



Synthetic Biology Leadership Council – Meeting 20
Thursday 19th July 2018
BIS Conference Centre, 1 Victoria Street, London SW1H 0ET

Attendees:

Prof Lionel Clarke, Prof Richard Kitney, Prof Anne Osbourn, Prof Joyce Tait, Dr David Tew, Prof Janet Bainbridge, Dr Rowan McKibbin, Dr Yvonne Armitage, Alastair Kent, Prof Petra Oyson, Dr Jason Vincent, Dr Gordon Ford, Dr Dana Heldt, Jonathan Hoare, Paul Henderson, Dr Nancy Bailey, Gillian Whitworth

Apologies:

Lord Henley, Prof Tim Dafforn, Dr Louise Ball, Dr Tim Fell, Dr Amanda Collis, Dr Jo Bray, Prof Dale Sanders

1. Welcome

- Lionel Clarke welcomed everyone to the meeting and the apologies were noted. Anne Osbourn was attending on behalf of Dale Sanders.
- Two people joined the SBLC
 - Dr Nancy Bailey leads the Environment team at Government Office for Science, covering issues including agriculture, food/plant disease, food/drink, rural affairs, and space. She is policy adviser, having worked in various government departments on issues such as emissions trading, agri-tech and higher education
 - Gillian Whitworth recently joined the bioeconomy team at BEIS as a Policy Officer, previously working at non-profit the Open Data Institute. She has a background in the charity and non-profit sector. Within her role at BEIS, she will be supporting the delivery of the upcoming Bioeconomy Strategy, as well as leading other activities that help foster the UK's bioeconomy, including supporting innovation in plastics.
- The focus of the meeting was outlined: Summary & discussions from SBLC workshop, Development of Roadmap 2020+ and identification of actions required to commercialise synbio.
- Lord Henley send his apologies during the meeting. He was not able to attend due to last minute changes in his schedule.

2. Internal Business

Minutes and Actions SBLC 19

- The minutes from the last meeting were approved after implementation of minor changes.
- The Actions of SBLC 19 were reviewed

Action	Description	Outcome
19 – 1	Updated slide deck from SBLC 19 to be send out	Done

19 – 2	Provide feedback on roadmap progress. Comment on whether we are on track and anything missing that we need to cover.	Reliance on the roadmap was discussed. A more integrated/joined up analysis and projection of the future of synbio innovation is appropriate, instead of the parallel linear outline, which inhibits joining up of key issues. It was noted that the roadmap illustrates the many factors contributing to success and underlines the importance of addressing the eco-system as a whole. The roadmap was originally used to report progress. New technologies (AI, CRISPR) have since been developed, which now need to be considered. Further discussion will be taking place throughout review of the workshop and Roadmap 2020+
19 – 3	All to consider external communication 'strategy' eg what is UK USP, why are we doing synbio and provide a 'whats in it for us' for an external (non-synbio educated) audience	Addressed in review of SBLC workshop and Roadmap 2020+
19 – 4	identify what is missing in the landscape to enable progress and commercialisation. Consider gaps in facilities/capabilities.	Addressed in review of SBLC workshop and Roadmap 2020+
19 – 5	URGENT request for input for an ISCF expression of interest, especially exemplars, industry examples, data. Draft to be circulated ASAP for comment.	Done. Awaiting announcements.
19 – 6	KTN to gather and develop a 'database' of success stories	Ongoing. Success of Colorifix (biological dye) and Bolt Threads (Spider silk) who both work with Stella McCartney were given as examples. It was noted we should include a "failure" database to learn from and review success stories as part of broader overview. Updated into Action 20 – 1
19 – 7	Dick to forward invitation to industry showcase day at Synbicite on 5th June	Done
19 – 8	Dick to circulate future synbio strategy report	Ongoing. This was integrated into the minutes of the S&T Subgroup (item 6). Richard Kitney will send out report by next meeting
19 – 9	Rowan to circulate info collected by BBSRC on research centres on RRI/ELSA generated as part of the mid-term reviews if permission is granted to help inform future SBLC led activities	Example activities in the RRI/ELSA include: <ul style="list-style-type: none"> • Engaging the public and interpreting public perceptions of synthetic biology applications, such as the development of synthetic menthol at Manchester. • Resident artists and social scientists, working at the bench with synthetic biologists to better understand and appreciate the nature and identity of synthetic organisms. • Developing local maps, charting innovation pathways for potential applications. • Developing novel interactive and outreach tools. • Developing training courses on ELSA / RRI, including topics such as sustainability, responsibility and ethics. • Engaging in numerous policy initiatives. • Developing open innovation methodologies.
19 - 10	Rowan to consider progression in respect to RRI	RRI is diverse in nature and the level of integration within synthetic biology is inconsistent. Synthetic biologists have found the diversity in the contributions and perspectives from social scientists uncomfortable, perhaps instead expecting a single view or answer. There is a significant tension (recognised in the field of

		social science and related disciplines), between carrying out innovative research in social science and acting as a constructive challenge and support to the synthetic biologists (or others) around 'ELSA/RRI'. It may be helpful to consider separating these roles explicitly in future multidisciplinary activities where this tension might arise.
19 – 11	Lionel to attend next IBLF meeting.	Done.
19 – 12	Dry run of national bio helpline co-ordinated by the met. Lionel /KTN(?) to approach Customem/Lab Genius about participating and feedback to the police.	Ongoing. Progress slightly slower than anticipated. <ul style="list-style-type: none"> • Plan as described in open meeting confirmed: Public can call helpline, which is run by designated response group which has been educated on synthetic biology. • Dry run taking place over the next weeks with Bristol to learn from it • Still requiring start-up to take part/host • Next step rolling out the helpline
19 – 13	SBLC to support Joyce with S&T council case study development/develop letter to prime minister	Completed. No support required. There was no opportunity to do this following approval of the next stage of development at the 'Council for Science and Technology' meeting and the planned timeframe for implementation.
19 – 14	Joyce to seek feedback from SBLC industry members on RRI and standardisation initiative being developed with BSI if required	Ongoing. Joyce is in discussion with BSI and Innovate UK about possible development of a standard for Responsible Innovation.
19 – 15	KTN to garner info on inviting the European student synbio society, EUSynBioS http://www.eusynbios.org/ and invite to open meeting in November to present on activities	Ongoing. Dana to contacted EuSynBio. They would like to attend, however none on the members are currently located in the UK. Financial support would be required to attend meeting. Possibility to attend via skype/pone to be investigated. It was surprisingly noted by SBLC members, that none of the members is located within the UK, considering it is a European Community. Representative does not have to be committee member. Dana to re-investigate.
19 – 16	KTN to develop stakeholder mapping (expertise matrix/gap analysis and ideas of industry sub group activities with SBLC input	Ongoing. Awaiting input from SBLC members.
19 – 17	All to agree to idea of 1.5 day meeting in July.	Done
18 – 1	Lionel to follow up with Phil Shapiro. Lionel Clarke to ask the directors of SBRCs what we are collectively learning on RRI, and to request they each send a one-page note to the SBLC Governance-Sub-Group	Done. Report on RRI received from Phil Shapiro.
18 – 3	Dick and Tim D. to continue discussions with the relevant societies regarding skills and education	Ongoing. Richard Kitney working with Tim Dafforn

Governance subgroup update

Joyce Tait gave an update on the 14th GSG meeting which took place on June 19th 2018.

Detailed information can be found in the GSG minutes (<https://ktn-uk.co.uk/news/governance-subgroup-of-the-sbhc>). The main points discussed were:

- Several GSG members are leaving due to other commitments and Hadyn Parry has joined the GSG. Additional new members are being sought to replace those leaving and to cover additional areas of expertise. The Terms of Reference of the GSG are being reviewed.
Action: SBLC members to suggest members for GSG
- Work is ongoing with BSI and IUK to develop a standard to support companies wishing to adopt a responsible innovation approach, with the aim that the Government will take actions/recommendations forward.
- Regarding future regulation of genome editing, on July 25th the European Court of Justice will rule on how this technology should be handled in future.
- Camelina, developed by Rothamsted in collaboration with researchers in France for increased omega 3 production has been ruled as 'not GM'. It therefore has not so far been subject to the EU regulatory system or to the collection of data that would be part of this system. A question was raised whether SBLC should work more closely with Rothamsted on public perception issues related to GM. Jim Haseloff is in discussion with Jonathan Napier and this could be linked to the work of the GSG.
Action: Joyce to investigate options to work more closely with Rothamsted
- It was suggested that the process of interaction between GSG and SBLC could usefully be reviewed so that exchanges between members are more frequent and both bodies are able to respond more quickly to upcoming events/developments
Action: Joyce to initiate ad hoc meetings (Skype/phone) as/when needed?
- The £10 million 'Regulators' Pioneer Fund' is now available for regulators to develop new approaches to facilitate innovation. Although this could have been an opportunity to consider how the UK should regulate new biotechnologies in future, in this case the regulator is unlikely to be in a position to make an application.

Science and Technology subgroup update

Richard Kitney gave an update from the SBLC S&T meeting which took place on June 18th 2018.

- Industrial showcase event was held on June 5th at the RAE, London. About 100 people attended the event which took place in liaison with SynbioBeta. Presentations from Synbio companies and panel discussions.
- The main discussion point of the S&T meeting was the future synbio strategy, addressing key areas
 - Education and people:
 - University based synbio education is crucial, eg undergraduate modules on synbio. Anne Osbourne created a survey of synbio education a couple of years ago. Anne agreed to update the survey and send an email to the SBRC for updated information.
 - Importance of a common teaching plan thorough the university was noted
 - Business Models and Finance
 - PoC funding provided by SynBiCite is well received and extremely helpful to start-up Companies.
 - The Norwich Research Park translation fund enables researcher to commercialise their work

- Public funding is crucial, especially at the early stage - £384mio of investment in the UK for start-ups so far this year.
 - Integration across Government – BEIS, UKRI, innovate
 - The USA Government recognises the importance of synthetic biology, while it was felt that in UK this is not the case.
 - Synbio is receiving a bad press and people are suspicious of GM → positive case studies to educate (**see Action point 20-1**)
 - The industrial strategy focuses around large companies and lacks input from small once
 - A high-level champion could help conveying the message to government
 - Learning from International community
 - UK should look at USA, China, Singapore, Germany as models. €56mio invested for 'clusters for excellence' in Germany. Fraunhofer institute given as example for successful technical translations into commercial products. What can we learn from them?
Action: Dick/Dana to contact Fraunhofer Institute
 - Industrial translation
 - Important key enablers are: facilities such as the foundries, standards, reproducibility & reliability and scale up strategy
 - Important to educate users of synbio applications → skill development
 - Bioincubator in Scotland (?)
 - Planned business courses with SBRCs (IP, business plan development...)
- Action: Dick to circulate Future synbio strategy report**
- Updates from the SBRCs were given at the S&T meeting

3. SBLC workshop and Roadmap 2020+ discussion

- A workshop took place on July 18th and was attended by about 35 representatives from academia, industry, government and stakeholders. Aim of the workshop was to shape the direction of the next 5 – 10 years of UK Synthetic Biology eco-system and how to commercialise synbio. Expected outcome is a report/document.
- Lionel Clarke set the scene and started the discussion “What makes UK synbio revolutionary?” Synbio is driver of the bioeconomy. The 2012 Roadmap provided a clear vision (holistic ecosystems) and was positively reviewed by other countries as unique document. New technologies are developing (CRISPR/AI/machine learning) and now it’s the time to translate synbio into commercialisation.
- Lionel gave a summary of the SBLC workshop:
 - Short scene setting presentations
 - UK Synbio today – the industrial context, investor landscape (Lionel Clarke)
 - UK Bioeconomy Strategy & Sector Deal (Lee Beniston)
 - SynbiCITE showcase + RAE summary [Richard Kitney]
 - Cambridge Consultants workshop report [Richard Hammond]
 - Co-developments - AI [James Field], quantum computers (Simon Benjamin)
 - UK Synbio futures - envisaging a joined-up Innovation Pipeline [LJC]
 - 4 breakout sessions:
 - Creating Options (technological drivers, blockers, opportunities)
 - De-risking (scaling, demonstrating, verifying)
 - Commercialising (accelerating delivery via an integrated innovation pipeline)

- Democratising (making more accessible, adoptable, applicable, acceptable)
- The key points of the workshop were summarised and opened up for discussion
- The table below gives a summary of the discussed points.

Layout/Structure/general	UK's UPS/Strength
<ul style="list-style-type: none"> • Build document on the 5 foundations (People, Places, Business environment, Ideas, Infrastructure) and 4 grand challenges (AI, Clean growth, ageing population, mobility) • Addressing Synbio as revolutionary and driver of the Bioeconomy 	<ul style="list-style-type: none"> • Multidisciplinary • Regulatory & Safety framework • UK soft power • Plant synbio • Strong chemical industry, opportunity for bioderived replacing • Enzymology • Materials • Sustainable fuels • NIBBS • UK has a big investment in the Centre for mammalian synthetic biology (unique in the world) • UK expertise in pharma & cell therapies
Novelty & Opportunities from technical advances	
<ul style="list-style-type: none"> • Synthetic genomes (yeast) • Robotics + AI/ML, quantum computing • Circular economy & Cross-sector activities • Complex chemical synthesis 	
Applications & case studies	Standardisation and Metrology
<ul style="list-style-type: none"> • Vaccine production/drugs (Prokarium, Leaf expression system, Intrexon, Chain) • Advanced therapies • Organism engineering (eg Camelina – Omega 3) • Novel agricultural spp/Crop protection (RNAi Syngenta, Nitrogen fixing crops) • Materials (functional, structural) • High value chemicals (C3bio) • Sensors, including personal monitoring • Environment (Colorifix, Customem) • Synthetic meat • Animal breeders (Cattle without horn) • 3D cell printing → replacing animal testing • AMR • 'Places' pillar (Andy Boyce, Bristol can provide case study on AI and materials) 	<ul style="list-style-type: none"> • active development of standards and metrology - Implementation of common plant syntax led by UK is widely accepted by international community
	Infrastructure
	<ul style="list-style-type: none"> • Accessible & affordable facilities needed as alternative to CPI • integrate companies at Universities • generate SME hubs
	Commercialisation
	<ul style="list-style-type: none"> • Scale up and predictability/complexity challenge • IP translation problematic/UK patent culture • Identify markets for synbio applications/where do companies fit in, what's the market pull?
RRI, Public Engagement & Communication	Funding
<ul style="list-style-type: none"> • Communicate the benefits of Synbio → Public education (science museum, natural history museum, BBC) • Address regulatory burden → reframing regulatory outline • lower regulatory hurdles • "Selling" synbio vision • Requirement for UK SynbioBeta conference 	<ul style="list-style-type: none"> • Continued Funding of basic research (SBRCs) required → reposition SBRCs • DARPA vs Innovate UK • Long term high risk investment fund/patience fund required • Easily accessible funding needed (eg pitch funding) • What can we learn from Fraunhofer?
Education & Skills	
<ul style="list-style-type: none"> • motivate people to work in the UK in SynBio – straight forward Visa systems • business/entrepreneurial education needed 	

Action: Lionel/Dana to summarise key points of the discussion and share with workshop attendees and SBLC members for feedback and input. First outline/draft of the document to be circulated to SBLC members by end of September.

4. Actions

The actions from SBLC 20 are summarised in the table below

Actions	Description	Responsibility	Due date	Progress/outcome
20 – 1	Updated version of Action 19-6. Development of success stories as part of a broader overview. Include “failure” case studies to learn from. SBLC members to provide positive and negative examples. Dick to provide relevant information from SynBiCite	Dana Heldt to collect	ongoing	Ongoing. Examples to be published on KTN/SBLC webpage.
20 – 2	SBLC members to suggest members to join GSG.	Joyce Tait	September	Membership refresh is well under way, to be reported at this November meeting. We could usefully still include one or two additional members.
20 – 3	Ministerial meeting between Lionel Clarke, a few SBLC members and Lord Henley to update Minister, who was not able to attend SBLC 20.	Lionel Clarke & Paul Henderson	September/October	Done. Lord Henley was updated on the issues raised in the meeting. A letter addressing the ECJ ruling on gene editing and the potential impact on UK research and industry was send to him.
20 – 4	Question was raised if SBLC should work closer with Rothamsted on public GM perception. Jim Haseloff is in direct talks with Jonathan Napier - can we link this into GSG? Joyce to investigate possible options.	Joyce Tait	By next meeting	Jonathan Napier gave a talk at the recent GSG meeting (see Minutes), and the process of continuing discussions with Rothamsted on the topic of public

				GM perception has been initiated.
20 – 5	Joyce to initiate ad hoc meetings (Skype/phone) as/when needed?	Joyce Tait	As required	We have begun to implement this process and will continue to do so. A good example was the letter to Lord Henley, drafted by JT and LC on behalf of the SBLC and the GSG, on the CJEU ruling on the status of gene edited crops in the EU. This involved excellent support and contributions from several members of the SBLC who are also members of GSG.
20 – 6	Contact Fraunhofer Institute in Germany for discussion on what can we learn from their infrastructure	Richard Kitney & Dana Heldt	By next meeting	Done.
20 – 7	Overview Draft of Roadmap 2020+ and circulation to SBLC members for feedback	Lionel Clarke	End of September	Done. Pre-reading Paper 5
20 – 8	SBLC members to provide topics and sessions for SBLC 21, open meeting	Dana Heldt to collect	End of September	done
Actions from previous meeting				
18 – 3	Dick and Tim D. to continue discussions with the relevant societies regarding skills and education	Richard Kitney/Tim Dafforn	ongoing	Ongoing (closed)
19 – 8	Dick to summarise & distribute the Future Synbio Strategy report	Richard Kitney	by next meeting	tbc
19- 15	KTN to garner info on European student synbio society (EUSynBioS, http://www.eusynbios.org/) and invite to open meeting in November to present on activities (by next meeting)	Dana Heldt	September	done

5. **AOB**

- A number of upcoming conferences were highlighted
 - UK Synbio conference (SBUK 2018) on November 19th/20th in Bristol. The meeting is organised jointly by the Biochemical Society and BrisSynBio
 - EFIB 2018 (European Forum for Industrial Biotech and the Bioeconomy) October 16th Toulouse
 - SynbioBeta 1st – 3rd October in San Francisco. Dick Kitney is organising a Trade mission. Contact him for future information/if you want to join.
- Date of SBLC 21 meeting: November 21st
 - Open meeting at the RAE
 - Need to plan topics and sessions. Suggestions so far: iGEM, 1 SME presentation, investment/Jobs overview, Vaccines in Plants)

Action: SBLC members to provide suggestions