Universal Fabricators

Call for proposals

Date: 02 April 2026

V2.0

Summary

Thank you for your interest in applying to this programme. This solicitation is derived from the published programme thesis *Universal Fabricators*, which sits in the ARIA Opportunity Space *Manufacturing Abundance*. **We strongly recommend reading both of these documents before proceeding.**

What we are looking for	Interdisciplinary teams of scientists and engineers to develop manufacturing platforms that use engineered proteins and reactor fields/flows to program the assembly of state-of-art inorganic and composite materials that currently cannot be mass manufactured. Teams will apply to solve one of 3 engineering challenges that we believe would unlock platform technologies: TA1.1. Fibre biomineralisation TA1.2. Isoporous, defect-free metal-protein frameworks TA1.3. Monodisperse nanocrystal templating in anisotropic composites We are looking to fund people who are highly iterative, not fixated on any specific functional application/material and are excited to become 'universal fabricators'!
Project duration	Up to 3 years
Teams & grant sizes	~£34m split across up to 9 teams
10-page full proposal submission deadline	**5 May 2026 (14:00 BST)**

As you read through the document, if you have any questions, please use the chat function on the funding call page for the quickest response. It can guide you to the right information or connect you with the ARIA team if needed.

Before asking for clarification on if your proposal is in scope, we ask that you please read *Section 3* (pages 8-9) for explicitly listed research areas that are not in scope.

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SECTION 1: Programme Thesis Overview

Today most protein engineers only design drugs and enzymes. If this programme is successful they will design next-gen materials across electronics, energy, infrastructure and more → proteins will become "universal fabricators". Despite advances in inorganic material synthesis, many desired electromagnetic, thermal, optical, and mechanical properties remain inaccessible. Manufacturing with molecular precision is crucial for state-of-art material performance, and proteins represent a uniquely powerful toolkit to achieve this. Yet despite recent breakthroughs in protein engineering (*e.g., Alphafold*, de novo design, directed evolution, non-canonicals, cell-free synthesis) subsequent investment and applications have primarily been in pharmaceuticals and biocatalysis, leaving the potential of proteins in materials assembly severely underexplored.

We believe these are a fraction of the socioeconomic potential of proteins. By leveraging their programmable assembly, non-equilibrium dynamics, and ability to produce deterministic outputs in ambient, stochastic environments, proteins can become the backbone for materials manufacturing across a broad range of existing applications and future functionalities. However, to unlock this future a key bottleneck must be solved – hierarchical assembly: we can't yet program proteins to organize into large, multi-functional structures or template inorganic mineralization.

Hierarchical assembly is the next frontier of protein engineering, a challenge only recently accessible because AI has effectively "solved" the 'Protein Folding Problem'.[1] Assembly is an underdefined and underfunded gap between academic biology and industrial manufacturing, as it sits outside of the Overton window of both communities.[2] Transforming the Folding Problem success into a solution for the 'Protein Assembly Problem': going from a single folded protein to organizing trillions into a macroscopic material with valuable function, is necessary to unlock the mass-market demand required to collapse protein production costs. Tackling assembly will require galvanising a new coalition of biologists, materials scientists, and systems engineers to go beyond today's perceived limits of protein engineering (*e.g.,* solutions, gels, films, fibres). Success would attract potential customers spanning almost every industry that suffers from material performance currently capped by one or more of 4 manufacturing bottlenecks: stochasticity, scale, security, and/or sustainability.

[1] Solving the first major protein challenge, protein crystal structure characterisation (1958), unlocked the Protein Folding Problem, which was defined in the 1960s and the static structure prediction component was considered 'solved' in 2020. Dynamic, contextual assembly remains an open field of research.

[2] The Overton window (window of discourse) is the range of subjects and arguments acceptable to a mainstream population at a given time.

SECTION 2: Programme Objectives

Programme Goal: develop scalable processes that use proteins to program the assembly of materials with structures that currently cannot be mass manufactured. Our programme goal can be broken down into 3 high-level programme objectives (PO):

- **PO1.** **Solve the "Protein Assembly Problem"**: build a programmable instruction set for proteins to organise themselves into large, multi-functional structures.
- **PO2.** **Make state-of-art inorganic materials:** at least one highly-valuable use case where protein-programmed manufacturing produces a functional material that clearly supersedes the currently manufacturable state-of-art.
- **PO3.** **Make protein-programmed manufacturing scalable (TRL4-5, MRL4):** sufficiently derisk the resilience and volume required to transition protein-based manufacturing to industrial-scale production.

Our programme will shift the paradigm from proteins as consumable drugs and catalysts to proteins as non-living architectural fabricators that assemble civilizational infrastructure *i.e., 'universal fabricators'*. We will use proteins as sacrificial or structural templates for non-living, solid-state manufacturing (*e.g.,* fibres, membranes, magnets etc.). Success will shift demand from kilograms to kilotons, volume that would necessitate and justify the deployment of agricultural-scale biomanufacturing infrastructure. The 'Assembly Problem' is the gateway; without the ability to make macroscopic assemblies proteins remain confined to the "molecules" market rather than the "materials" market.

On a more technical level, our progress towards these high-level programme objectives can be measured by quantitative metrics such as described in **Table 1**. We aim to derive/aggregate these general metrics from data measured by each creator project we fund. With the help of the broader community, we will continue to develop their reliability and interpretability over the course of the programme.

Our programme will be split into 2 phases.

This solicitation is for Phase 1, which will run for 3 years, and will be mostly focused on achieving PO1 & PO2.

If Phase 1 is successful, concluding with teams having successfully developed protein-programmed platform manufacturing technologies, and demonstrating strong progress towards an outlined industrial application (see *Sections 3 & 4*), a second solicitation will be launched to extend the programme for a further 2 years. In Phase 2 there will be a heavy emphasis on PO3 in parallel with continued development of PO1 & PO2. Teams would more deeply partner with industry, to further develop application-specific functionality and robustness of a particular material, as well as to jointly start work towards a scalable and cost-competitive assembly process.

Table 1: Preliminary high-level programme metrics. For proteins to demonstrate value as general purpose fabricators, we need to achieve the Minimum targets. Stretch targets are aspirational and likely require subsequent investment.

PO	Metrics	Minimum	Stretch
1. PROTEIN	**1.1. Hierarchical Scale Ratio:** between the smallest controlled feature and largest structural dimension (*e.g.*, 10 nm precision in a 1 cm structure).	10^6	10^8
	1.2. Structural fidelity: defect-free rate in incorporating proteins correctly into the final macroscopic structure.[3]	*TBD*	*TBD*
	1.3. Predictive Accuracy: between physical geometry and simulated prediction.	±25%	±10%
2. INORGANIC	**2.1. Interfacial precision:** feature roughness at the organic-inorganic boundary.	<10 nm	<1 nm
	2.2. Phase & feature uniformity: variation in the primary functional feature (*e.g.*, crystal grain size or diameter)	<5%	<1%
	2.3. Programmable tunability (span): range that material properties (*e.g.*, magnetic coercivity, optical attenuation) can be tuned by altering protein sequence.	2x	10x
3. PROCESS	**3.1. Input tolerance**: purity of protein and inorganic precursors required to achieve target functional specifications.	*Not required*	<90%
	3.2 Throughput: total solid-state material or continuous 1D material produced per month	>1g or >10m	>1kg or >10km
	3.3 Reproducibility: process reproducibility rate across 10 independent runs.	>70%	>90%

[3] We know this is important to characterise and measure, we are not sure yet how best to do so.

SECTION 3: What are we looking for/what are we not looking for

What we are looking for in this solicitation

Technical Area 1 (TA1): Protein-programmed materials manufacturing platforms
We are looking for teams (Creators) that will submit proposals to develop processes that target one of three platform technology engineering challenges (**Table 2 & Fig. 1**), each making progress towards our programme objectives. Our challenges and their use cases were designed to give clear targets to solicit project proposals, and will continue to be developed in parallel with funded research progress. This will be done in collaboration between the ARIA programme team, ARIA funded Creators, and industry advisors. More details on why these challenges were selected can be found in our programme thesis.

Table 2: Portfolio of platform technology programme targets

Protein Engineering Challenges	Example Application
Fibre biomineralisation (1D)	Hollow-core optical fibres
Isoporous, defect-free metal-protein frameworks (2D)	Ultra-high purity lithium hydroxide extraction membranes
Monodisperse nanocrystal templating in anisotropic composites (3D)	Rare-earth free magnets

We're looking for Creators that are highly iterative and adaptable. This programme is designed to expand the Overton window in this domain: to move from biology into first-principles manufacturing. It is difficult to pre-empt specific project challenges and application pathways as teams progress. As such, adaptability of application and metric specificities are deliberate, core programme features. Accordingly, adaptability is a key trait we are looking for in the people funded by this programme. We are looking for scientists and engineers who are excited to become universal fabricators! Teams must be willing to adapt/pivot rather than fixate on a specific application. Specific application specialists (*e.g.*, optical fibre physicist/engineer) can be onboarded later in the programme.

We anticipate funding a variety of Creator team structures. Programme success will require both deep expert knowledge and systematic integration of know-how from a number of fields that could span: material science, condensed and solid state physics, biology and bioinformatics, chemistry, process engineering, computer science, and more. Because of this we expect teams to be deeply cross-functional across these fields, likely via collaboration (or new hiring). This means startups, frontier research organisations and contractors, academic research groups & new spinouts, independent individuals, and integrated teams of the above.

Processes that assist protein-programmed assembly with field/flow induced alignment mechanisms and downstream post-processing. We are interested in combining the intrinsic sequence-to-assembly programmability of proteins with reactor hardware to provide the dynamic phase-change trigger for assembly and the selective pressures for fidelity ("error correction"). We are interested in flows and fields including but not limited to acoustic, optic, electric, and magnetic. Downstream processes might, but not necessarily, include cross-linking, calcination, sintering, annealing and pressing.

Processes with first-principles scalability. We will not turn academics into industrial engineers, but do expect processes that have no clear barriers to scalability. For example processes should not require large quantities of rare elements, have well thought through mass/heat transfer considerations, and have realistic prospects for future input cost reductions and speed/throughput optimisations.

In-house metrology. creators will have to routinely characterise both protein and inorganic building blocks, their dynamic assembly processes and the resulting complex, multi-scale structures they form. We expect a 2-tiered characterisation approach. In this call we are looking for the first tier – rapid & iterative with standard equipment & automated proxy measurements.

What we are not looking for for in this solicitation

+ **Metrology benchmarking partners.** The second tier is external high-resolution and bespoke application benchmarking. Once the key structural and functional assays become clear for each platform technology and application, we plan to work with advanced (industrial and/or academic) metrology teams to ensure that decisions about development directions are made based on as high quality and complete data as possible. *A separate open call for this will follow at the earliest in Q4 2026.*
+ **Software development / Modelling are toolsets, not a primary objective**. Modelling is an intrinsic aspect of understanding and improving manufacturing processes. As such, we expect that successful teams will heavily leverage in silico modeling/simulation. However, development of such models should be limited to their usefulness towards the end goal, not their comprehensiveness. During Phase 1 we expect to fund smaller shared and open ecosystem service technologies, including for software tools aimed at protein assembly and standardised data ontologies. We expect that a key enabler towards protein-based materials manufacturing will be to incorporate characterised data into hybrid mechanistic- and data-driven AI/ML models that can accurately predict how the engineered proteins will fold, assemble and function under different process conditions and how the resulting templated structures will translate to macroscopic properties. *A separate open call for this may follow, once our core teams and their shared needs have been confirmed.*

- **Scaling protein production.** We are not aiming to fund R&D in scaling protein production (biomanufacturing). However, we do expect to fund efforts necessary to rapidly produce sufficiently large quantities of bespoke engineered proteins, to unlock the rapid design-test iteration cycles required to achieve the programme objectives and target demonstrations. *A separate open call for this may follow, once our core teams and their shared needs have been confirmed.*
- **Direct research into a pre-defined, fixed target material/function.** The target functional material will evolve with the manufacturing processes that each team develops and the demands from industry partners.
- **Pharmaceutical, healthcare, biocatalysis, or any other 'conventionally biological' applications including single proteins, solutions and purely organic macromaterials (e.g., silk) are out of scope.** To shift the Overton window and change the world's perception of what can be done with proteins, applications using inorganic materials and composite structures must be the end goal.
- **Non-protein scaffolding/templating (*e.g.*, cells, DNA, RNA, petrochemical polymers) are out of scope.** The main programmable substrate must be proteins. We welcome hybrid manufacturing approaches that span the biotic-abiotic spectrum including the organic inputs listed above, but they must play a supporting role to a primarily protein-programmed assembly platform.
- **Phase 2 — Scaling to specific application demands.** If Phase 1 succeeds, Phase 2 will be done in a separate solicitation.

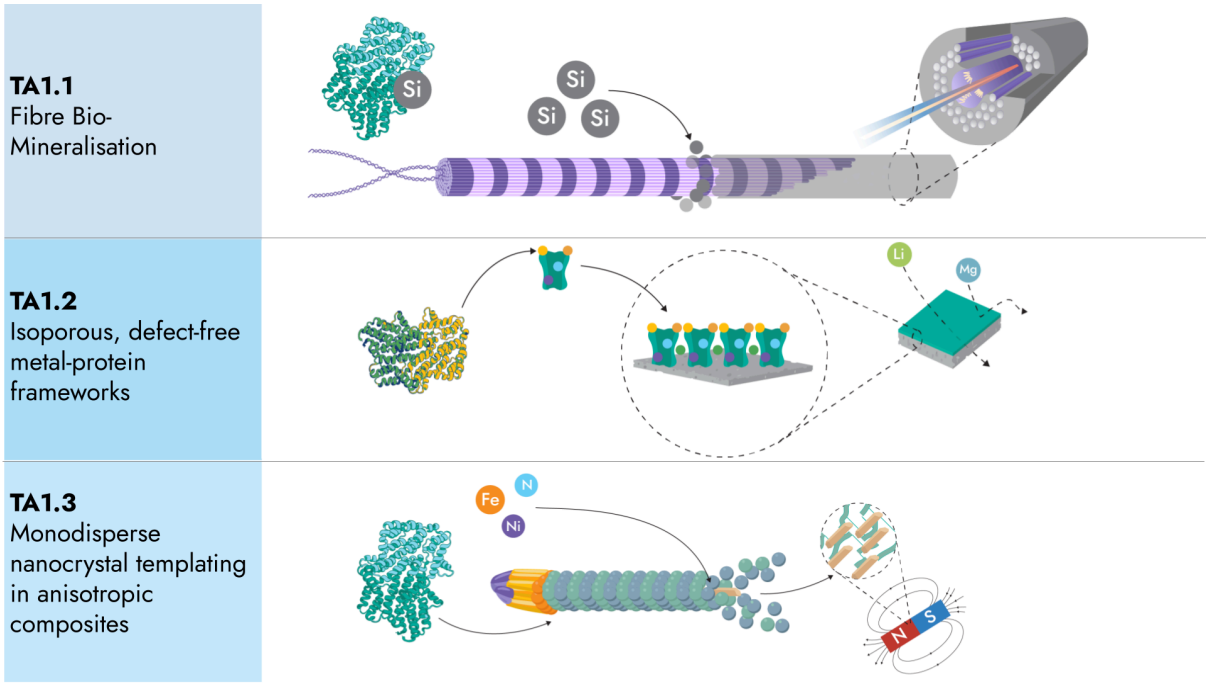

Figure 1. Schematics illustrating the 3 programme challenges and potential example use cases (hollow-core optical fibre, ultra-high purity lithium hydroxide extraction membranes, Rare-earth free magnets). 1D, 2D, 3D challenges correspond to technical areas (TA) 1.1, 1.2, 1.3 respectively.

SECTION 4: Technical Targets

TA1.1 — Fibre biomineralisation (1D Challenge)

Proteinaceous fibres (including filaments and fibrils) have been used since ancient times, and are becoming increasingly specialised and engineered, used as building blocks of everything from textiles, film and hydrogels to artificial tendons and controlled drug dispensers. The broader space of 1D materials extends well beyond those directly accessible to proteins alone, such as semiconductor nanowires, photonic/phononic waveguides and high-strength ceramic fibres. All these fibres exploit anisotropy through hierarchical structures to express and enhance performance along a single dimension, and have structures governed by the same physical constraints and manufacturing requirements: longitudinal coherence, radial symmetry and precision, surface perfection, and the suppression of defects along extreme aspect ratios. In the long term, fibrous materials can in principle encode complex or stimuli-responsive functionality. However, this programme focuses on establishing the manufacturing foundations required to achieve this regime of precision and uniformity. So by targeting fibres with simpler, well-defined functions, we aim to unlock a generalisable platform for fabricating high-performance 1D materials across multiple application domains.

TA1.1 Example use case — Hollow-core optical fibres

We selected silica biomineralisation into hollow-core optical fibres as the target application. Hollow-core optical fibres guide light through interference-based confinement, achieved via photonic bandgaps or anti-resonant reflection in the surrounding microstructured cladding. As a result, optical loss and mode purity are set primarily by how faithfully this interference condition is realised along the fibre length. This imposes some of the most stringent manufacturing requirements in photonics: angstrom-level control of radial geometry and surface quality, precise hierarchical structuring, and kilometre-scale longitudinal uniformity.

Table 3: Preliminary targets specification for 1D Challenge (TA1.1)

TA1.1 Fibre biomineralisation (1D)	[18 month targets] Geometric control: + Longest sample >1m, total samples made >100m + 3 different inner diameter samples produced in the 1 - 50 um range + 3 different outer diameter samples produced in the 10 - 200 um range + Mechanically stable to a 10cm bend radius without fracture (if need-be, with coating included) Material quality: + No detectable organic trace inside the sample after post-processing (complete protein debris removal, *e.g.,* by FTIR spectroscopy)
	[36 month targets] Functional specification: + Internal surface roughness <0.1 nm (*e.g.,* by AFM on cleaved sections) + Attenuation at 230, 532 and 1550 nm measured (via cavity ring-down, targeting <0.14 dB/km @1550nm, below the G.654 standard)

TA1.2 — Defect-free metal-protein frameworks (2D Challenge)

Nature offers a distinct class of engineerable 2D materials beyond the fluid lipid bilayer: the crystalline protein lattices (such as S-layers) that serve as protective coats and molecular sieves for bacteria and archaea, periodic photonic crystals that serve as structural colorants or crystal/cytoplasm multilayers that serve as mirror lenses. Fundamentally, the manufacturing principles that govern selective transport across membranes mirror those that govern wave propagation in 2D materials. While selectivity can arise without order, controlling periodicity, symmetry, and defect suppression at the nano-to-micro-scale, where lattice architecture defines energy landscapes, is what enables deterministic transport. In this regime, the same processes for crystalline assemblies are transferable; they could be programmed not only to filter molecules, but to sculpt optical, electronic, or magnetic band structures, yielding lenses, filters, and other functional 2D devices.

This challenge is inspired by naturally occurring isoporous structures which demonstrate that proteins alone can form mechanically resilient, perfectly uniform filtration barriers. We anticipate that selectivity will be encoded not by the supporting lattice alone, but by engineered transport channels templated within a defect-free protein membrane, analogous to metal-organic frameworks. The membrane provides a perfectly ordered scaffold, while the channel interiors are tuned to create the precise physical and ionic environments required for discrimination.

We see this as the foundation for a general-purpose separation technology that could eventually replace energy-intensive thermal distillation and indiscriminate reverse osmosis across the chemical, pharmaceutical, and water industries. However, to drive this platform from lab-scale curiosity to industrial necessity, we must initially tackle a separation challenge that existing synthetic membranes struggle to solve efficiently.

TA1.2 Example use case — Isoporous selective membranes towards ultra-high purity lithium polishing

We selected direct lithium extraction (DLE), in particular the challenging polishing step of separating ultra-high purity lithium from magnesium, as the initial target use case. The extreme similarity in ionic radii between Li^+ and Mg^{2+} demands a membrane with angstrom-level pore precision and absolute defect intolerance. By engineering protein assemblies that integrate these selective channels and remain stable under harsh conditions, we aim to validate a manufacturing platform capable of creating 2D materials for any molecular separation need.

Table 4: Preliminary targets specification for 2D Challenge (TA1.2)

TA1.2 Isoporous, defect-free metal-protein frameworks (2D)	[18 month targets] Geometric control: + Largest continuous membrane sample >200 cm^2; total produced >2 m^2 + Three different pore sizes produced in the 1-50Å range + Mechanically stable under tangential flow[4] conditions with a transmembrane pressure (TMP) of 20 bar and cross-flow velocity of 0.5 m/s without delamination or compaction Material quality: + Non-selective leakage < 0.1% of total flux, verified by rejection of 1nm neutral markers like sucrose or PEG-200, or gold NP challenge + Pore homogeneity is <20% from intended size under a range of different flow conditions, estimated via MWCO profiling
	[36 month targets] Functional specification: + Selectivity is Li^+/Mg^{2+} >100 and Li^+/Na^+ > 20 targets in equimolar mixed feed (0.1M) under 10 bar pressure + Flow-through of >5 LMH/bar water with lithium flux of >0.5 mol/m^2/h/bar + Chemical Stability: No loss of selectivity and flow-through (< 5% deviation) after 10 full CIP cycles.

TA1.3 — Monodisperse nanocrystal templating in anisotropic composites (3D Challenge)

While synthetic chemistry excels at producing inorganic powders, it often struggles with organising those powders into high-performance, macroscopic, bulk solids without destroying their nanoscale properties. In contrast, biology seamlessly integrates nucleation, growth, and assembly (as seen in the synthesis of bone, nacre, and magnetosomes) to create hierarchical composites where the organic matrix dictates the inorganic structure.

We view protein-directed biomineralisation as a general-purpose engine for 3D manufacturing. By utilising proteins as identical, molecularly-precise reactors, we can achieve monodisperse nanocrystals with exact control over size, shape, and crystalline phase. Furthermore, these protein-coated crystals can be organised into complex 3D composites. The protein matrix can serve as a permanent structural binder (creating tough, flexible composites) or as a sacrificial scaffold, to be removed during post-processing to leave behind dense, nanostructured ceramics or metals. This capability unlocks a vast array of downstream applications, from high-efficiency catalytic converters and optical metamaterials to ultra-hard structural coatings and caloric refrigerants.

[4] Pressure and flow-through stability is for tangential flow nano-filtration membranes. Passive or active ion exchange membranes or other system modalities should propose similar stability and throughput metrics.

TA1.3 Example Use case — Rare-earth free magnets

To validate this platform technology, we have selected a challenge that is notoriously resistant to traditional metallurgical and ceramic processing: high-performance rare-earth free permanent magnets. The transition away from critical supply-chain materials like neodymium and dysprosium requires us to unlock the magnetic potential of abundant elements (such as iron or cobalt) through precise nanostructuring. Theoretical candidates for these magnets (*e.g.*, cobalt ferrites and iron nitrides) exist, but they lose their magnetic properties if grains grow too large or are randomly oriented. This application demands simultaneous mastery of three conflicting constraints:

+ Phase & Size Control: synthesising single-domain nanocrystals to maximise coercivity.
+ Protection: preventing oxidation and sintering during consolidation.
+ Anisotropy: aligning these crystals physically and magnetically across the macro-scale.

We believe that by exploiting magnetically-directed self-assembly, where the protein shield allows nanocrystals to be fluidly aligned by an external field before being locked into position, we may be able to bypass the thermodynamic limits of traditional sintering. Solving this challenge would not only secure a critical component for the green energy transition but would prove that protein-based manufacturing can dictate the physics of bulk matter.

Table 5: Preliminary targets specification for 3D Challenge (TA1.3)

TA1.3 Monodisperse nanocrystal templating in anisotropic composites (3D)	[18 month targets] Geometric control: + Total sample > 10g, maximum single solid sample >1g + Three different size anisotropic nanocrystalline powders have been produced (of single, or different material compositions), in the 10 - 2000 nm target range (below the single domain limit of the particular materials). + All nanocrystalline powders have been incorporated into a regular anisotropic lattice, with >100 mg single solid produced. + The solid samples are mechanically stable in air at room temperature. Material quality: + The nanocrystalline materials (with proteins removed) are mono-dispersed around the target size, with +-15% standard deviation (measured via TEM image analyses) + The protein composite anisotropic lattice shows high regularity (SAXS) + High packing density of crystalline vs protein matrix material (crystalline fraction > 40%)
	[36 month targets] Functional specification: + No rare earth derived elements are used in the composition. + The nanocrystalline materials are in the correct magnetic phase (XRD) + Magnetic squareness ratio > 0.8 measured via VSM + Intrinsic coercivity is measured, > 1 kOe target + BH_max magnetic product is measured, >10 MGOe eventual target

SECTION 5: Programme Duration and Project Management

Teams

We expect to fund 6 - 9 Creator teams with an initial total pot of ~£34M over 3 years, ideally (but not necessarily) distributed as 2–3 teams per challenge (TA1.1–1.3). We hold additional funding reserved to double down on teams showing promise to accelerate their progress.

We expect teams to be typically led by academics, spinouts, or companies, and will almost certainly foster new interdisciplinary collaborations. However, we will strongly bias to lean, efficient teams that contain no more than the minimum viable set of essential capabilities. We expect the teams that ARIA contract to be supported by subcontractors (at each individual Creator team's discretion) that provide services to accelerate progress, such as protein design AI scientists and automated protein production cloud labs. As discussed in Section 3, if there are shared ecosystem services that would be beneficial accelerants to all Creators across the programme, ARIA will run follow-up open calls (*e.g.*, metrology benchmarking partners, software and data).

Approach to Intellectual Property

We will largely be following ARIA's default IP policy which can be found here. At a high-level, creator teams own all the IP (ARIA does not take any IP) but are required to share all data and physical samples upon request with the mandated third-party metrology benchmarking partners under strict confidentiality protections. While public IP disclosure is not required by default, applicants must submit a commercialisation hypothesis as a part of full proposals which must be updated, maintained and a part II to be provided throughout the life of the project. We welcome a diverse range of IP approaches, from fully open to proprietary, without prioritising any specific model.

Project Milestones

The maximum term for this solicitation is 3 years, though applicants are encouraged to consider plans which may reach success (or failure) on faster timelines. Each project's progress will be monitored using clearly defined milestones. Milestones will be defined by the applicant prior to the start of a project, be agreed upon by ARIA, and should be designed to easily convey progress to a third party. To do this, milestones should:

+ Be specific, measurable, and signify a meaningful step towards reaching the overall programme goals.
+ Include details on methods used for measurement and evaluation.
+ Be defined on a quarterly cadence for all phases of the programme.
+ Include major "Go / No-Go" decision points. Success/pivot/closure criteria for each project will be determined by the applicant's ability to meet these.

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Further guidance on setting ARIA milestones can be found here.

During the first year of the programme, we will work closely with teams to significantly refine the technical milestones for years two and three.

Collaboration & Events

Creators will be expected to attend an estimated 2-4 events (e.g., workshops, demo days) per year, led by the Programme team, to encourage collaborations with industry, ecosystem partners, and across teams. Inter-team collaboration is not mandatory, but it is highly encouraged. Teams may choose to collaborate via their own IP-sharing agreements and can be facilitated by ARIA.

We will host demo days at Months 15 and 30 to ensure that the programme is building towards highly valuable manufacturing technologies and engaging with key ecosystem stakeholders. Participation in the first demo day is a prerequisite for the Month 18 Go/No-go gate, where teams must also achieve their initial milestones and renegotiate their Month 36 targets. These final targets will be refined based on technical progress and market research to ensure they demonstrate maximum functional value by the Month 30 demo day.

We expect the Month 30 demo day to be a showcase of the success of TA1 and largely inform a potential Phase 2 (TA2) at Month 36. Building towards these demo days and post-programme translation (commercial viability), ARIA will facilitate industry matchmaking throughout the first 36 months; teams are encouraged to independently secure partners as well. If Phase 2 were to go ahead, we expect a solicitation to launch at Month ~31, and we would require Creator teams to submit a joint application with an industry partner for metrology, scalability, and system integration. Ideally in Phase 2 industry partners and/or venture capital would provide match-funding.

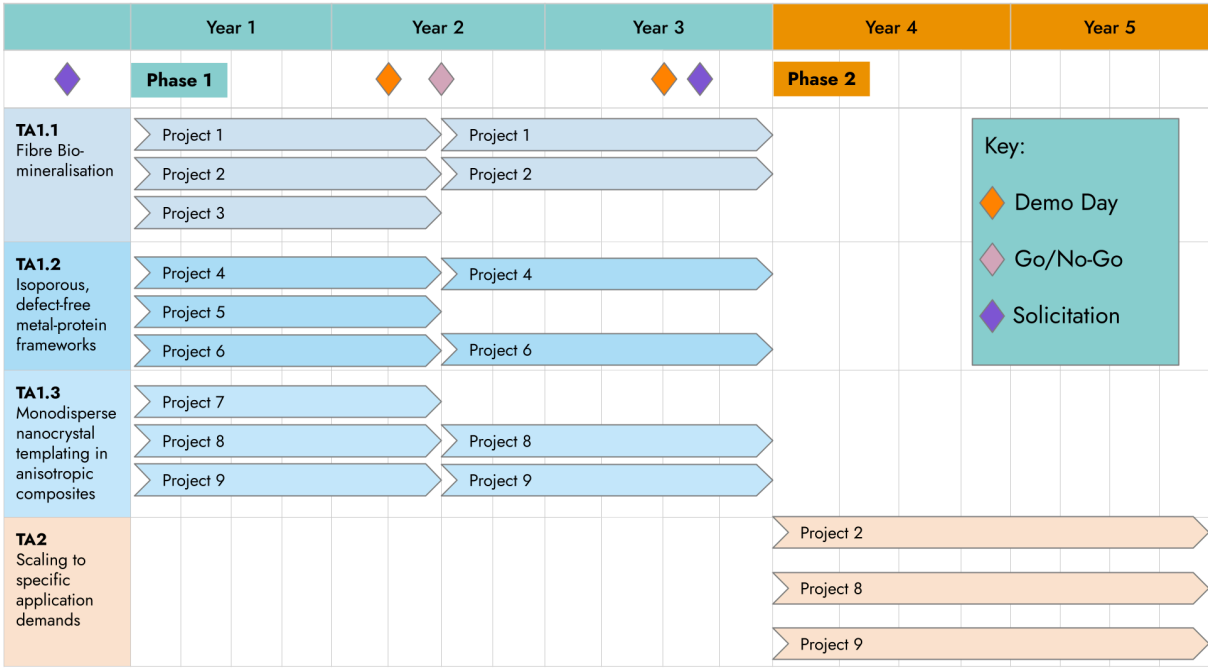

Figure 2. Indicative roadmap. It is important to note that the distribution of projects in this figure are for illustrative purposes only. We do not have a quota for teams progressing past Month 18 or into Phase 2. If all funded teams hit their Month 18 milestones they will all progress to working towards Demo Day 2.

Programme & project management

During each quarterly project check-in, project teams and the ARIA programme team will review the agreed upon milestones, and discuss further details of each project. As part of that discussion, teams will be encouraged to think through a set of questions as they execute on their plan. These may include the following, provided as illustrative examples:

+ What is(are) the target deliverable(s) for each phase of the programme?
+ What are the top three risks identified at this stage of the project?
+ What are the first three experiments required to overcome each risk?
+ What are the expected outcomes/learnings from these experiments?
+ How long will these experiments take and how much will they cost?
+ What are the dependencies from prior activities/phases of the Programme?

Upon completion of each experiment, questions we will look to answer are:

+ What new information has been gleaned?
+ What (if any) risks have been overcome? What new risks have emerged?
+ Did we learn what we thought we would learn? If not, why not?
+ Is there anything we can do to learn more or faster?
+ Is there still a path towards the target? Are we heading towards any dead ends?

In the first year (3-4 rounds) of quarterly reporting we expect significant learnings from technical progress and workshopping/advisories with industry. A key component of project management will be adaptability and alignment between your teams and ARIA on shared Programme Objectives ("North star"), which will not change.

At ARIA we celebrate teams that valiantly test exciting hypotheses to achieve ambitious technical milestones, even if they don't ultimately achieve success. Projects are expected to move at pace and adapt through tight iteration cycles in response to technical results and feedback from industry advisors. Where agreed milestones are not met, we will work with teams to explore pivots that remain aligned with programme objectives and timelines; where this is not possible, funding may be brought to a close early.

Importantly we do not have a quota for teams progressing past Month 18 or into Phase 2, if all teams achieve their milestones then all teams will progress. However, we will set sufficiently ambitious challenges such that a single team achieving their Month 36 milestones would result in us successfully achieving our programme objectives. Our guiding philosophy is that teams are not competing with one another for funding, but rather working together in competition for market share against Petrochemical & Iron Age manufacturing. A successful team in our programme raises the tide for all ships sailing towards the Protein Age.

If you have any additional programme-specific questions, please use the chat function on the Universal Fabricators funding call page here. Please see 'SECTION 9: How to apply' below for more detail.

SECTION 6: Eligibility & Application process

Eligibility

We welcome applications from across the R&D ecosystem, including individuals, universities, research institutions, small, medium and large companies, charities and public sector research organisations.

Finding potential collaborators and teaming

For those seeking specific expertise to support their proposal, we have created a teaming request form to facilitate finding potential team members who have registered their interest in this programme. By following the link to the sign up form here you will be able to register, submit your details, and gain access to a list of other individuals seeking to find/share their expertise. All requests are screened via ARIA's internal team prior to access, after which connections will be made by individual users based on aligned expertise.

Application Process

The application process consists of two stages:

Stage 1 - Concept paper (completed)

Stage 2 - Full proposals (current stage)

This step requires you to submit a detailed proposal including:

- **Project & Technical information** to help us gain a detailed understanding of your proposal
- **Information about the team** to help us learn more about who will be doing the research, their expertise, and why you/the team are motivated to solve the problem
- **Administrative questions** to help ensure we are responsibly funding R&D. Questions relate to budgets, IP, potential COIs etc

You can find more detailed guidance on what to include in a full proposal here. **You can submit a full proposal even if you did not submit a concept paper.**

For more details on the evaluation criteria we'll use, click here.

Non-UK funding

Our primary focus is on funding those who are based in the UK. However, funding will be awarded to organisations outside the UK if we believe it can boost the net impact of a

programme in the UK. In these instances, you must outline your proposed plans or commitments that will contribute to the programme in the UK within the project's duration (note the maximum project duration for this solicitation is 3 years).

If you are successfully selected for an award subject to negotiations this proposal will form part of those negotiations and any resultant contract/grant.

More information on the evaluation criteria we will use to assess your answers can be found later in the document here.

We have provided some additional guidance on non-UK funding in our FAQs including available visa options.

SECTION 7: Timelines

This call for proposals will be open for applications as follows (we may update timelines based on the volume of responses we receive):

Full proposal submission deadline	**5 May 2026 (14:00 BST)**
Full proposal review	**5 May 2026 - 22 June 2026**

As part of our review we may invite applicants to meet with the Programme Director to discuss any critical questions/concerns prior to final selection — this discussion can happen virtually or we may seek clarification on certain aspects of your proposal via email. We anticipate any potential meetings at the stage to take place between 8 June 2026 and 15 June 2026.

Successful/Unsuccessful applicants notified	**29 June 2026**

At this stage you will be notified if you have or have not been selected for an award subject to due diligence and negotiation. If you have been selected for an award (subject to negotiations) we expect a 1 hour initial call to take place between ARIAs PD and your lead researcher within 10 working days of being notified.
We expect contract/grant signature to be no later than 6 weeks from successful/ unsuccessful notifications. During this period the following activity will take place:

- Due diligence will be carried out
- The PD and the applicant will discuss, negotiate and agree the project activities, milestones and budget details
- Agreement to the set Terms and Conditions of the Grant/Contract. Please note ARIA does not negotiate these terms. Find a copy of our funding agreements here

Award	**10 August 2026**

Please note, contract/grant must be signed on, or before, this date for the project to be funded by ARIA. The offer of funding may be withdrawn if contracts cannot be signed by this date.

SECTION 8: Evaluation Criteria

Proposal evaluation principles

To build a programme at ARIA, each Programme Director directs the review, selection, and funding of a portfolio of projects, whose collective aim is to unlock breakthroughs that impact society. As such, we empower Programme Directors to make robust selection decisions in service of their programme's objectives ensuring they justify their selection recommendations internally for consistency of process and fairness prior to final selection.

We take a criteria-led approach to evaluation, as such all proposals are evaluated against the criteria outlined below. We expect proposals to spike against our criteria and have different strengths and weaknesses. Expert technical reviewers (both internal and external to ARIA) evaluate proposals to provide independent views, stimulate discussion and inform decision-making. Final selection will be based on an assessment of the programme portfolio as a whole, its alignment with the overall programme goals and objectives and the diversity of applicants across the programme.

Further information on ARIAs proposal review process can be found here.

Proposal evaluation process and criteria

Proposals will pass through an initial screening and compliance review to ensure they conform to the format guidance and they are within the scope of the solicitation. At this stage we will also carry out some checks to verify your identity, review any national security risks and check for any conflicts of interest. Prior to review of applications Programme Directors and all other reviewers are required to recuse themselves from decision making related to any party that represents a real or perceived conflict.

Where it is clear that a proposal is not compliant, outside the scope and/or does not pass a quality assurance review, these proposals will be rejected prior to a full review on the basis they are not compliant or non-eligible.

Proposals that pass through the initial screening and compliance review will then proceed to full review by the Programme Director and expert technical reviewers (this may include the use of AI. Further information on ARIAs proposal review process can be found here and the use of AI in the conditions of the call available here).

In conducting a full review of the proposal we'll consider the following criteria:

1. **Worth shooting for:**
    a. The proposed project uniquely contributes to the overall portfolio of approaches needed to advance the programme goal and objectives.

   b. It has the potential to be transformative and/or address critical challenges within and/or meaningfully contribute to the 3 programme objectives.
2. **Differentiated** – The proposed approach is innovative and differentiated from commercial or emerging technologies being funded or developed elsewhere.
3. **Well defined** – The proposed project clearly identifies what R&D will be done to advance the programme objectives, is feasible and supported by data and/or strong scientific rationale. The composition and planned coordination and management of the team is clearly defined and reasonable. Task descriptions and associated technical elements provided are complete and in a logical sequence with all proposed stage-gates and deliverables clearly defined. The costs and timelines proposed are reasonable/realistic.
4. **Responsible** – The proposal identifies major ethical, legal or regulatory risks and that planned mitigation efforts are clearly defined and feasible. The proposed project should focus on developing processes and creating materials that have a low risk of adverse planetary health impact.
5. **Intrinsic motivation** – The individual or team proposed demonstrates deep problem knowledge, have advanced skills in the proposed area and shows intrinsic motivation to work on the project and key individuals are dedicating sufficient time to the project. The proposal brings together disciplines from diverse backgrounds.
6. **Benefit to the UK** – There is a clear case for how the project will benefit the UK. Strong cases for benefit to the UK include proposals that:
   a. are led by an applicant within the UK who will perform the majority (>50% of project costs spent in the UK) of the project within the UK
   b. are led by an applicant outside the UK who seeks to establish operations inside the UK and perform a majority (>50% of project costs spent in the UK) of the project inside the UK and present a credible plan for achieving this within the programme duration.

      For all other applicants we will evaluate the proposal based on its potential to boost the net impact of the programme in the UK. This could include:
   c. A commitment to providing a direct benefit to the UK economy, scientific innovation, invention, or quality of life, commensurate with the value of the award;
   d. The project's inclusion in the programme significantly boosts the probability of success and/or increases the net benefit of specific UK-based programme elements, for example, the project represents a small but essential component of the programme for which there is no reasonable, comparably capable UK alternative.

      When considering the benefit to the UK, the proposal will be considered on a portfolio basis and with regard to the next best alternative proposal from a UK organisation/individual.

Proposal feedback

At the full proposal stage, applicants will be notified whether or not they have been successfully selected for award. For those applicants not selected for award we will not provide feedback.

SECTION 9: How to apply

Before submitting an application we strongly encourage you to read this call in full, as well as the general ARIA funding FAQs.

If you have any questions, please use the chat function on the funding call page for the quickest response. It can guide you to the right information or connect you with the ARIA team if needed.

Any questions or responses containing information relevant to all applicants will be provided to everyone that has started a submission within the application portal. We'll also periodically publish questions and answers on our website, to keep up to date click here.

Please read the portal instructions below and create your account before the application deadline.

If you are disabled or have a long-term health condition, we can offer support to help you engage with ARIA, navigate our funding application process, or carry out your project, you can find more information here.

Application Portal instructions

APPLY HERE

Full Proposal Guidelines

Updated guidance following Concept Papers

The following are general points of clarity and feedback following concept paper reviews:

1. The goal of this programme is developing manufacturing processes. We expect that the final demonstrator application for each challenge will likely pivot based on early technical results and industry advisory. However, as part of the selection process we aim to review all project teams against a consistent set of targets intentionally designed with difficult geometries, length-scales and production throughputs. In your full proposals you must demonstrate your process can achieve the Month 18 and Month 36 milestones for one of our challenges, or else it will be out of scope. A strong proposal will also convince us that your process can generalise beyond a single challenge to multiple high value applications across 1D-3D structures. This ensures that application pivots are feasible and that we are developing technologies on route towards "Universal Fabricators".
2. Generally, concept papers were either comfortable at the molecular scale or at the macro scale (>cm & >100g). In the full proposal we are looking for teams and proposals with strong expertise across molecular to meso to macro; this is one of the key factors that makes this programme challenging.
3. 1D Challenge (TA1.1): protein separation from the final inorganic material to achieve Month 36 functional milestones is a major challenge to be seriously considered.
4. 2D Challenge (TA1.2): this is a metal-protein framework challenge, not a selective pore engineering challenge. Pore engineering may be required to achieve the Month 36 milestones, however the proposal and initial team composition should first focus on the Month 18 structural milestones such that a mid-programme pivot to a non-separation application (*e.g.,* optical metamaterials) is possible.
5. 3D Challenge (TA1.3): nanocrystal formation is only half the challenge, the other half is anisotropic bulk matrix alignment and should receive equal consideration.
6. Please make sure to follow the scope guidance on peptides (see clarification questions)
7. Please review the project selection criteria carefully and ensure that your proposal addresses all requirements of the funding call. In particular, your proposal should clearly demonstrate how it will deliver benefits to the UK (see Call for Proposals, Page 21).

How to Format your proposal

- Page count: maximum of 10 pages (including diagrams, excluding references). 10 pages is not a target, less is fine. **Proposals that exceed the page limit will be considered non compliant and will not be reviewed.**
- Linespacing 1.15 ,standard character spacing (neither expanded nor condensed)
- Font: Arial. Colour: black. Size: 11-point font or larger
- Figure captions must be size 10-point font or larger
- Margins: At least 0.5" margins all around
- File Type: PDF

Project Title

Please include your Applicant ID in your application name.

Due to the similarity of concept paper titles, we encourage you to avoid commonly used terms such as protein, peptide, universal, fabricator, (bio)mineralisation, programmable, assembly, and platform, as these make it difficult to distinguish between proposals.

Instead, aim to choose a title that highlights what makes your proposal unique. As an alternative approach, consider: if you were spinning out a company based on the success of this project, what would you call it?

Section 0: Summary

Summary of your proposal in 250 words max including highlighting in simple words how it will achieve the programme objectives (*outlined in Section 2*)

Section 1: Programme & Technical

The aim of this section is to gain in-depth, technical information about the project being proposed. This should include:

- Which Technical Area you seek to work towards (TA 1.1, 1.2 or 1.3), and clearly describe how the proposed idea/solution will achieve the Month 18 target goals in geometric control, throughput, and material quality (*outlined in Section 4*).
    + This should be supported by visual aids, data and/or strong scientific rationale for why what you are proposing would work.
- A description of your current protein engineering, synthesis, assembly, and testing methods, both in-silico and wet methods, including costs and timelines, and any improvements to quality, speed, tunability, reproducibility *etc.,* that you expect to make within the next 18 months as part of the programme
- A description of the set of analytical characterisation methods and machinery your team has experience with, and reliable access to, without requiring asset purchases. Please indicate if machinery or team is in multiple physical locations,

or owned by distinct organisations, and if so, your plan of coordinating between the locations and organisations. Describe what rapid proxy characterisations you may be able to use to supplement slower and more expensive methods.
- A description on how you expect to specialise your protein platform technology towards the currently described example use case within your selected challenge category, and what key development directions would be required to achieve the Month 36 functional specification goals.
- A description of your meso/macroscale assembly methods beyond the nanoscale, both in-silico and experimental.
- How the proposed approach is differentiated, *e.g.* from commercial or emerging technologies being funded or developed elsewhere.
- Clearly describe the most technically or scientifically challenging aspect(s) of your approach, particularly those that are critical to the project's success and would be genuinely transformative. These should be explained in a way that an intelligent non-specialist can understand, so that experts from different fields (e.g. protein engineers and an optical physicist) can readily grasp their significance.
- In addition to the above, a comprehensive list of the known technical risks/unknowns standing in the way of achieving the stated goals. These can be explained in more domain-specific language.
- A description of the proposed activity of work, key metrics and milestones and any dependencies and assumptions.
- Estimated timelines - applicants should provide a Project Plan for the lifecycle of the project, showing what you plan to achieve for each period of the project.
- A description of how you envision the scale-up of the entire process into a "pilot production line".

Section 2: The Team

At the full proposal stage, we will only consider fully structured teams and not individuals. However, we accept if not all individuals have been identified or recruited at the time of submission. In particular, application (use case) subject matter experts need not to be part of the initial team, or only in a part-time advisory capacity.

This section includes information about the proposed individuals or teams that will conduct the research and management structures. This must include:

- Details of the project team - we want to know who will be doing the work (not just the principal investigator or project lead) and what portion of their time will be dedicated to this project. We prefer a 100% dedicated technical project lead (who need not be the principal investigator), and ideally all key researchers to be spending 80%+ of their time on the project.
    + Please see our website clarification questions for an update to minimum time commitments required for team members.

- The "North Star" motivation of the project lead (and the principal investigator, if different) for their technical work in general (without aligning it with the programme objectives).
- Why your motivation (described above) and ARIA's *Manufacturing Abundance* opportunity space have a mutually intersecting interest, and why that is on the critical path to achieving the *Universal Fabricators* programme objectives.
    + When we ask for your 'North Star" motivation we are not looking for a restatement of the programme's objectives. Instead, we encourage you to share your personal motivations, what drives your interest in this area and why you see this programme as an important step toward your goals. This might include the experiences, challenges, or long-term ambitions that have shaped your work, and how participating aligns with the impact you hope to achieve. For example "I've spent the last decade exploring solutions to eliminate plastic waste across academia and industry, where it was evident the solution will require a manufacturing paradigm shift. I believe this programme is on the critical path to eliminating plastic waste. Or equivalently, "My training is in self-assembly driven by a long-held passion of reading science fiction. Our core scientific curiosities are aligned and ARIA's willingness to fund ECR project leads means that successfully delivering this programme would be career defining."
- You could include short bios about each team member (we discourage you from submitting CVs).
- If you intend to collaborate with or rely on any third parties, sub contractors/ grantees, please list who they are, which elements of the project they will support/deliver, at what stage of the project they will be onboarded and for what expected duration.
- How you intend to coordinate and manage the teams including any collaborations with third parties.
- Any potential gaps in your core competency which would be required in order to achieve the overall goals.
- Please describe why your team structure is a good fit for the highly interdisciplinary and high risk developments required to meaningfully advance proteins as a general-purpose manufacturing technology.

In addition to the above, please complete as an annex (outside of page limits) the following table summarising the team and their commitments:

Individual	Project Role / Expertise	Organisation and role within	Already in place? If not, how long after project kickoff are they likely to start? Other concerns?	FTE	Total time on project (months, rounded)
Sophia Fleissig	*Project lead, Protein engineer*	*Startup X, Principal scientist*	*Currently assigned to a different project but could transfer to this*	*100%*	*36*

			project with 6 weeks notice		
Magnus Diligente	*Principal investigator, Material scientist*	*University Y, Professor*	*Yes*	*60% during months 1-18, 40% during months 18-36*	*18*
Amanda Assidu	*Physicist with experience in structured light fields and hardware*	*University Z, Postdoctoral Researcher*	*To be seconded from collaborator for 6 months in-person initially, then frequent visits or potential*	*100%*	*36*
Etc	*Etc*		*Etc*	*Etc*	*Etc*

Labour table to be completed for all individuals working on the proposed project (*filled here with purely hypothetical examples*).

Section 3: Administrative Response

This section includes information about the budget, intellectual property that you intend to rely on, any perceived conflicts of interest and for non-UK applicants how the proposed project may benefit the UK.

In completing your application you must also provide answers to the following questions. Answers to these questions are not included in the 10 page cap. You should complete these questions in the application portal so there is no need to format these specifically.

Application	Guidance
How much funding do you need?	*Please provide a cost breakdown by completing the spreadsheet here. In your proposal you may submit your budget using yearly, quarterly, or monthly phasing.* *Prior to completing this template you should review ARIA's Eligible cost guidance here.* *If your proposal is successful, prior to contract signature when the scope of work has been agreed, you will be required to provide a monthly cost breakdown.*

Are you proposing to contribute funding?	*If you or your organisation are proposing to contribute funding to the project please let us know how much funding you plan to contribute, who is contributing the funding, is the funding already secured and any other relevant details.* *ARIA will fund 100% of project costs and contribution of funding is not essential however, we welcome proposals that contribute funding in cases when such funding will strengthen the potential success. In these cases, this funding contribution will be considered as part of the overall strength of the project proposal.*
Does your proposal depend on background IP (pre existing)?	*If Yes, give us an Indication of: What background IP is required, Whether you currently have rights to that IP.*
Have you already secured funding for a similar project or are you currently in the process of seeking support from other funding sources for the same project?	*If yes, tell us more about the funding you already have or are applying for.*
Any other factors or restrictions that might impact your freedom to operate and deliver the project?	*Please provide a detailed description of any perceived conflicts of interest with the programme director, import/export or security restrictions that you are aware of*
How do you envision commercialisation of the proposed project?	*Please complete and upload a commercial hypothesis for your project using the guidelines here.*
Are you proposing to perform the majority of the proposed project outside of the UK?	*Our primary focus is on funding those who are based in the UK. For the vast majority of applicants, we therefore require the majority of the project work to be conducted in the UK (i.e. >50% of project costs and personnel time). However, we can award funding to applicants whose projects will primarily*

	take place outside of the UK, if we believe it can boost the net impact of a programme. *In these instances, you must outline any proposed plans or commitments in the UK that will contribute to the programme within the project's duration (note the maximum project duration is 3 years). Please provide a detailed description of any proposed plans (including a timeline) or commitments).*
Has a suitably authorised member of your Organisation approved the submission of this proposal?	*In the application portal, please select the option that best describes your situation and provide details where required.*
Have you read and understood our funding terms?	*Our goal is to ensure your research can get going quickly, so we want to ensure a fast negotiation and award process. We aim to have agreements signed within 6 weeks, which we recognise can be much faster than standard at some organisations. Before proceeding, please confirm that you have read and understand our funding terms. If you are unsure which terms apply to you, you can find more guidance here.*
Additional questions about you/your organisation that can be found in the application portal.	