New Directions in Synthetic Biology

30 March to 3 April 2009

Airlie Conference Center, Warrenton, VA (USA)

This is a 'Call for Participants' to take part in a five-day sandpit to look for innovative ways to explore future developments in Synthetic Biology.

Closing date for applications: 4pm, Submitter's Local Time, Thursday 15 January 2009

Introduction

The Engineering and Physical Sciences Research Council in the UK (EPSRC), through the IDEAS Factory Program, and the National Science Foundation in the US (NSF) invite expressions of interest to participate in an interactive workshop (Sandpit) to be held at Airlie Conference Center in Warrenton, VA (USA) from 30 March to 3 April 2009.

The aim of the sandpit is to stimulate thinking in promising new, or currently underdeveloped, areas of synthetic biology.

The EPSRC and the NSF plan to allocate up to £5.5M (as of the exchange rate on 4 November 2008), pending the availability of funds, to support genuinely novel and potentially transformative research arising from the sandpit.

Participants will be expected to engage constructively in dialogue with each other, the facilitators, and the Directors and Mentors to develop collaborative research proposals.

UK Research Councils have utilised successfully the sandpit mechanism for a number of high profile strategic partnerships with industry and HM Government Departments.

Given the current state of knowledge in this area, transformative progress demands an innovative and multidisciplinary approach. Consequently, the aim of this sandpit is to bring together researchers to create an integrated vision for future research, both those already working on synthetic biology, and others whose research could directly contribute.

The UK Biotechnology and Biological Sciences Research Council (BBSRC) has been consulted about the IDEAS Factory Sandpit and will provide advice where appropriate, as well as attending the sandpit.

The Research Challenge

Synthetic Biology seeks to discover and apply the operational principles of biological systems through the design and construction of biologically inspired parts, devices, and systems that do not exist in the natural world and to redesign existing, natural biological systems for useful purposes.

Synthetic Biology uses biological systems as the primary sources of data, dynamics, and phenomena to fabricate devices that are based on or exhibit features of natural living systems. For example, advances in DNA sequencing have made it possible and cost effective to chemically synthesize and subsequently assemble large fragments of DNA into genetic systems. Similarly, new tools for designing and controlling neural circuits can lead to engineering of a virtual brain with the goal of better understanding brain/behaviour interactions and to new computer technology based on our understanding of brain processes. The iterative use of three stages -- design, fabrication and experimentation/measurement -- generates over time a more efficient and robust device and ultimately leads to a deeper understanding of the fundamental properties of living systems.

Synthetic biology relies on an array of tools and technologies from engineering, synthetic chemistry, informatics and computer science, mathematics and statistics, physics, materials science, cognitive science, neuroscience, genomics, metabolism, and cell and molecular biology - providing a wealth of opportunities for interdisciplinary research efforts.

Potential applications of Synthetic Biology are diverse, but are believed to offer many societal, environmental and medical benefits:

- Advancing a deeper fundamental understanding of naturally occurring complex systems
- Biomedicine and bioprocessing of pharmaceuticals
- Bioremediation
- New and renewable sources of energy
- Novel materials
- Novel tools and techniques for studying complex systems
- Chemical sensors/biosensors

Given that Synthetic Biology is still considered to be an emerging science in both the UK and the US, there exist myriad challenges and barriers to overcome in order for the technology to reach its full potential.

Societal Implications and Ethical Issues

It is recognised that some areas of Synthetic Biology have the potential to raise societal, ethical, philosophical and legal issues, and opportunities also exist for research in areas outside the natural sciences and engineering, for example philosophy, sociology and history. The involvement of researchers from these other fields is essential to ensure that scientific research is considered within a societal context and that any ethical, legal and societal issues that are raised are fully explored as the area develops.

A Sandpit for Ideas

The concept of the IDEAS Factory is to organise interactive workshops (**sandpits**) on particular topics, involving 20-30 participants. The aim of this sandpit is to stimulate thinking in promising new, or currently underdeveloped, areas of synthetic biology, and to fund new collaborations between leading US and UK scientists, in order to advance current research practises from both nations.

The sandpit is sponsored by the NSF and EPSRC. As such, **anyone eligible to apply for funding from either the NSF or EPSRC is eligible to apply to attend the sandpit.**

The Sandpit Event

The sandpit will run over five days starting mid-morning on day one and finishing mid-afternoon on day five.

At the outset of the sandpit, the participants work collaboratively to identify and define the scope of the challenges in the area of Synthetic Biology. As the sandpit progresses, participants will build up thoughts on how the identified challenges may be addressed and develop their innovative ideas and activities into research projects, which should contain genuinely novel and potentially risk-taking investigations that address new approaches in synthetic biology. The sandpit will include inputs from a variety of sources.

Up to £5.5 million is planned to be allocated to fund collaborative research projects arising from the sandpit, pending the availability of funds. EPSRC is leading the organisation of the sandpit; however, both the EPSRC and the NSF plan to provide funding for these projects.

Those selected to participate will receive further instructions prior to attending the event.

How will the Sandpit Work?

The sandpit is an intensive, interactive and free-thinking environment, where a diverse group of participants from a range of disciplines and backgrounds gets together for five days – away from their everyday worlds – to immerse themselves in collaborative thinking processes in order to construct innovative approaches.

The nature of the sandpit requires a high degree of trust between participants in order to gain the breakthroughs in scientific thinking. This trust extends to allowing the free and frank exchange of scientific ideas, some being in the very early stages of development. The aim of the sandpit is not to discuss ideas that are already well-developed but not yet published. Rather, the goal is to bring individuals from different disciplines together to interact and engage in free thinking on first principles, to learn from one another and create an integrated vision for future research projects. It is expected that the sharing of these ideas would be encouraged within the sandpit but their confidentiality would be respected outside the sandpit.

The sandpit will be led by two Directors whose role will be to assist in defining the topics and aid facilitated discussions at the event. The Directors will be joined by a small number of Mentors. The Mentors will be selected by the Directors in consultation with the EPSRC and the NSF, based on their intellectual standing, their impartiality and objectivity, and their broad understanding of and enthusiasm for the broad topic of synthetic biology. The Directors and Mentors will take full part in the sandpit, and will not be eligible to receive research funding under this collaborative activity, and so will act as impartial peer reviewers in the process, providing a function analogous to that of an NSF review panel. The Directors will be Patrick Dennis, Program Director in the Division of Molecular and Cellular Biosciences, and Krastan Blagoev, Program Director in the Division of Physics, both at the NSF.

The process can be broken down into several stages:

- Defining the scope of the challenges
- Evolving common languages and terminologies amongst people from a diverse range of backgrounds and disciplines
- Sharing understandings of the challenges, and the expertise brought by the participants to the sandpit
- Taking part in break-out sessions focused on the challenges, using creative thinking techniques
- Capturing the outputs in the form of highly innovative research projects
- Using "real-time" peer review on those projects at the sandpit to determine their eligibility for funding

The sandpit will be an intensive event. For the well-being of participants, the venue offers opportunities for relaxation, and the timetable will include networking and other activities as a break from the detailed technical discussions.

Who Should Apply to Participate?

Having the right mix of participants influences the success or failure of such an event. Applications are encouraged from individuals representing diverse research areas across engineering, physical sciences, life sciences, and the social and cognitive sciences. Examples of disciplines and research areas that could be potential contributors include:

- Engineering
- Biology
- Chemistry
- Philosophy
- Physics
- Bioinformatics
- Ethics
- Sociology
- Computer Science
- Mathematics, Statistics
- Modelling
- Cognitive Science
- Neuroscience

However, we are not defining the disciplines that should be represented at this sandpit; rather we are asking potential participants to indicate how their expertise can address the challenges facing synthetic biology.

It would be beneficial for applicants to have some prior knowledge of the challenges facing synthetic biology, but more importantly to demonstrate an enthusiasm for cross-disciplinary research, as the future of this technology will require input from many disciplines. The ability to develop and pursue a new approach will also be crucial.

Expertise is required from a very broad range of disciplines, and applicants should not feel limited by conventional perceptions: the whole IDEAS Factory approach is about bringing people together who would not normally interact. We actively encourage people to apply that are experts in their own research areas but have not yet applied it to the challenges facing synthetic biology.

This is an opportunity to share ideas and develop future collaborations.

Participants are welcomed at any stage of their research career however; they MUST be eligible to apply for funding from either the NSF or the EPSRC.

Location and Date

This sandpit will take place at Airlie Conference Center in Warrenton, VA (USA) between 30 March to 3 April 2009. Further details of this venue are available at: http://www.airlie.com/

The environment will encourage free and open-minded thinking, vital for the purposes of this event.

Submission of an application will be taken to mean that the applicant is available to attend on the specified dates and will make a commitment to attend if selected. Additional details of the venue, how to get there and the accommodation arrangements will be provided to the selected participants. It should be noted that all travel to the sandpit, accommodation, refreshments, breakfast, lunch and dinner costs will be met by the EPSRC and the NSF. However, all incidental costs incurred while at the event must be met by the participant.

Applying to Participate in the Sandpit

Applications are invited from individual researchers who can contribute to the sandpit and resulting research projects. **20 to 30 participants** will be identified to take part in the sandpit. Participants will be chosen to allow representation from both the UK and US.

Applicants should complete the short Expression of Interest (EoI) form **(maximum two sides)**, found at the end of this document. Your answers to these questions will be used to assess your application and demonstrate that you have the suitable skills and attitude to participate in this sandpit.

Please note that your academic publication or research track record is not of primary interest. Of greater interest is evidence of how you might approach multidisciplinary problems in a novel area. **In order to participate, applicants must be available to attend for the full five day duration of the sandpit.**

If selected as a participant your CV details, listed in the first section of the EoI, will be made available to other participants to facilitate networking at the event.

The deadline for applications is **4:00 pm submitter's local time Thursday 15 January 2009.**

Applications (EoIs) should be submitted electronically to SynBiol_NSF@epsrc.ac.uk by the deadline date and time. Please include "**Synthetic Biology**" in the subject field.

No further documentation will be accepted. Please note that late submissions will not be considered further.

Applicants will be informed of their selection for the sandpit event by the end of February, 2009.

Assessing Applications

Applications to attend will be considered by a Selection Panel consisting of Dr Paula Duxbury (EPSRC), Dr Joanne Tornow (NSF), Dr Patrick Dennis and Dr Krastan Blagoev (Sandpit Directors), and the Sandpit Mentors in order to ensure a mix of disciplines and experience. Final selection decisions regarding participation in the Sandpit will be made by the EPSRC and the NSF.

Overall, the Selection Panel will seek to ensure that a balance of expertise is present at the sandpit; their assessment will be based on the specific criteria outlined below.

Selection criteria:

- The ability to develop new and highly original research ideas;
- The potential to contribute to research between disciplines;
- The ability to work in a team across academe and industry;
- The ability to explain research to non experts.

Please ensure you fully complete the EoI form, as this is the **only** information on which potential sandpit attendees will be selected. It is therefore important to give evidence of your experience in your application.

Please note that because of the large number of applications expected, we will not be able to give individual feedback to unsuccessful applicants.

Post Sandpit Proposal Assessment

Following the sandpit, the participants involved in the projects that are invited to submit full proposals will be tasked with writing full proposals covering their intended activities as identified at the sandpit. The deadline for submission of proposals generated at the sandpit will be the 28 May 2009. Proposals that are led by a UK Investigator will be submitted to EPSRC via the Research Councils Joint Electronic Submission System (JeS). Proposals that are led by a US Investigator will be submitted to the NSF through FastLane or Grants.gov

Further guidance on this part of the process will be available at the sandpit event.

The primary review criteria used throughout the process of developing and assessing the final proposals will be based on the NSF review criteria of Intellectual Merit and Broader Impact, and will focus on how well proposals address the vision of the call. A description of the NSF review criteria can be found in Chapter III of the NSF's Grant Proposal Guide, at http://www.nsf.gov/pubs/policydocs/pappguide/nsf08_1/gpg_3.jsp#IIIA)

Highest priority will be given to proposals that show:

- Novel highly multidisciplinary research projects, clearly reflecting the distinctive opportunity for creating such projects that the sandpit provides.
- Clear evidence that the team has the capability to deliver its project as a high quality multidisciplinary activity.
- Clear relevance to, and the potential to make a distinctive and novel contribution to, addressing the research, societal and/or ethical challenges around synthetic biology.

Final funding decisions will be made by July 2009.

Any collaborative project funded through this programme must have a signed Collaboration Agreement between the partners that clarifies the contributions and rights of each partner before the start of any grant. The sponsors of the Programme attach great importance to the dissemination of research findings and the publishing of information about the research they support in the public domain. However, all dissemination and publication must be carried out in the manner agreed in the project's Collaboration Agreement.

For Further Information

For further information, advice or queries regarding the format of the event, application procedure and other operational matters please contact:

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New Directions in Synthetic Biology

Application Form – Expression of Interest
Complete and email to:
SynBiol_NSF@epsrc.ac.uk

PLEASE NOTE: Each EoI should be **no longer than 2 sides** and in a readable and reasonably sized font. HINT- we are not looking for your academic publication or research track record, but rather how you might approach cross-disciplinary problems in this area and the sandpit.

Name:	**Dept:**
e-mail:	**Institution:**
Brief Summary of CV/Track Record:	
What expertise do you bring that is relevant to the topic?	

Applications should be no longer than 2 sides

If selected to participate, would you be happy to share this front page with other participants? Yes / No

In accordance with the UK Data Protection Act 1998, the personal data provided on this form will be processed by EPSRC, and may be held on computerised databases and/or manual files until after the sandpit event.

Name:	**Dept:**
Please spend some time responding to the following questions. Your answers to these will be used to distinguish your application and convince us that you have suitable skills and attitude to participate in the sandpit event. Hint – we are not looking for your academic publication or research track record but rather how you might approach the sand-pit. (Guide: 100 words each)	
a: What is your personal experience of working with people in teams?	
b: How would you describe your ability to explain your research to non-experts?	
c: The sandpit will be especially suited to individuals who are willing to step outside their particular area of interest or expertise, who are positively driven, who enjoy creative activity, who can think innovatively and who can settle in easily in the company of strangers. How well do you see yourself fitting in?	
d: What would you personally gain from participating in this sandpit event?	

Where did you hear about this IDEAS Factory sandpit?
EPSRC Web-site ☐
NSF Web-site ☐
EPSRC e-mail ☐
University Research Office ☐
Other ☐

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