

Workshop Report

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Workshop Report

The purpose of this report is to capture the key details and outcomes of the workshop held in Bristol in April 2024 for the *Synthetic Plants* programme.

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SECTION 1: Workshop Overview

Date	23 - 24 April 2024
Location	Engineers House <i>The Promenade, Clifton Down, Clifton, Avon, Bristol, BS8 3NB</i>
Goal	Test emerging programme hypothesis Help develop the structure of the programme Connect and nucleate people and communities
Materials	<u>Workshop pre-reads:</u> Prior to the workshop, an early version of the programme thesis was shared with attendees. <u>Breakout sessions</u> During the workshop, there were three breakout sessions where the main cohort was split off into breakout groups to discuss specific topics. You can find the briefing for these sessions, the prompts given to attendees, and what they reported back with here .

Background

Plants represent 450 gigatons of global carbon; over 80% of the Earth's biomass is made up of plants; they are scalable and adaptable; they provide food, fuel, fibre, pharmaceuticals, and more. We need to explore mechanisms to harness the potential plants provide to secure our future on Earth and create a sustainable and thriving biosphere.

Workshop Design

The workshop was designed to first provide an overview of ARIA, an overview of Angie's discovery process thus far, insight into the current state-of-the-art in the field, followed by three breakout sessions targeted around the above three goals.

There were three main goals of workshop:

- Test the emerging programme hypothesis,

- Help design the Synthetic Plants programme, and
- Connect and nucleate people and communities.

Key Discussion Points

The first breakout session was focused around understanding the gap and what the bridge is between where we are and where we want to be in the future, with regards to creating programmable plants. Angie had a few ideas of what could be needed to bridge the gap, such as the creation of synthetic chloroplast and/or synthetic chromosomes, but wanted input from the attendees to think of other potential pathways, alongside opportunities and challenges of these pathways. The breakout groups had to consider the following questions and present it back to the main group afterwards:

- What is the most important pathway (between where we are and where we want to be) and why?
- Should there be other pathways to consider?
- What are the major opportunities for each pathway?
- What are the major challenges for each pathway?

For the next breakout session, each of these pathways were then further broken down into two breakout topics attendees could engage with:

1. What are the key phases for each of these routes?
 - *Eg. Design, build, deliver, and maintain*
2. What is needed in order to help drive the success of the above phases?

The attendees chose which topic they wanted to develop in their breakout group and split off to discuss these.

For the first topic, attendees reported back on the below questions:

- State what the phases should be and why
- State the major opportunities (goals, milestones) for the phases
- State the major challenges (risks, bottlenecks) for the phases
- State the interdependencies between the phases
- What was the most challenging or controversial part of the discussion?

For the second topic, attendees reported back on the below questions:

- State what is needed and why
- State the major opportunities (goals, milestones) for these
- State the major challenges (risks, bottlenecks) for these
- State the interdependencies between the phases and what you've identified as elements needed for the success of the phases
- What was the most challenging or controversial part of the discussion?

For the final breakout session, participants were able to choose joining a breakout group to discuss topics around building a programme (eg. programme design, success and hurdles) or to join an unconference group. At the end of the first day, participants wrote down potential breakout group topics to discuss and Angie picked the top eight ideas. The most popular topic was voted for during the second day of the workshop and selected for the unconference group topics. There were two unconference groups for the final breakout session where the groups discussed engineering chromosomes and plastomes in parallel alongside tools needed for genome synthesis.

The groups had to address the following questions.

Programme design:

- What budget is required for this programme?
- What initial proof-of-concept experiments should we plan for the first year of this programme?
- What are the 'kill criteria' we would use to stop funding aspects of this programme?
- What are the key metrics of success for this programme?

Success and hurdles:

- Is this programme unlikely to happen without ARIA's intervention? What makes this programme differentiated?
- Would success in this programme change the conversation globally on what's possible/valuable? How?

- How will the scientific/technical breakthroughs from this programme translate into commercial and social impact?
- If the programme successfully meets the stated technical objectives, what's next?
- What bottlenecks/challenges/barriers to success will this programme face?
- What solutions do you see to those bottlenecks?
- What do you see as the safety, security and ethical risks for this programme?
- It's 2030 and the programme has failed. Why?
- What was the most challenging or controversial part of the discussion?

Tools:

- List of priority tools (highlight top 3)
- What budget is required?
- What initial proof-of-concept experiments would you do?
- What are the key metrics of success for this programme? How do you know if a tool is making progress? What are the 'kill criteria' we would use to stop funding aspects of this programme?
- What bottlenecks/challenges/barriers to success will this programme face? How would you solve them?
- What was the most challenging or controversial part of the discussion?

Engineering chromosomes and plastomes in parallel:

- What budget is required?
- What initial proof-of-concept experiments would you do?
- What are the key metrics of success for this programme? How do you know if a tool is making progress? What are the 'kill criteria' we would use to stop funding aspects of this programme?
- What bottlenecks/challenges/barriers to success will this programme face? How would you solve them?
- What was the most challenging or controversial part of the discussion?

Outcomes

The workshop had three main goals. The first was to test the emerging programme hypothesis, the second was to help develop the structure of the programme, and the third was to connect and nucleate people and communities.

Following the workshop, chromosomes and chloroplasts became a focus area for the programme and other synthetic elements, such as mitochondria, were deprioritised. Furthermore, following feedback around the main bottlenecks that could be faced in the programme, the programme has now been designed with two distinct phases as a mechanism to allow for learnings from the programme to be implemented and adjustments made.

Following the workshop, Angie focused on updating and building out her programme thesis, [Synthetic Plants for a Sustainable Future](#), ahead of a programme launch.

SECTION 2: Agenda

Day 1 Agenda | Tuesday 23 April 2024

Time (BST)	Agenda Item
10:00 - 10:30	Arrivals and light breakfast
10:30 - 11:30	Introduction to ARIA
11:30 - 12:30	Attendee introductions
12:30 - 13:30	Lunch
13:30 - 14:30	Invited presentations
14:30 - 15:15	Walk & networking <i>or</i> coffee & networking
15:15 - 17:30	Breakout session 1
17:30 - 19:30	<i>Optional dinner</i>

Day 2 Agenda | Wednesday 24 April 2024

Time (BST)	Agenda Item
08:30 - 09:00	Arrivals and light breakfast
09:00 - 11:30	Breakout session 2
11:30 - 12:00	Walk & networking <i>or</i> coffee & networking
12:00 - 13:00	Lunch
13:00 - 15:15	Breakout session 3
15:15 - 15:45	Coffee break
15:45 - 16:30	Looking ahead