

Project Proposal Application

To be completed by the lead proposed supervisor,
with input from the non-HE Partner Organisation(s).



Arts and
Humanities
Research Council

SECTION 1: PROJECT SUMMARY AND APPLICANT DETAILS			
Proposed Project Title:		From Algae to Bioplastics: The Making of Ecosophy	
Project Summary: <i>(Maximum 100 words)</i>		Native algae grow around the North East and Scottish coasts and biologically convert anthropocentric carbon dioxide into biomass including biodegradable plastic polymers, which 21 st -century biotech industry has valorised as sustainable plastics. However, there is little understanding in the real sustainability of marine bioplastics around the whole circularity from bioproduction to intellectual and utilitarian consumption. Forging a new collaboration between Newcastle University and the Earthshot-Prize winning algal bioplastic company <i>Notpla</i> , the studentship will critically explore the process of making and aims to architect ecosophy – ecological and ethical materiality against mentalities behind plastic pollution and beyond.	
Host University:		Newcastle University	
Name of Non-HE Partner Organisation(s): <i>(Add more lines if needed)</i>			
1. Notpla			
2.			
Contact(s) at Non-HE Partner Organisation(s): <i>(Add more lines if needed)</i>			
Name:	Rodrigo Garcia Gonzalez	Email:	rodrigo@notpla.com
Name:		Email:	
Primary AHRC Subject Area: <i>Select one subject area from the list here. Do not add or amend subjects - there will not be a corresponding Subject Area panel to assess the application.</i>		Design	
Does the project include a Creative Practice component?		YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>

Do you consider the project to be interdisciplinary?	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>
If you consider the project to be interdisciplinary, please state why: <i>(Maximum 100 words. Note, all applications will be assessed by the appropriate primary subject area cross-institutional</i>		
The making of bioplastics from algae is conventionally a process of making developed by science and technology research in modern biotechnology. This research explores overlooked sustainability of this biotechnology by creative practice in search for more holistic materiality to interrogate plastic pollution and therefore brings together creative practice in design-led biotechnology and chemical engineering at Newcastle University with world-leading algal bioplastic industry expertise of the Earthshot Prize winning UK company Notpla.		

SECTION 2: PROJECT PROPOSAL AND CASE FOR SUPPORT

Please provide full details of the proposal and make your case for support below:

(Maximum 750 words)

Research context and research questions

Technology is not a silver bullet to ecological crises. Bioplastic biotechnology may reduce the further genesis of plastic pollution in waterways and landfill but may cause new kinds of environmental pollution: for instance, the degradation of algal bioplastics emits unwanted methane gas - a more critical greenhouse gas than carbon dioxide in global warming; while this may be counterbalanced by algae not competing with agricultural land use as field crops do (i.e., corns and potatoes used for bioplastics), hence relatively more sustainable sources. In transitioning from the fossil-fuel society towards biomass-based net-zero futures, the replacement of plastics with bioplastics requires cultural, industrial and technical interventions with the pattern of production and consumption behind consumables but this demands more holistic and less reductionist approaches to the making of bioplastics.

We posit that the materiality of bioplastics is still premature with functionalist and scientific reductionism drivers in biotechnology; Algal bioplastics in industry are typically made from purified biopolymers, mass-produced outside UK- either carrageenan or alginate – each extracted from certain macroalgae species (i.e., Irish Moss for carrageenan production; brown algae species for alginate). More recently, unrefined biomass is used for the economy of the processing. With less specificity to carrageenan or alginate content, this approach makes it more feasible to explore local macroalgae on the North East coast with a view to ‘stumble across’ – to borrow the words of Paul Carter (2004) - new material properties and biology-driven aesthetics. The utilisation of native algae shines light on unexplored natural resources of the coastal nation from less scientific reasoning – an antithesis to the modern development of bioplastics on one hand and on the other an ‘ecological’ step towards futureproofing both sustainable production and consumption and green economy. This studentship will be supported by the modus operandi of bioplastic production by the industry partner Notpla and more experimental making from local algae by the supervisory team at Newcastle. The collaboration makes it possible to critically address and architect the circular materiality of bioplastics from production to consumption.

The theoretical framing for this practice-led research questions technocratic approaches and explores Félix Guattari’s concept of ecosophy (1989/2000, 1992/1995) that identifies the root of environmental pollution with our way of living, interweaving the environment, social relations and subjectivity; hence, the premise of this project seeks beyond technocracy and technical solutions. Instead, this studentship seeks to creatively design ecological and ethical bioplastic materiality and will account for an empirical process of transforming algae, traversing the environment, social and mental domains, into a bioplastic materiality against the pattern of plastic pollution: this studentship explores the making of ecosophy. Central questions to this inquiry are:

- Can a creative-practice approach to bioplastic making generate new knowledge of biotechnology?
- What changes does creative biotechnology bring to the pattern of production and consumption?
- How can the creative practice of ecosophy architect ethical and ecological materiality in bioplastics?

Research methods

This interdisciplinary inquiry uses creative practice to generate material samples, through empirical production and consumption, of ethical and ecological materiality. The theory of ecosophy will inform the practice and vice versa in this practice-led research.

We highlight the harvesting of local algae to experience and gain some understanding of the whole process of bioplastic making and its root in the environment. The student will sustainably field-sample local algae from the Northeast coast and process the harvested raw material by combining artistic and scientific methods of making and assessing bioplastics: laboratory-based expertise for biomass and bioplastic polymer extractions and analysis will be provided by the supervisory team at Newcastle. Extracted bioplastic materials will be further processed into a series of material samples in workshops, supported by Notpla’s expertise in utilitarian consumption. The field work will refer to the existing catalogue of local algae by Northumbria Wildlife Trust (<https://www.nwt.org.uk/wildlife-explorer/marine/seaweeds-and-seagrass>) and follow environmental protocols and health & safety policies.

The student will develop understanding of intellectual consumption and the concept of ecosophy through literature review, practice and reflection. Training will be provided in quantitative life cycle analysis used in chemical engineering, and

qualitative analysis on the bioplastic production and consumption will be collaboratively assessed with industry-based knowledge of Notpla staff.

Research outputs will include a thesis with visual documentation of the process of making from production to consumption and a collection of original material samples of bioplastics. Outcomes are expected to advance sustainability agenda in biotechnology and more widely in science and technology from arts and humanity research perspectives. Visual outputs will be exhibited as part of Notpla's public engagement.

Provide details of any resources and facilities, including equipment, fieldwork, training, etc., that will be required to complete the project successfully. NBC has limited Research Training Support Grant funding, which may affect the feasibility of high-cost projects. Please note where you might also secure additional funding, (e.g. partner organisations; department or school).

Include estimated costs:

(Maximum 200 words)

At Newcastle, the student will have access to biology and chemical engineering laboratory facilities as well as studio/fabrication workshops to wash, dry and process. General laboratory consumables are covered from the supervisors' research funding outside this studentship, but specific items (filters, extraction chemicals) and a homogeniser to process raw seaweeds are to be purchased, totalling £1500. Aseptic drying rooms to prevent contamination of biomaterials are available at the chemical engineering. Local fieldwork will not require specialist equipment but incur travel expenses including subsistence, totalling £300. Specialist skill training in life cycle analysis will be offered at Chemical Engineering. Visual documentation will be facilitated by audio-visual equipment at Architecture, Landscape and Planning; microscopy imaging/analysis at the state-of-the-art NEXUS Unit (£300 at £30/hour) is encouraged but this depends on the successful candidate.

At Notpla, the student will be provided with desk space in the office and access to the workshop and real-life projects with Notpla staff. Travels to the London-based premise are necessitated totalling £1800 (covering train fares, accommodation and subsistence).

Public exhibition/engagement expenses will be sought from internal funding (i.e., Engagement and Place Fund, HaSS Institutes Pioneer Awards) within Newcastle.

The total requested from Northern Bridge: £3,900.

Outline the arrangements for communication between the non-HE partner organisation and the academic host institution in regard to project management and monitoring academic progress:

(Maximum 200 words)

The studentship is forged through recent dialogue to collaborate on another funding scheme between the supervisor (Sawa), a prospective PhD candidate and Notpla (Gonzalez et al.) to explore overlooked aspects of bioplastics from algae. The research parentship will be steered by quarterly partnership meetings between the academic team and Notpla and ensure positive impacts and shared interest. The student's progress in research will lead partnership meetings.

There will be monthly joint meetings between the student and academic supervisors and quarterly joint meetings with Gonzalez. The student will be supervised by Sawa and Orta in laboratory work and will regularly communicate development to Notpla staff. The student will be based in Notpla to participate in Notpla's specific projects with access to mentorship from the collective team of Sawa, Orta and Gonzalez where relevant. Provisions and support from Notpla will be reviewed at quarterly meetings to adopt to the development of the project and the student's more specific needs. The student will adhere to Notpla policies and procedures and receive inductions accordingly.

What benefits will there be for the candidate and the non-HE partner organisation as a result of your collaboration?

(Maximum 300 words)

The studentship will be instrumental in evaluating the potential of local algae in the Northeast for UK-based bioplastic production, which is of great interest to Notpla's sustainability vision. The company in return will benefit from the student to work critically, creatively and technically with algal bioplastic materials for in-house sustainability projects.

The student will generate new methods of making bioplastics without excluding ethical and ecological concerns and this will inform Notpla's R&D interest. The focus on creating new values and mentalities around plastic pollution in this practice is recognised as important in sustainability agenda but industry is often limited to explore these aspects. The collaboration will offer a unique interaction to critically explore holistic values of algal bioplastics, rooted in the natural environment, industry

and individuals.

State what financial (if any) or in-kind contribution the non-HE partner organisation will be making over the duration of the award:

*(Maximum 100 words. A financial contribution is **not** a requirement. However, the AHRC expect that **non-HE partners based overseas** will make a financial contribution to the costs of the student's return travel and accommodation when visiting.)*

Notpla will provide:

- Supervision at regular meetings where required and quarterly partnership meetings
- Opportunities to get involved in design, production and delivery of Notpla products in the company's premise
- Access to expertise through project staff and inhouse training on production
- Office space in Notpla

Describe the nature of the collaborative arrangement and the activities the candidate will be undertaking with the non-HE partner organisation:

(Maximum 300 words)

This project forges a new partnership between Newcastle University and Notpla to explore overlooked sustainability of bioplastics from algae from arts and humanity research perspectives and bring together expertise of creative practice in design-led algal biotechnology, life cycle analysis of algal biomass in chemical engineering and bioplastic product production in industry. This creative exploration is outside the scope of the company but is beneficial for the company's research and development. The partnership shares interest in the repositioning of marine bioplastics in relation to accelerating bans on plastics in our everyday life.

Main activities of the student in collaboration with the Notpla team will be centred around the assessment of production and consumption of bioplastics in industry. The student will be able to gather first-hand insight and experience in commercial production of bioplastic packaging by Notpla.

Notpla is committed to ensuring the safety of the student and its workshops are routinely supervised for health and safety by industrial codes of practice.

SECTION 3: SUPERVISION AND EXTERNAL ADVISORS

Primary (or Co-) Supervisor: Dr Marin Sawa

School or Department:	Architecture, Planning and Landscape (SAPL)	Email Address:	marin.sawa@ncl.ac.uk
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Secondary (or Co-) Supervisor: Dr Sharon Velasquez Orta

School or Department:	Chemical Engineering (SCE)	Email Address:	sharon.velasquez-orta@newcastle.ac.uk
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Name of the Advisor based at the Non-HE Partner Organisation: Rodrigo Garcia Gonzalez

Organisation/Institution:	Notpla	Email Address:	rodrigo@notpla.com
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Organisation/Institution:		Email Address:	
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Name of Additional Internal or External Advisors or Academic Supervisors, if any:

Organisation/Institution:		Email Address:	
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Explain how the expertise of the supervisory team and external advisor(s) will allow them to support the proposed project and the selected candidate:
(Maximum 500 words)

Dr Marin Sawa is a Newcastle University Academic Tenure Track (NUAcT) Fellow: Biotechnology and a principal investigator at the Hub for Biotechnology in the Built Environment. Sawa studied architecture at the Architectural Association (AA Intermediate, RIBA Part 1) with practice experience including with the Kengo Kuma and Associates (Tokyo) and has a MA (Distinction) and a Ph.D. in the intersection of design and algal biotechnology from Central Saint Martins (CSM), the University of Arts London. Sawa conducted scientific research through collaborations as a postdoctoral research associate and Techcelerate Fellow at Departments of Life Sciences and Chemical Engineering, Imperial College London. Sawa brings over 12 years of experience, world-leading expertise and research infrastructure in the fields of biodesign and biotechnology spanning arts and sciences. Her creative practice has been published in 10 invited public exhibitions. She has published in edited books such as Biodesign from MoMA as well as in the high-impact science journal Nature Communications. In an advisory capacity, Sawa contributed to the Algae Platform programme at the Royal Academy of Arts and the IKEA’s ‘Future Home 2030’ report. Her forthcoming book ‘Bio Realism’ (Bio Design series, Routledge) discusses the role of design in algal biotechnology with topics covering the duality of aesthetics and functions and the concept of ecosophy.

Dr Sharon Velasquez Orta is a Senior Lecturer (Associate Professor) in Sustainable Chemical Engineering. She has led a research group ‘BIORE’ for >10 years, investigating waste transformation, particularly for algae biomass in the urban context. Orta has expertise in biomass treatment and characterisation techniques, renewable material synthesis and fabrication (e.g. biocomposites), and life cycle analysis tools and metrics to measure sustainability and circular economy. Her group has attracted funding to support 8 Ph.D. students (4 graduated, 4 current) and 6 early career researchers. Orta has a track record of independent and collaborative research that has been recognised by the science community via 5 awards, 3 book chapter invitations (Elsevier, Wiley, and CRC Press), 45 scientific publications including in Algal Research, Bioresource Technology, and Environ.Sci.Tech., 1 patent, 2289 citations, [Google Scholar](#). She has co-chaired or co-organised 7 conferences, seminar series or science dissemination events. In her role as co-organiser of the 4th EU-ISMET conference, Orta invited Prof Rachel Armstrong, then Professor of Experimental Architecture at SAPL, as keynote speaker to discuss and support applications of biotechnology in the built environment. Orta currently chairs a UK-wide working group in the BBSRC-NIBB Environmental Biotechnology Network.

Rodrigo Garcia Gonzalez is a co-founder of Notpla Ltd and an architect and educator with teaching experiences previously at Kingston University and currently at Central Saint Martins College of Art and Design, UAL. Notpla is an interdisciplinary venture between the architectural designer and a biomaterial scientist from Imperial College London. The company has successfully won an Eathshort Prize in 2022 and is active in research and development with notable water container packaging for the London Marathon.

SECTION 4: RESEARCH ENVIRONMENT

Please provide details about the research environment the selected candidate will be joining and its suitability:
(Maximum 500 words)

The studentship will be hosted by the School of Architecture, Planning and Landscape (SAPL), the Hub for Biotechnology in the Built Environment (HBBE) and the NUAcT Fellowship Scheme. In the top 50 of QS rankings by subject (2022), SAPL offers a world-leading research environment with the departmental research community with over 30 PhDs.

Sawa offers an interdisciplinary home environment with active external and internal research collaborators in algal biotechnology, photosynthesis, biodesign and architectural fabrication. The Orta group provides a specialist home environment with researchers at postgraduate and doctoral levels all working in algal biotechnology, life cycle analysis and biomass processing. The research practice will be supported by the research-intensive biology laboratory at Ridley Building where Sawa is located and by the chemical engineering laboratory of the Orta Group at Merz Court. The student will have full

access to fabrication workshops at Building Sciences Lab in SAPL. These buildings are located in close proximity on the Haymarket Campus.

The student will be a valued member of two research groups: The HBBE includes designers, architects and scientists researching at the intersection of biotechnology and design. The HBBE is a cross-faculty/cross-institutional research cluster between Newcastle and Northumbria Universities, with a vibrant community of research staff and students working in biotechnology and biodesign as well as offering state-of-the-art facilities including a prototype-testing house 'OME'. There is also a community of creative practitioners at the Institute for Creative Arts Practice which organises a monthly forum where the student will have opportunities for critical reflection in a group setting. The Architecture Research Collective, with interest in sustainability and literacy, practice, theory, technology, provides the student with a critical and reflective environment in which to present and discuss work-in-progress to other academic members in sustainability design research.



RECRUITMENT INFORMATION

In the event that your project is successful it will be advertised on the Northern Bridge Consortium website to aid recruitment:
<http://www.northernbridge.ac.uk/applyforstudentship/cda/>

Please therefore complete the following Applicant Criteria so that advertising can begin immediately following the outcome of the competition:

<i>For further information about this Collaborative Doctoral Award and to submit an Expression of Interest, please contact:</i>	
Lead Supervisor (or Alternative Contact):	Dr Marin Sawa
Email:	marin.sawa@ncl.ac.uk
Expressions of Interest must be received no later than:	2024 January 8 th
Expressions of Interest must take the following format:	
<ul style="list-style-type: none"> • A 500-word personal statement • 1-page CV • 2-page portfolio or 2 posters • 2 x references 	
Interviews for shortlisted candidates are expected to take place:	The week commencing January 22 nd

APPLICANT CRITERIA		
<i>Candidates must also meet the criteria for acceptance on a doctoral programme as set out by the host institution's Postgraduate Admissions Service. The successful candidate will be required to submit a postgraduate application to their host institution following notification that they are to be awarded a conditional CDA studentship, and meet the conditions of the offer of a place on the doctoral programme.</i>		
Education and Professional Qualifications	Essential Criteria	An excellent master's degree in design and/or biotechnology
	Desirable Criteria	A bachelor's degree in architectural design
Research and Impact Experience and Training	Essential Criteria	Independent research experience in algal bioplastic design

	Desirable Criteria	Knowledge of biomaterial design practice and research
Professional Practice and Job-related Experience	Essential Criteria	Experience in creative practice in design
	Desirable Criteria	Professional design experience
Interpersonal Skills	Essential Criteria	Excellent written and verbal communication skills
	Desirable Criteria	Empathic listener
Other Factors	Essential Criteria	Awareness of equality, diversity and inclusion (EDI) values
	Desirable Criteria	