# JOINT SYNTHETIC BIOLOGY INITIATIVE

**CALL FOR PROPOSALS**

**CLOSING DATE: 22 NOVEMBER 2011 (4pm)**

**SUMMARY**

The Joint Synthetic Biology Initiative (JSBI) is a partnership between the Biotechnology and Biological Sciences Research Council (BBSRC), the Defence Science & Technology Laboratory (Dstl), the Engineering and Physical Sciences Research Council (EPSRC) and the Medical Research Council (MRC).

The aim of the JSBI is to fund a cohort of innovative proof-of-concept and/or preliminary speculative scientific investigations that seek to explore the potential applicability of synthetic biology to meeting the UK's current and future national security and defence needs. This may include, but is not limited to, research that can underpin novel sensors, detectors and diagnostic approaches, including in field devices; development of new materials and methods for decontamination and trauma care, including wound management and healing; smart materials and coatings, especially those that can reduce the weight of equipment; and improvements to bioprocess or metabolic engineering for the production of biologics or small molecules to be used in such technologies. The research will be funded in line with relevant Research Councils policies and international conventions.

It is expected that successful projects will demonstrate highly multidisciplinary approaches, bringing together life scientists, engineers and, where appropriate, physical scientists[1] in the formulation, management and implementation of the project.

Up to £2.4M has been earmarked to the call for proposals and we expect to fund approximately 20 high quality, innovative projects. It is expected that requested project costs will typically be up to £120k with duration between 6 and 24 months. The management and administration of the call will be provided by BBSRC.

This partnered call is supporting the Ministry of Defence in the strategic assessment of the *defence (and security) impact of emerging technology (DIET)*. This is an enduring multi-topic initiative created in response to the Strategic Defence & Security Review, implemented by the Futures & Innovation Domain within the Dstl Programme Office. Dstl is part of the Ministry of Defence fulfilling the role of in-house experts in defence science and technology[2].

BBSRC, EPSRC and MRC are all partners in the RCUK Global Uncertainties Programme[3] which brings together the Research Councils in response to global security challenges. The programme aims to

[1] Including those with chemistry, physics and information and communication technologies expertise, where appropriate
[2] http://www.dstl.gov.uk/
[3] http://www.globaluncertainties.org.uk/

help governments, businesses and societies to better predict, detect, prevent and mitigate threats to security. The JSBI contributes to the delivery of the RCUK programme.

**TIMETABLE**

**Closing date for proposal submission: 4pm, Tuesday 22 November 2011**
**Decision on successful proposals: end February 2012**
**Successful proposals should ideally start by 1 May 2012, in order to meet Dstl reporting requirements. Therefore this call would be most suitable for research groups that have existing staff resource that could be deployed quickly. However, if this is likely to be a problem, the funders' reserve the right to allow a discretionary extension to a project's start date, when an acceptable case can be made.**

**SCIENTIFIC SCOPE**
**Definition of Synthetic Biology**
Synthetic biology is an emerging, multidisciplinary research area at the intersection of engineering, bioscience, chemistry and information technology. Commonly accepted definitions of synthetic biology have been evolving and currently there appears to be convergence and consensus around the following:
*Synthetic biology aims to design and engineer novel biologically-based parts, devices and systems, as well as redesign existing natural biological systems for useful purposes. It incorporates the principles of engineering e.g. modularity, abstraction and orthogonality into classical biotechnology.*

Within the emerging definition of synthetic biology the following sub-sectors are commonly identified[4]:

- Minimal genomes: understanding the minimal number of parts needed for life, to serve as a basis for engineering minimal cell factories for new functions and including genome synthesis;
- Orthogonal biosystems: expanding information storage and adding coding capacity;
- Regulatory circuits: e.g. designing synthetic gene circuits that may be based on standard biological parts;
- Metabolic engineering: engineering modified biosynthetic pathways to yield useful products. Overcoming/removing elements that block production;
- Protocells: bottom-up chemical design approaches to create cells de novo;
- Bionanoscience: e.g. utilising and exploiting cellular molecular machines.

In common with most emerging technologies, the potential applications of synthetic biology approaches are broad, from new research methods and approaches to potential applications in industrial biotechnology (e.g. improved bioprocesses), the clinic (e.g. novel biopharmaceuticals, diagnostic devices and biomaterials) and in field situations (e.g. bioremediation, toxin detection).

**National Security & Defence Context**
The UK government has a duty to protect its citizens and military personnel against threats and attacks both at home and abroad in response to the spectrum of threats, both in support of current operations and public security, and the longer-term requirements of future capability. To this end, Dstl aims to maximise the impact of science and technology for the defence and security of the UK. The principal risks against which the UK needs to insure are identified as terrorism, cyber attack, major natural hazards and accidents, and international military crises[5]. Synthetic biology is an emerging multi-disciplinary technology that has the potential to address some of the current and

[4] http://www.easac.eu/fileadmin/PDF_s/reports_statements/Synthetic%20Biology%20report.pdf
[5] Dstl Corporate Plan http://www.dstl.gov.uk/downloads/DstlCorporatePlan2011/2016.pdf

future issues facing defence science. Particular challenges include: reducing the logistical and cost burden of equipment, such as reducing the weight and size of equipment or supplies, ease of use (low light, automation) and robustness under extreme conditions; improving operational capability, such as developing more sensitive sensors and more effective protective measures. Example areas in which synthetic biology may be able to contribute to defence research are shown in Figure 1.

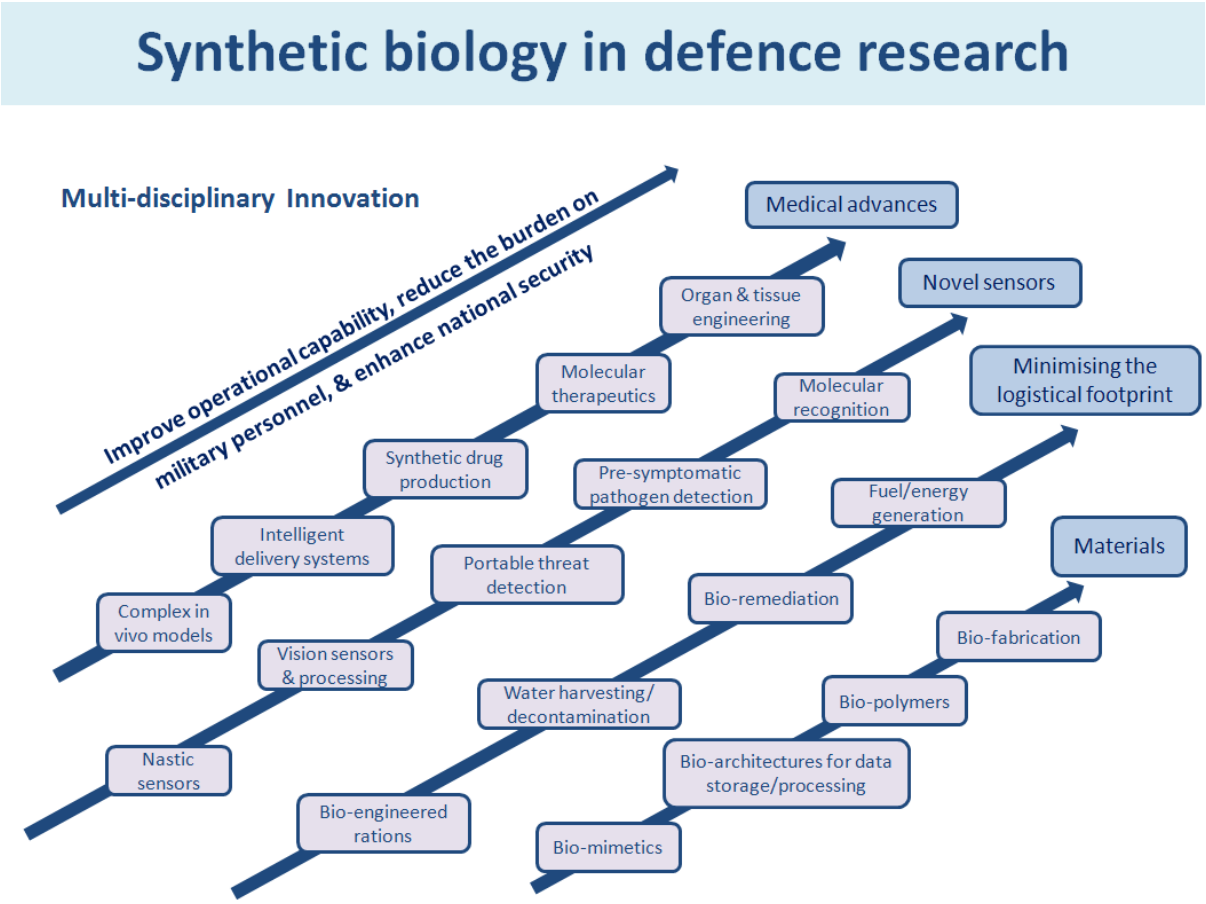


Figure 1 Areas where synthetic biology could contribute to defence research

**Scope**

The JSBI aims to support short-term innovative proof-of-concept and/or preliminary studies aimed at the development and application of novel tools and approaches in synthetic biology with a strong relevance to the security and defence arena. These can be in any area of synthetic biology research described above and can be enabling platform technologies or directed towards specific applications.

Most studies are expected to be of 12 months duration however studies of a shorter or longer duration (up to 24 months) will be considered on their individual merits, as long as it meets the ethos of this call.

The JSBI encourages highly innovative, multidisciplinary projects which could result in a step-change in the development and application of technologies or approaches in synthetic biology research; and reveal a step-change impact to defence and security in the future. The projects could be in areas of general basic research interest, building on new ideas, applying ideas in different ways or using a novel combination of ideas to provide a different way to tackle a problem.

All proposals must be placed in a defence and/or security context, and any additional context with civil-sector relevance as appropriate. Some examples of areas where projects are encouraged (this list is neither exclusive nor exhaustive, and is intended as a guide only) are:

- Improvements to bioprocess or metabolic engineering for the production of biologics or small molecules
- Novel sensor or detector technologies and diagnostic approaches for clinical use or use in field situations, including monitoring exposure to external agents
- Development of novel (bio)materials, or the novel use of existing products, for use in decontamination, detection and trauma care (e.g. wound management and healing)
- Smart and/or lightweight materials or biocoatings
- Novel diagnostics, including miniature systems

Outputs from these projects may be for general application in research, as a stepping stone, or more directed towards a commercial or defence application – see 'Assessment Process' below for further details of this.

**Ethical, Legal and Societal Issues**

Synthetic biology can raise ethical, legal and societal (ELS) issues. Research projects should consider the ELS issues inherent in the work they are proposing and applicants should apprise themselves of the findings of relevant reports[6] and public dialogue activities[7]. In particular, projects related to defence and/or security have the potential to raise contentious issues. Applicants will be expected to demonstrate an awareness of relevant international treaties[8] and relevant domestic legislation, regulations and guidelines, as well as addressing any concerns about the potential misuse of the research. Applicants should be aware that BBSRC and MRC (together with the Wellcome Trust) have published a statement on the misuse of research[9], and refer to this as appropriate in their application.

Applicants should address these issues within the case for support and applicants may wish to request funds for assessing the ELS component in more depth.

**FUNDING**

Subject to the number and quality of the proposals submitted in response to this call, it is anticipated that approximately 20 projects will be funded. The requested project costs (i.e. at 80% fEC, in accordance with standard Research Council funding practices) will typically be no more than £120k. A maximum of **£2.4M** is available.

Applicants are advised against under-resourcing a project. This initiative is focussed on supporting small-scale, proof-of-concept studies. Applicants seeking larger, more substantive research funding should explore other funding mechanisms (e.g. conventional grant funding).

**EXCLUSIONS**

The following are specifically excluded from this call for proposals:

- Applications not using a synthetic biology approach or that will not advance knowledge in, or application of, synthetic biology
- Applications where the tools and approaches proposed fall outside the remits of the funders

[6] For example, Balmer & Martin (2008) http://www.bbsrc.ac.uk/organisation/policies/reviews/scientific-areas/0806-synthetic-biology.aspx

[7] http://www.bbsrc.ac.uk/web/FILES/Reviews/1006-synthetic-biology-dialogue.pdf

[8] http://www.opbw.org/

[9] http://www.bbsrc.ac.uk/organisation/policies/position/public-interest.aspx

- Applications not within the specified expectations on project scale (including cost and duration)
- Applications without any consideration of defence and security context, taking into account that this context is about how anticipated advances in synthetic biology could lead to step-changes in technology.

In addition, proposals in areas where there is already a significant research effort (e.g. regenerative medicine, food production, water purification and biofuels) are discouraged unless a clearly defined **new** application of synthetic biology relevant to the defence and security sectors can be demonstrated. Potential applicants wishing to submit in these areas are encouraged to contact BBSRC to discuss their proposal prior to submission.

**ELIGIBILITY**

This call for proposals is open to all applicants and institutions normally eligible for BBSRC, EPSRC or MRC managed mode calls, which include HEIs, Research Council Institutes and Independent Research Organisations (IROs) approved by BBSRC, EPSRC or MRC. For the categories of eligible organisations, see the RCUK eligibility guidance[10].

Details of eligibility criteria can be found in the BBSRC Research Grants Guide, EPSRC Funding Guide[11] or MRC Applicant Handbook[12].

**ASSESSMENT PROCESS**

**Overview**

Proposals submitted to this call will be assessed through a **single-stage assessment process** administered by RCUK SSC Ltd. BBSRC is managing this strategic initiative on behalf of all of the funders.

BBSRC (as the lead Research Council) reserves the right to reject proposals, without reference to peer review, which are deemed to fall outside the remit and scope (including financial scope) of this call. Applicants are strongly advised to contact the research councils if they are unsure whether their proposal would be suitable for the call.

Proposals that fit the remit of the call will then be assessed through a single stage, fast-track panel assessment process so that the high-risk exploratory ideas and novel technologies can be rapidly tested and/or challenged. The streamlined nature of the assessment will use a broadly-based, multi-disciplinary panel, composed of experts (nominated by the funders) and technical advisers from Dstl to provide input into the defence-and security related aspects of the proposals.

**PLEASE NOTE: Proposals will be assessed only by the expert panel. Written reports from additional referees will <u>not</u> be obtained. The Panel will evaluate the proposals against the Criteria for Assessment (see below) and provide the funders with a recommended rank-ordered list of proposals based on the details contained within the case for support. Applicants should therefore ensure that sufficient details of their expertise and track record, proposed hypotheses, approaches and methods are provided within the case for support to enable the proposal to be assessed by scientists with relevant but not necessarily specialist expertise**

**Applicants will receive post-panel feedback on unsuccessful proposals. Details of how to request this will be provided in due course, and once the panel decisions have been made.**

[10] http://www.rcuk.ac.uk/research/Pages/Eligibilityforrcs.aspx
[11] http://www.epsrc.ac.uk/funding/apprev/fundingguide/Pages/default.aspx
[12] http://www.mrc.ac.uk/Fundingopportunities/Applicanthandbook/Grantcalls/Handbookannexes/index.htm

**Criteria for Assessment**
The criteria which the Assessment Panel will use to evaluate and rank-order the proposals submitted to this initiative call are as follows:
Primary
- Scientific excellence
- Potential application in, and future impact on, national security and defence research, as well as the wider research context (including any ethical, legal, societal issues).

Secondary
- Level of innovation, novelty and multidisciplinarity
- Potential to improve prosperity and quality of life, i.e. understanding of the wider possible socio-economic impact of the research
- Timeliness and promise
- Value for money

In addition, the Assessment Panel will consider the fit of proposals to the scope of the call as described above.

**SPECIFIC REQUIREMENTS**
Applications should be submitted to BBSRC through the JeS portal no later than 4pm on 22 November 2011. Applications should follow BBSRC's standard grant rules, unless stated otherwise, and should include:
- Part 1A: Track Record (2 pages)
- Part 1B: Data Sharing Statement (1 page)
- Part 1C: Animal Usage (1 page – where relevant)
- Part 2: Case for Support (6 pages)
- Justification of Resources (1 page)
- Pathways to Impact (2 pages) – see below for specific details
- CVs of all applicants, including named researchers (2 pages each)

In addition, each application should submit one slide (using the template provided in the Downloads section of this webpage) describing the scope of the proposed work, the question it seeks to address and future potential applications, with an emphasis on defence and security-related applications – see below for specific details. **This slide should be converted to PDF before upload, since JeS does not accept PowerPoint formats.**

**Pathways to Impact**
All applications for Research Council funding now require a 'Pathways to Impact' statement to be included, where applicants can describe how they envisage the potential impact of their planned research on society generally.

For this call, applicants should use the first page (of the two permitted) to describe what impact their research may have in the defence and security sector particularly. Questions that could be relevant here are:
- How might the research lead to a new or improved defence/national security capability?

- What might be the wider impact of the research, i.e. relevance to other applications, sectors or wider spin-off into the civil sector?

The second page of the Pathways to Impact statement should be used to describe broader impact plans, in common with all other Research Council proposals. Please see JeS help for more guidance.

**PowerPoint Slide**
This should be included as an attachment in JeS and should be classified as "Proposal Cover Letter". If you have any questions regarding this particular requirement, please refer in the first instance to the Dstl contact Mr Joe Capitelli (see contacts below).

**Reporting Requirements**
At six monthly intervals from the start of the project (that is, once for a 12 month project), successful applicants will be required to forward to Dstl an updated PowerPoint slide set (two/three slides with notes if required) describing the scope of the work, the question addressed and progress to date in the context of how the understanding of future potential has been improved.

Successful applicants will also be required, in line with standard BBSRC grant terms and conditions, to submit a short final report on the project. The format of this will be provided to successful applicants in due course.

**Dissemination**
Successful applicants will be required to present their work at a dissemination and networking event hosted by Dstl. This will require the production of a poster presentation and travel for the Principal Investigator and appropriate research staff. These costs should be factored into the requested resources for the project, as no additional funds will be provided for this activity.

**CONTACTS**
For further details and enquiries, please refer to the Frequently Asked Questions document. If you need further clarification, please refer to the relevant contacts below.

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