



Synthetic Biology Leadership Council – Meeting 19
Wednesday 21st March 2018
BEIS Conference Centre, 1 Victoria Street, London SW1H 0ET

Attendees:

Prof Lionel Clarke, Synthetic Biology Leadership Council (SBLC) co-chair:
Lord Henley, House of Lords Parliamentary Under Secretary of State at Department for Business, Energy & Industrial Strategy and SBLC co-chair
Dr Yvonne Armitage, Knowledge Transfer Network
Prof Janet Bainbridge, Department for International Trade
Jo Bray, Department for Business, Energy & Industrial Strategy
Prof Tim Dafforn, University of Birmingham
Dr Gordon Ford, Innovate UK
Paul Henderson, Department for Business, Energy & Industrial Strategy
Dr Jonathan Hoare, Department for Business, Energy & Industrial Strategy (in part)
Prof Richard Kitney, Imperial College London
Prof Petra Oyston, Defence Science & Technology Laboratory
Dr Rowan McKibbin, Research Councils UK, UKRI
Prof Dale Sanders, John Innes Centre
Dr David Tew, GSK
Prof Joyce Tait, Innogen Institute, University of Edinburgh (by phone) in part
Dr Jason Vincent, Syngenta

Apologies:

Louise Ball, DEFRA
Dr Amanda Collis, BBSRC, UKRI
Dr Tim Fell, Synthace and BIA Engineering Biology Advisory Committee chair
Alastair Kent, Genetic Alliance UK

1 Welcome and introductions

The Chair welcomed everyone to the meeting, especially the new attendees Jason Vincent who is new head of synbio at Syngenta and Gordon Ford who leads on synbio at Innovate UK.

2 Progress and key issues summary

It was gratifying to note that synthetic biology had been mentioned in the life sciences strategy & bioeconomy sector deal. It is currently the mid-year reviews of research centres. Thus, it is a critical time for synbio and we need to capitalise on this. It is important to develop and use a common message across all sectors.

The minutes of the last meeting were approved without amendment.

Lionel described his view of the roadmap activities – being a view of where activities are, not a plan and requested feedback from the SBLC on whether we are on track. Technologically we are ahead of the game with CRISPR and AI etc now included that previously wasn't. The original goal of excellence in science and to create jobs/growth must be front and centre, as well as encouraging big industry to use synbio. We need to look at what next 5-10 years might look like and Lionel asked for everyone to consider any additional things needed.

Action: SBLC to feedback on roadmap and whether there is a need for additional activities

- The spreadsheet of activities is aimed at a synbio-educated audience.
- Compare technology push vs market pull.
- Always asking why are we doing it? What is in it for us? What is UK USP?

Action: Lionel to send out updated slide deck.

Lionel talked to slide showing UK publications. The UK was responsible for 17% of all global publications in SynBio in 2017 more than France and Germany put together.

Gingko Bioworks will be the first billion dollar company. We need to look at how the UK can make it attractive to invest in start ups/companies and look at getting a critical mass of companies. Issues to address include:

- How good are we at converting research into IP?
- How good are TTO's at helping commercialise?
- Do we have the right facilities?
- What is fundamentally different in UK compared with US?
- A lot of focus is on scale up, but the reality is small scale facilities could be required for personalised products for example.
- Trying to identify the financial stability of eg Gingko/Twist would be useful; how have they been so successful?

It was noted that science and engineering facilities have different priorities. Science's main criteria is publications, whereas engineering is possibly IP.

Action: Identify what is missing in facilities/support.

Summarising the discussion topics and needs from the minister included:

- Need to get across step changes we need to make and what he can do to help and where.
- ISCF – request the minister acts as an advocate. Short review on current intelligence on ISCF wave 3 proposals.
- Make the minister aware of the bioeconomy sector deal so he can support it and raise with other ministers.
- Strategy and ISCF will provide change for synbio.
- DARPA impact works so can we do something similar to help investment in UK businesses

Industrial Strategy Challenge Fund wave 3 proposal

The SBLC is intending to submit an expression of interest application to the wave 3 call for proposals. A draft was circulated ahead of the meeting and a discussion on the content was held.

Q1

- Challenge – need to show what we could lose.
- Decarbonisation roadmap focussed on energy but not really feedstocks. Whereas synbio starts from scratch. Carbon budgets/clean growth strategy tools and products.
- Ability to sustain vision of the roadmap.
Translation of world class science to increase productivity by 25%.
Key to achieve Bioeconomy growth.

Q2

- Invested \$300m. Got research centres/IKC.

- Productivity really important.
- Link to clean growth/five foundations.
- Predictability of development.
- Time and cost reduced.
- Possibly add data from foundries.
- Need examples. Include how automation/AI can be used. Drugs made more quickly. Talk to SBRCs for examples.

Q3

- High value jobs created across the UK supporting the bioeconomy
- SBRCs across the UK.
- Technology licensing.
- Design capability and links to advanced manufacturing.
- Make products we haven't yet thought of.
- Complex molecules can be made. Low energy, low carbon, decentralised manufacturing.
- Use analogy of microbreweries. Rethinking from scratch. Not just smaller brewery but a *smarter* brewery.
- Personalised medicine.
- Precision agriculture.

Q4

- Multi-disciplining community.
- We have used an experimental approach.
- Compare with US/China. US- in Silos. China- not ideas.

Q5

- Industry needs. Large companies/SMEs different. Establish what industry needs. Mention other sectors – aviation/automotive. Need industry backing.
- Can we link to MMIP advanced therapies/ complex molecules.
- Engineer classics to fit into existing infrastructure.
- Garner support from IBLF. Use Biochem 10 where synbio has the answer.
- Process focus -platform technology + few exemplar products.

Q6

- Industry needs it.
- DARPA validate for investors.
- Done a lot but need more.
- Increasing TRL levels.
- Funding adding something. Say why progress wouldn't happen without public funding. Evolution or revolution, Government intervention helps to de-risk.
- Possibly refer to Heilmeire Cataclysm, Heilmeire former DARPA. Provides a set of project questions.

Q7

- Show what has been achieved so far and what could be achieved with.
- Need to retain skilled people in research and IK centres.
- Needs to be DARPA scale and include facilities.
- Talk about advanced manufacturing.
- For 3 years.

(There maybe £700m for wave 3. 7-11 projects?).

8. Yes

Action: SBLC to send bullet points to Lionel by next day or so for Q5 in particular.

3/4 **DISCUSSION: Synthetic biology and the bioeconomy/ Policy issues and options**

The Minister joined the meeting at 11 am.

Lord Henley noted he going to visit Manchester University. Dick has been talking to the other centres regarding further visits.

Jo described the bioeconomy work that is underway, especially the strategy cleared by BEIS ministers and that it had gone to write round yesterday. The strategy is 'badged' as an industrial strategy product and BEIS is currently looking at for a launch/publication date. This is tied into No 10 rules and the pre-election period up to 12th April so it will be after then. A bioeconomy sector deal is running in parallel, which was submitted by Steve Bagshaw on 2nd March. Some strengthened case studies to the draft submitted in Oct/Nov had been added. Richard Harrington to meet Steve Bagshaw, the Chair of the 5 leadership council chairs involved in the bioeconomy strategy/sector deal in mid-April. A reminder of the role of the 5 chairs was made and where synbio sits in the bioeconomy as potentially disruptive and that the UK is technologically ahead of the game right now.

It was noted there may be some mention of plastics, with the current interest surrounding this area. The government's 25 yr environment plan includes plastics and innovation on plastics.

The Minister was made aware of the some of the bids being put into the industrial strategy challenge fund wave3 call for proposals, which included synbio, biomanufacturing, sustainable aviation fuel and a plastics one.

Lionel reviewed some of the key statistics for UK synbio that have shaped the landscape. For instance the human genome project resulting in cheaper DNA sequencing, noting miniaturisation being important to construct DNA. Where the UK sits globally and the funding space. McKinsey predict synthetic biology to be \$100bn industry in next 10 years. There is a real need to attract investment and to help start ups to emerge and nurture them to develop critical mass/clusters.

Lord Henley asked whether the pension fund investments named in budget help? The SBLC felt that pension funds could indeed help as it changes to how the money can be provided. Government can support with policy and public funding, but both need to be aligned for success. DARPA style funding is needed as it is flexible and gives investors confidence. DARPA was the "inspiration" for ISCF. Investors are risk averse in UK compared with US and stronger links with them are required. Large-scale capital for bio- plants is significant. The example of Gingko was used to illustrate how as a company they have leveraged their connections, but their valuation may not reflect their financial stability.

Critical mass is important, when companies fail staff move on. Also funding schemes such as the industrial biotechnology catalyst is important. The ISCF is an opportunity to keep the acceleration going and it is designed to help translation. We can use Synbio as a model of how to progress.

Regulations are also important and for Agrifood the regulatory framework is very important and takes time to develop. Gene editing has been with the European Court of Justice for the last 18 months. It was felt that the EU increases regulatory burden

in UK, not just for synbio but existing technologies such as pesticides. It is very slow and inhibits new technology development. Look at traits being developed not the technology when shaping new regulatory frameworks.

The Royal Society has just published a report on public attitude to GM. Genetic solution is cleaner than spraying chemicals. The governance sub-group is inputting into the Convention on Biological Diversity. As regulations can evolve with technology developments there maybe opportunities to shape it. Jason noted that regulations for new GM crop varieties are adequate.

Finally, we have the technologies developed and now must identify products, services, tools desired for the next 1-2 decades and harness current needs. For example plastic waste; the public understand it and synbio can help solve the plastics conundrum. We know we need alternatives. People don't understand the technologies, but don't need to. It is important to develop success stories that resonate.

Action: 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 (by next meeting)

Need to identify what is missing in the landscape to enable progress and commercialisation. Consider gaps in facilities/capabilities. KTN to co-ordinate and collate responses. (by end May)

URGENT request for input for an ISCF expression of interest, especially exemplars, industry examples, data. Draft to be circulated ASAP for comment. (by Easter if possible or 5th April)

KTN to gather and develop a 'database' of success stories (by end May)

5 Science and technology sub-group

Dick gave an update on the last meeting held on 6th March. As a reminder the composition of the sub group is the directors of the SBRCs/IKC and doctoral training centres.

- Working with Lord Henly to visit SBRCs, Manchester first and the others are keen also; all done in conjunction with Lionel and the SBLC.
- Investor Board launch is 25th April and will be chaired by David Willetts. SBLC to be invited.
- An invitation only SynBio Industrial Showcase will be held at Synbicite on 5th June. The SBLC will be invited.
- A biosecurity proposal was discussed to ensure it is co-ordinated with existing university structures – needs to be tied to risk and safety folk.
- Future Synbio strategy report has been produced and will be fed to SBLC. The document includes training canvases, business courses, funding info.

What is going on in their area?

BBSRC collecting info on research centres – could be used if permission given.

RRI. CoBiotech – trying to set a vision for strategic research agenda. Someone in BBSRC is leading on this, the work has been contracted to Edinburgh University. Report to be delivered in that in next month. The question of whether RRI is increasingly embedded or sitting on outside was mooted.

Rowan suggested that Sir Roland Jackson would be a good person to talk to in response to the question about 'how much have we moved on with respect to RRI?' This was from the perspective that he has been involved in various stages of the SBRC

assessment process within which RRI/ ELSA was an important criterion, but it does not need to be only about the SBRCs.

Action: Dick to forward invitation to industry showcase day at Synbicate on 5th June. Date for the diary for SBLC (by 12th April?)

Dick to circulate future synbio strategy report (by next meeting)

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 (by next meeting)

Rowan to Sir Roland Jackson on RRI aspect

6 Governance sub-group

Joyce Tait referred to the minutes of the GSG meeting on 26th Feb, and gave an overview of the discussions. The main agenda items at this meeting covered: a report from Lionel Clarke on the last SBLC meeting, an update on further developments from the BSI PAGIT Project (Proportionate and Adaptive Governance of Innovative Technologies), including regulatory adaptation needs and Responsible Research and Innovation (RRI).

Lionel Clarke referred to the progress that had been made on setting up a national biosecurity contact within the metropolitan police to create trust that we are managing this in an open and transparent way.

The PAGIT project was funded by BEIS and the British Standards Institution (BSI) with endorsement from SBLC as a contribution to delivery of the 2016 Strategy commitments. Joyce Tait brought the meeting up to date on further developments from this project. Based on the project reports, and through her membership of the Prime Minister's Council for Science and Technology (CST), an initiative is under way to implement some of the project recommendations on regulatory adaptation based on the innovation principle and the related regulatory principles of proportionality and adaptation. The expected outcome is a letter from the CST to the Prime Minister with relevant recommended actions. Suggested case studies to accompany the letter are: synbio/gene editing; CRISPR CAS 9 for medical applications; driverless vehicles; blockchain.

Action: SBLC to support Joyce with S&T council case study development/develop letter to prime minister (by next meeting)

The PAGIT Report on Responsible Governance of Innovative Technologies, discussed in detail by the GSG, focused on what companies need to do to demonstrate that they are behaving responsibly in their innovation processes, including development of a framework to support decision making, similar to the risk register that companies will already be familiar with. One option for implementation of the recommendations in this report would be to collaborate with the BSI in development of a standard (possibly a 'Publicly Available Specification' (PAS) for Responsible Innovation. In discussion it was noted that it will be important to understand the cost benefit relationship for companies in such a proposal, and also the risks of not achieving accreditation.

7 Skills

Plans to relocate the iGEM annual jamboree in UK and for the office to support the competition in London as been under discussion between the founders and UK representatives. RCUK (BBSRC and EPSRC) have done due diligence on the business case submitted by iGEM in January at the request of Sir Mark Walport. Independent peer review has been carried out using expertise from different sectors. A panel meeting was held on 16th March, which included some of the independent reviewers and senior members of RCs. Recommendations will be sent to Mark Walport at approx. end March.

EPSRC have launched their call for Doctoral Training Centres. These can be co-funded by other councils. There is one or two for synbio being submitted, including one from Imperial with a couple of partner university's.

Synbicate have organised business courses include more systematic courses with SBRCs, LEAN launchpad, 3 day MBAs etc. Developing infrastructure for university based courses including specialist courses.

QAA have just launched their new guidance on enterprise training. UK is of world standard. We need mentors/trainers. Gender balance is good except at senior level. Lionel raised the issue of younger people being encouraged to participate. The European student synbio society was suggested. Imperial and UCL both have synbio clubs. Engagement with 'garage biologists' was also suggested.

Action: Dana to investigate EuSynBioS, garage biologists etc with a view to inviting a rep to the open meeting. Discuss at next meeting.

8 Information sharing: reports on conferences, international links

Lionel is present at the next Industrial Biotechnology Leadership Forum meeting.

A possible workshop alongside the next meeting on 19th July was mooted, giving a 2 day meeting.

When considering a sub group to gain input from industry Look at stakeholder mapping; creating an expertise matrix/gap analysis. Consider how we can engage more SMEs; someone from fine chemicals area; AI.

Conferences include

- SBUK.
- Syn Bio Beta.

Would be good to have a synbio engineering conference, the RAE could host?

Action: Lionel to attend next IBLF meeting on 3rd May to look at collaborative opportunities and feedback at next meeting.

9 Review of actions from SBLC 18

1. Lionel to follow up with Phil.
2. Remove from action list. Lionel to speak to Gordon.
3. RSB to include in accreditation possibly. Defined part of degree scheme. Dick to follow up with IET.
4. Done.
5. On-going. Identify 2-3 for next meeting. Neil Parry. Deep Mind and Lab Genius.

6. Done.
7. ESPRC ok with BBSRC representing. Could be included in the future.
Rowan representing RCUK.
8. Done
9. Done
10. Done
11. Done

10 Any other business

Actions arising from SBLC 19

- 1 Lionel to send updated slide deck to Yvonne/Dana to send out (by end March)
- 2 Provide feedback on roadmap progress circulated by Lionel. Comment on whether we are on track and anything missing that we need to cover. Spreadsheet attached again for immediate reference. (by end April)
- 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 (by next meeting)
- 4 Need to identify what is missing in the landscape to enable progress and commercialisation. Consider gaps in facilities/capabilities. KTN to co-ordinate and collate responses. (by end May)
- 5 URGENT request for input for an ISCF expression of interest, especially exemplars, industry examples, data. Draft to be circulated ASAP for comment. (by Easter if possible or 5th April)
- 6 KTN to gather and develop a 'database' of success stories (by end May)
- 7 Dick to forward invitation to industry showcase day at Synbicite on 5th June. Date for the diary for SBLC (by 12th April?)
- 8 Dick to circulate future synbio strategy report (by next meeting)
- 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 (by next meeting)
- 10 Rowan suggested that Sir Roland Jackson would be a good person to talk to in response to the question about 'how much have we moved on with respect to RRI?' This was from the perspective that he has been involved in various stages of the SBRC assessment process within which RRI/ ELSA was an important criterion, but it does not need to be only about the SBRCs. Rowan to talk to Roland Jackson on RRI (by next meeting).
- 11 Lionel to attend next IBLF meeting on 3rd May to look at collaborative opportunities and feedback at next meeting
- 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. (by end May)

13 SBLC to support Joyce with S&T council case study development/develop letter to prime minister (by next meeting)

14 Joyce to seek feedback from SBLC industry members on RRI and standardisation initiative being developed with BSI if required

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 (by next meeting)

16 KTN to develop stakeholder mapping (expertise matrix/gap analysis and ideas of industry sub group activities with SBLC input (by end April)

17 All to agree to idea of 1.5 day meeting in July. Please respond yes or no to this email please by end April

Previous meeting actions

Dick to follow up with IET (18.3)

Lionel to follow up with Phil (18.1)