

Synthetic Biology Leadership Council
Draft actions of the meeting held on Thursday 14th March 2013
Ministerial Conference Room B, BIS,
1 Victoria Street, London, SW1H 0ET

In attendance:

Co-chairs: Prof. Lionel Clarke (LJC, Shell Global Solutions); Rt Hon David Willetts (DW, BIS)

Leadership Council: Prof. Janet Bainbridge (JB, UKTI); Carol Boyer-Spooner (CB-S, Chemistry Innovation Knowledge Transfer Network); Dr Amanda Collis (AC, RCUK); Dr Belinda Clarke (BC, Technology Strategy Board); Prof. Richard Kitney (RIK, Imperial College London); Sharmila Nebhrajani (SN, Association of Medical Research Charities); Dr Sarah O'Connor (SO, deputy for Prof. Dale Sanders, John Innes Centre); Prof. Joyce Tait (JTait, ESRC Innogen Institute, University of Edinburgh); Prof. Janet Thornton (JTh, European Bioinformatics Institute).

Observers: Mike Edbury (ME, GO Science); Shamimara Ahmed (SA, BIS)

Secretariat: Dr Aurélie Bovi (Biosciences Knowledge Transfer Network); Chris Warkup (Biosciences Knowledge Transfer Network).

Apologies: Dr Simon Dolan (SD, GlaxoSmithKline); Prof Dale Sanders (DS, John Innes Centre); Ron Egginton (RE, BIS)

1. Welcome and introductions

2. Review of Minutes from previous meeting and matters arising

Actions from the December 13th first SBLC meeting were reviewed and discussed. These are included again in Appendix 1 for reference.

- Action 1

An additional specific activity to establish and monitor / maintain a leading UK global position in Synthetic Biology was added in the draft Terms of Reference (ToR). The suggested modification was circulated to SBLC members prior to the meeting. The new ToR was ratified by SBLC members, and will be made publicly available on the [SynBio SIG](#) website.

- Action 2:

SBLC members were updated by BC on the results of the Technology Strategy Board (TSB) *Advancing the Industrial Application of Synthetic Biology* competition for feasibility funding, which were announced on March 7th by DW during a visit to Synthace Ltd, a small company based at the University College London (UCL), which is leading on one of the funded projects. Action 3:

Joyce Tait (JTait) gave a brief overview and a discussion followed. JTait agreed to provide a draft with the key points for a letter to the Minister – see action 1 arising

- Action 4

JTait provided a summary paper illustrating why the SBLC should give particular attention to governance and regulation of synthetic biology. In order to take forward discussions, a sub-group will be established and led by JTait, with support of interested SBLC members. The Leadership Council fully recognises that there is significant relevant expertise outside the SBLC, and agreed that such experts may be brought in to work alongside SBLC members within specific sub-groups as appropriate.

- Action 5

LJC, RIK and the secretariat have taken forward discussions with David Castle (University of Edinburgh, INNOGEN) regarding the development of a series of workshops on intellectual property (IP) and knowledge management strategy for synthetic biology innovation.

The proposition is to hold a series of three IP workshops throughout 2013. Firstly, a UK-specific workshop, which will take place no later than end of June, with objectives to develop a white paper outlining a UK intellectual property and knowledge management strategy for synthetic biology. The strategy paper is intended as a basis for a panel discussion session on synthetic biology IP as a contribution to the 'Six Academies' meeting on synthetic biology in July. Finally, a third Europe-wide workshop has been proposed to take place in the autumn.

The SBLC members were asked to give their view on who should be involved in the first UK-based workshop. LJC and RIK will gather these views and carry on working together with David Castle to further develop the workshop programme.

- Action 6:

LJC has spoken to people within the Department for Business, Innovation and Skills (BIS) and ScienceWise on the subject of public dialogue. The SBLC members agreed on the importance of engaging effectively with the public. Discussions ensued about the most effective way to progress. Examples were given on how the Industrial Biosciences Leadership Forum (IBLF) engages with the public. Further discussions took place under agenda item 10.

- Concerning public engagement, the Leadership Council agreed that it would also be helpful to learn from the experience of communication to the public from the Association of Medical Research Charities (AMRC).
- It would be useful to summarise what synthetic biology is in terms that may be more easily understood by a broader audience than the expert scientific community alone.

- Action 7:

The SBLC will work with RCUK via AC [Paul Gemmill will address this whilst AC is on assignment]; to assist in the development of the multidisciplinary research centres to be funded from the new BIS capital funding, to maintain alignment with the UK Roadmap. More details were given under agenda item 3 of this meeting.

- Action 8:

BC reported the outcomes from the Emerging Technologies and Industries (ETI) meeting on discussions relating to public engagement and communication. Action 9:

BC looked at areas of excellence and potential leadership activities within the UK based on the emerging technology assessment methodology used at the Institute for Manufacturing and this was reported under agenda item 6 of this meeting.

- Action 10:

Agenda item 6 has been included for discussion around Synthetic Biology commercialisation, relevant activities from the IBLF and industrial translation models.

- SBLC members felt it would be useful to gather more information from people trying to translate the science towards commercialisation to better understand the hurdles at a working level, building on the material already gathered during the Roadmap study. It was also agreed that it would be timely to review data gathered during the roadmap workshops alongside new data being generated.
- The Leadership Council stated the need for joined-up thinking on how the proposed capital investment will be spent, in order to ensure the right incentives are in place and the appropriate sectors targeted to ensure short and long terms success.

- Action 11:

AC provided an update on progress with the Doctoral Training Centres. The call is currently for expression of interest and the deadline is the 4th April; short-listed applications invited to submit a full proposal will have a deadline of 18 July.

3. Business Case

AC presented the Research Councils UK 'Strategic Business Case for Synthetic Biology', which was developed and agreed by BBSRC, EPSRC, MRC, ESRC and submitted to BIS in February 2013.

A RCUK SynBio working group has been established, led by BBSRC. The group has engaged in discussion with BIS and TSB.

The launch of the phase one of the call for the six multidisciplinary research centres should be in June 2013

4. Standards

RIK reported that there is a considerable amount of on-going work in relation to developing standards for synthetic biology. This work is concentrating on two standards which are compatible and synergetic. The first is a development of DICOM, the international standard for biomedicine that is widely used by industry. The new Part of DICOM which is being developed is called DICOM-SB. The second standard, SBOL (synthetic biology open language), relates to the unambiguous description and transmission of DNA. The British Standards Institution (BSI) is engaged in this activity.

5. Minister's comments

DW asked about the timeframe for delivery of results following the current investment programme. It was noted that the roadmap illustrates a wide range of potential applications covering a wide range of likely timescales to market. Some applications such as biosensors

may be brought sooner to market than others, but an essential aspect of this sector is the commitment to the long-term vision which will encourage investment and growth over the longer-term.

DW suggested it may be a good idea to bring the next meeting forward one day and hold it on 17th July instead of 18th July, as previously planned, in order to enable us to invite representative international visitors who are attending the SB6.0 event in London to join the SBLC for a session addressing International developments.

6. Synthetic Biology Commercialisation – activities and actions required

A sub-group composed of LJC, JB and SD initiated discussions around commercialisation and industrial translation models as preparation for this meeting.

LJC reminded SBLC members that the main focus of the day's agenda item was to hold an in-depth discussion of commercialisation mechanisms, with the aim of facilitating progress towards commercialisation of applications derived from Synthetic Biology: specifically to ensure the UK is well placed to derive benefits as and when opportunities arise. This requires (1) identifying and putting in place suitable supporting infrastructures; (2) anticipating and addressing potential blockers to progress. This in turn requires taking a holistic, longer-term perspective, as outlined in the ToR.

Some important factors identified by the commercialisation sub-group include:

- Minimising avoidable blockers whilst recognising valid constraints;
- Fiscal and support incentives
- Demonstrators and Case-studies.
- Alignments with other Government initiatives to help developing a synthetic biology industry, e.g. working with UKTI/BIS, learning from experience of the IBLF.

CB-S provided a summary of relevant activities from the Industrial Biotechnology Leadership Forum (IBLF).

- The IBLF was set up by the Technology Strategy Board to operate across its networks to implement the recommendations of the 2009 Industrial Biotechnology Innovation and Growth Team (IB IGT).

Over the past three years, the IBLF focused on raising the awareness of chemical manufacturers about the biological mechanisms available for their processes; Hundreds of companies were visited and gained help raising their profile, with help of funding available through the TSB such as the 'Sustainable High Value Chemicals Manufacture through Industrial Biotechnology' call.

IBLF recently held the UK's largest showcase of industrial biotechnology in London. Notes will be made available to SBLC members. More information and presentation are available from the Industrial Biotechnology Special Interest Group (IB SIG) website:

<https://connect.innovateuk.org/web/industrial-biotechnology/articles/-/blogs/10712459>

The IBLF and the IB SIG, which provides secretariat for the IBLF, have secured funding for two more years and will carry on engaging with more companies and help

to UK reach the objective of becoming one of the top three leaders in industrialising Biotechnology.

- The IBLF commissioned a report from Forum for the Future, 'Sustainable returns: Industrial Biotechnology done well', published in 2013. This report details the opportunities available for new bio-based energy sources, transport fuels, or chemicals in the UK. One of the key findings of the report is that by 2015, the global market for technologies across industry, agriculture, forestry, healthcare, and manufacturing could be anywhere between £150bn and £360bn, and that given the UK's strong record in science and innovation and Europe's leading position in development of biotechnology and feedstocks, its share could encompass £4bn to £12bn of this. A PDF of the report is available following this link:
<http://www.csrinternational.org/sustainable-returns-Industrial-biotechnology>
- IBLF looked into a website made for nanotechnology called 'Nano and me' as a possible way to engage the public on Industrial Biotechnology:
<http://www.nanoandme.org/home/>
- IBLF has set up a sub-group to look at what technology gaps might exist between the different sectors in which IB is involved, and to identify which ones are IB specific. They will focus on the market sectors in phase two.
- Investments for the Government are continuing to support IB activities.
 - The TSB will carry on investing ~£2.5M per year on collaborative R&D calls, alongside market investments.
 - BIS has invested in several Industrial Biotechnology facilities, such as CPI, which, in 2011, was named as the process element of the Government's High Value Manufacturing Catapult centre.

LJC presented some material to stimulate discussion on commercialisation issues. In summary, the roadmap and associated discussions provide an effective strategic framework to start from, and it is now time to focus on driving forward the actions needed to achieve the overall goal of maximising the impact of UK investment and the developing a competitive industry sector in synthetic biology.

LJC used the outcomes from the 2012 Roadmap workshops as a basis for categorizing distinct potential application areas.

Subsequent discussion identified the following factors:

- Nurturing companies entails more than seed funding alone.
- Available mechanisms should be used, such as the SBRI and government procurement, but greater awareness and understanding of such options may be needed.
- The approach needs to remain sufficiently flexible that it will not exclude / prevent breakthrough markets which were not originally foreseen. Platform technologies, which will provide services through contracts worldwide, and commercialisation of applications of such technology should both be part of the portfolio, but the issues faced will be different.

- An external study could help prioritise efforts and drive this agenda by looking into the data already available through the roadmap workshops and other literature. In the meantime, the SBLC will start pulling the information from the workshops for the Roadmap and will focus on developing proposals to progress the remaining 'top 4' bullet points on commercialisation, leading to an action plan with timelines to report back to the next meeting.

7. Mapping the UK Synthetic Biology community

AC and BC provided a joint presentation from RCUK and TSB to update on the mapping of the UK synthetic biology community to date.

BC stressed that the main hurdle with this mapping is the fact that some companies are doing underlying work involving synthetic biology but do not declare themselves as synthetic biology companies, so may not be counted.

8. Update on Feasibility Studies competition

BC informed the SBLC members on the outcome of the *Advancing the Industrial Application of Synthetic Biology* TSB competition for feasibility funding, which aimed at allowing businesses to demonstrate the feasibility of applying synthetic biology to commercial challenges. Projects proposed for funding demonstrated true synthetic biology, and covered the areas of chemicals, healthcare, platforms and energy/fuels. The successful consortia were announced by Rt Hon David Willetts, MP on March 7th 2013.

BC reminded the Leadership Council that the synthetic biology national roadmap calls for “responsible acceleration” of technologies to market. Therefore, the TSB has for the first time implemented a ‘Responsible Innovation Framework’ (RIF) to the feasibility competition, requiring appraisals of potential social, ethical, legal, regulatory and environmental issues of each proposal. All submitted projects were assessed by an external RIF panel. There will also be an on-going RIF mentoring of all funded projects, and cohort building activities are being planned with RCs.

9. Regulatory Issues

JTait outlined the main issues linked with Governance and Regulations, and why the SBLC should give them particular attention. She emphasised that the SBLC is in an excellent position to initiate discussion on these issues and to consider how a new consensus can be built, and stressed the importance of international aspects of governance at EU and UN levels. Consideration of how the UK can best influence decision making at these levels will be important.

JTait agreed to lead a sub-group working on the regulatory and governance issues. JB and CW volunteered to be part of the sub-group, and SBLC members proposed that Ron Egginton should be invited to be part of the sub-group too. The sub-group will need to define its remit and will review what has been/is being done and will present the results at the July meeting.

10. Public and stakeholder dialogue and engagement

The discussion on public engagement and dialogue had been initiated earlier in the meeting under agenda item 2, in reviewing action 6 from SBLC meeting 1. The SBLC agreed it would be beneficial and timely to re-engage with the external community. LJC will form a sub-group to look at the next level of engagement after initial discussions. JTait volunteered to draft a paper about engagement to initiate the activity.

The Leadership council agreed that an impartial external body should be involved in delivering the paper on future public engagement and dialogue on synthetic biology, and suggested ScienceWise could be such a body. AC will liaise with Patrick Middleton from BBSRC Public Engagement group for his involvement with the sub-group.

11. Developing a format for SBLC open meeting

The SBLC discussed the format for a SBLC open meeting before the end of the year. Several examples of public meeting formats were given.

Because of the International focus given to the July meeting, the SBLC agreed the October meeting should be the open meeting. LJC and the Secretariat will propose a format at the next meeting.

Conclusions and summary of actions

Summary of actions SBLC meeting 2, 14th March 2013

Please find below the actions resulting from the SBLC meeting 2, held on 14th March 2013. When several members have been named for an action, the name of the owner of this action has been underlined.

Action No.	Activity description	<u>Owner</u>
1	<ul style="list-style-type: none"> Joyce Tait to draft key points for a letter from David Willetts to Owen Paterson regarding the regulation of synthetic biology and the CBD. 	<u>J Tait</u>
2	<ul style="list-style-type: none"> Secretariat to give the go ahead to David Castle to organise the IP workshop Richard Kitney and Lionel Clarke to liaise with David Castle on the invitation list for the IP workshop to take place in May or June 2013; To circulate this list to SBLC for suggestions 	<u>Secretariat</u> ; <u>RK and LJC</u> ; All
3	<ul style="list-style-type: none"> A subgroup of the SBLC to work with RCUK and assist in the development of the multidisciplinary research centres to be funded from the new BIS capital funding 	<u>AC</u> , RK, SD, SO (or DS)
4	<p>At Minister's request:</p> <ul style="list-style-type: none"> Richard Kitney will brief the Minister on Standards; Joyce Tait will brief the Minister on CBD and Cartagena Protocol. 	RK JTait
5	<ul style="list-style-type: none"> Richard Kitney to circulate slides on standards to SBLC members 	RK
6	<ul style="list-style-type: none"> Carol Boyer-Spooner to provide notes about the IBLF event - IB: a UK showcase, which took place in January 2013 	CB-S
7	<ul style="list-style-type: none"> Belinda Clarke to explore opportunities for government procurement of products of synthetic biology for the July SBLC meeting 	BC
8	<ul style="list-style-type: none"> Carol Boyer-Spooner to produce a summary on what can be learnt from the IBLF activity on finance and Venture Capital for the July SBLC meeting 	CB-S
9	<ul style="list-style-type: none"> LJC and the Secretariat to ensure all the outputs from the roadmap activities are accessible to SBLC members, e.g. via dropbox or equivalent cloud folder. 	<u>LJC</u> and Secretariat
10	<ul style="list-style-type: none"> Identify an external independent body to help prioritise the Commercialisation efforts and drive this agenda; Consider accelerating the pace of commercialisation via the concept of 'Ice breakers', drawing upon the outputs of the UK Roadmap Workshops and other sources; Identify value chains, address potential blockers and enablers. 	LJC, JB, SD <u>LJC</u> , BC and Secretariat
11	<ul style="list-style-type: none"> Develop proposals to progress the remaining 'top 4' bullet points on commercialisation, leading to an action plan with timelines to report back to the next meeting 	<u>Commercialisation sub-group (JB, SD, LJC)</u> ; BC and Secretariat
12	<ul style="list-style-type: none"> Belinda Clarke to present her 'final' mapping of the UK Synthetic Biology community and repeatable methodology (at the July or Oct meeting?) 	BC
13	<ul style="list-style-type: none"> Joyce Tait to lead a sub-group, including Janet Bainbridge, Chris Warkup, and Ron Egginton, to look at regulatory and governance issues and linking this activity to ESBAC work on this topic. <ol style="list-style-type: none"> Sub-group to define its remit; Review what is being/has been done on regulatory issues Other volunteers to contact Joyce Tait 	<u>JTait</u> ; JB; CW; RE All

14	<ul style="list-style-type: none"> • LJC to liaise with Science Wise to ask if they would agree to be the impartial external body delivering the paper on future public engagement and communication on synthetic biology; <p>Initiate planning of future stakeholder dialogue and engagement:</p> <ul style="list-style-type: none"> • Joyce Tait to send a draft paper about stakeholder engagement; • Amanda Collis to liaise with BBSRC Public Engagement (Patrick Middleton) for their involvement; • Richard Kitney will speak to Prof. Nikolas Rose at Kings' College for his involvement; 	<p>LJC</p> <p><u>Stakeholder Engagement subgp</u></p> <p>JTait</p> <p>AC</p> <p>RK</p>
15	<ul style="list-style-type: none"> • LJC to invite a few representative international visitors who are attending the SB6.0 Academies event in London (e.g. Drew Endy) to the July meeting for a session addressing International Engagement 	LJC
16	<ul style="list-style-type: none"> • LJC and Shamimara Ahmed to investigate possible move of July SBLC meeting from 18 to 17 July 	<u>LJC</u> ; SA; Secretariat
17	<ul style="list-style-type: none"> • Lionel Clarke and Secretariat to propose a format for the open meeting in October at the July meeting 	LJC and Secretariat

Appendix 1

Summary of actions SBLC meeting 1, 13th December 2012

Action No.	Activity description	Person
1	Secretariat to work with Richard Kitney and Belinda Clarke to include an additional specific activity in TOR to establish and monitor / maintain a leading UK global position in Synthetic Biology and circulate to Leadership Council members for approval.	SBLC secretariat, Richard Kitney, Belinda Clarke
2	Belinda Clarke to update Leadership Council members on project applications to the current Feasibility Studies competition and to work with Amanda Collis to provide a breakdown of the Universities and research institutes that have been awarded significant funding through the RC investment in Synthetic Biology.	Belinda Clarke, Amanda Collis
3	Joyce Tait to summarise current position in relation to the Cartagena Protocol on Biosafety and circulate to Leadership Council members. <i>Ron Egginton to take forward discussions with relevant contacts at Defra.</i>	Joyce Tait, Ron Egginton
4	Leadership Council members to establish a regulatory sub-group and take forward discussions ahead of the next Council meeting in March. Joyce Tait to lead on these activities, with support of interested Council members.	Joyce Tait, supported by interested Leadership Council members
5	Lionel Clarke to take forward further discussions with David Castle and Dick Kitney about potential to include IP session at the next 6 academies meeting at Imperial College.	Lionel Clarke, Dick Kitney
6	Secretariat to work with Lionel Clarke and contact Joanne Hodges at the BIS Science Media Centre to introduce the Leadership Council and to indicate that public engagement has been identified as an important area for future UK Synthetic Biology activities. Leadership Council is kept informed (via Lionel Clarke) of future social engagement activities by the Science Media Centre relevant to Synthetic Biology.	Secretariat, Lionel Clarke
7	Establish a sub-group to provide effective dialogue between the Leadership Council and the Research Councils on the multidisciplinary research centres strategy being led by BBSRC. Council members expressing interest included Amanda Collis; Dick Kitney; Simon Dolan; Sarah O'Connor.	Amanda Collis; Dick Kitney; Simon Dolan; Sarah O'Connor
8	Belinda Clarke to report back outcomes from the Emerging Technologies and Industries meeting on discussions relating to public engagement and communication at the next Leadership Council meeting.	Belinda Clarke
9	To look at areas of excellence and potential leadership activities within the UK based on the emerging technology assessment methodology used at the Institute for Manufacturing and report back to the Council at the next meeting	Belinda Clarke
10	To include an agenda item to discuss Synthetic Biology commercialisation, relevant activities from the IBLF and industrial translation models at the next Leadership Council meeting.	Secretariat
11	Amanda Collis to provide an update on progress with Doctoral training Centres at the next meeting.	Amanda Collis