters, and the software and data used for bioinformatics, omics, and any other program required for your work from simple scripts through to machine learning platforms.

## 4. Knowledge pipeline

**4.1.** Within your domain, what are the key scientific and technical opportunities over the next five years for advancing the development of engineering biology, including its foundational technologies?

**4.2**. Within your domain, what are the key scientific and technical challenges over the next five years for advancing the development of engineering biology, including its foundational technologies?

**4.3**. What works well within the current landscape of UK research institutions? What is missing? Are there examples from other countries we can learn from?

## 5. Talent and skills

Note:

* **Talent** refers to influential named individuals and our ability to attract and retain them.
* **Skills** refers to the development of scientific or technical capabilities through training for the wider workforce.

**5.1**. In order for your domain or the domains of those you represent to develop, scale and commercialise products derived from engineering biology, what are the key technical and non-technical skills?

**5.2.** Please indicate what is working, not working or not to a sufficient scale.
Scale 1= working well, 3= working but not to a sufficient scale/remit, 5 = not working or not happening, 6 = not relevant to me 13

* Support for early-career researchers
* Support for mid-career researchers
* Support for late-career researchers
* Programmes to support technicians careers
* Programmes to support regulatory skills
* Programmes to support entrepreneurship

Please explain your answer.

## 6. Business ecosystem

**6.1.** How do we create mechanisms which bring engineering biology small and medium enterprises (SMEs) together with their customers (including larger firms) in a way that promotes a clear understanding of each others’ requirements? What are the barriers to this in practice? What can we learn from other countries?

**6.2.** How is your firm considering overseas production of your products, or exporting to international markets? What are, or would be, the implications of these decisions for your UK-based activities?

**6.3.** At what stage and investment size have your company (or those you represent) found it challenging to raise finance? What were the barriers you faced at each of these stages? How did you solve these barriers?
Difficulty level 1= secured investment with relative ease, 3 = challenging but achievable, 5 = very challenging, 6 = don’t know or not relevant

* < £500K
* £500k - £1 million
* £1 million - £2 million
* £2 million - £20 million
* £20 million +

Please explain your responses.

## 7. Regulatory environment

**7.1.** Do you expect, or have you encountered, any specific regulatory issues when developing, scaling and commercialising products using engineering biology? Please provide as much technical background as needed to fully explain the issue, and an outline of how you navigated the regulatory system.

**7.2.** How should government look to influence the development of international regulations, standards, and norms to help grow the UK sector and protect the UK’s capabilities?

## 8. Future expectations

**8.1.** For your own domain or the domains you represent, please select the top three areas from the UK’s Science and Technology Framework you would want government to prioritise in any future plans for engineering biology.

These are outlined further in The UK Science and Technology Framework linked [here](https://www.gov.uk/government/publications/uk-science-and-technology-framework).

1. **Signalling UK strengths and ambitions**: Promoting domestic and international recognition of the UK’s strengths and ambitions in science and technology to ensure that all stakeholders have the confidence to invest their time, money and effort supporting our science and technology vision.
2. **Investment in research and development**: Focus UK R&D investment to match the scale of the Science and Technology Superpower ambition, and have the private sector take a leading role in delivering this.
3. **Talent and Skills**: Secure a large, varied base of skilled, technical and entrepreneurial talent which is agile and can quickly respond to the needs of industry, academia and government.
4. **Financing innovative science and technology companies**: Improve access to capital at all stages with increased participation from domestic investors, and an environment to grow and scale large globally competitive science and technology companies that drive growth in the economy and high-skilled employment opportunities for citizens.
5. **Procurement**: Investigate how Government departments create a demand for innovation that can catalyse their buying power into economic growth, through the departments own procurement strategies.
6. **International opportunities**: Secure international partnerships which support critical technologies and the growth of our sectors.
7. **Access to physical and digital infrastructure**: Make certain that infrastructure is accessible and that coordination of infrastructure attracts talent and investment, establishing anchors for innovation clusters and enabling companies to scale.
8. **Regulations and standards**: Utilise post-Brexit freedoms and put the UK at the frontier of setting technical standards and shaping international regulations.
9. **Innovative public sector**: Work to ensure the public sector has a pro-innovation culture, with a system that adequately supports and rewards innovation while unblocking systemic barriers.