

QUEX Institute Accelerator Grant Scheme 2019 Application Form

Please return the completed form to QUEX@exeter.ac.uk and globalstrategy@uq.edu.au by 16 September 2019.

QUEX Institute Accelerator Grant applications must clearly detail intended funding submissions and other outputs that will result from this initiative. When completing this form, please remember to write in a way that is readily accessible to a general audience. Applications will be reviewed by an interdisciplinary panel.

Please review the QUEX Institute Accelerator Grant Scheme 2019 Guidelines for Applicants before completing your application

1. Applicants (please add further lines if there are more applicants)	
Lead Applicant (1)	
Name	Dr Sarah Hartley (PI)
Post	Senior Lecturer
Appointment type	fixed term
Appointment	academic
Department	Science, Innovation, Technology and Entrepreneurship
Institution	University of Exeter
Email	Sarah.hartley@exeter.ac.uk
Co-Applicant (2)	
Name	Professor Karen Hussey (Co-I)
Post	Professor and Director
Appointment type	fixed term
Appointment	Academic
Department	Centre for Policy Futures
Institution	University of Queensland
Email	k.hussey@uq.edu.au
Additional Applicant (if applicable) (3)	
Name	Dr Pedro Fidelman (Co-I)
Post	Senior Research Fellow
Appointment type	fixed term
Appointment	research
Department	Centre for Policy Futures
Institution	University of Queensland
Email	p.fidelman@uq.edu.au
Additional Applicant (if applicable) (4)	
Name	Dr Katie Ledingham (Co-I)
Post	Lecturer
Appointment type	fixed term
Appointment	academic
Department	Science, Innovation, Technology and Entrepreneurship
Institution	University of Exeter
Email	k.a.ledingham@exeter.ac.uk
Additional Applicant (if applicable) (5)	
Name	Dr Caroline McCalman (Named Researcher)
Post	Postdoctoral Research Associate
Appointment type	fixed term

Appointment	research
Department	Science, Innovation, Technology and Entrepreneurship
Institution	University of Exeter
Email	C.McCalman@exeter.ac.uk

2. Title / Name of proposed initiative (max 70 characters, can be provisional)	
Global gene drive governance for climate adaptation and conservation	
Start Date:	1 Februray 2020
End Date:	31 July 2020

3(a). Please specify one or more of the QUEX Themes that this project aligns to:	
Environmental Sustainability	
3(b). Please specify one or more of the QUEX Sub-themes that this project aligns to:	
Decision making tools for environmental sustainability Conserving species in a changing world Combating environmental change in marine and aquatic ecosystems Tipping points: Threats and opportunities	
3(c). Please specify one or more of the United Nations Sustainable Development Goals that this project aligns to:	
Goal 17: Partnerships Goal 16: Peace, Justice and Strong Institutions Goal 13: Climate Action Goal 3: Good Health and Well-Being Goal 14: Life Below Water Goal 15: Life on Land	

4. AMOUNT REQUESTED (Max AUD 50,000/ GBP 30,000) Funding will be provided in full to the nominated lead applicant in the currency of their home institution. The lead applicant will be responsible for the budget and spending and transfer arrangements.	
Total:	£29,967.97

5. Please provide a summary of your research (300 words max). Within the context of your identified QUEX theme(s), please describe your project using language that is readily accessible to academics of other disciplines and/or members of the public. Should your project be successful, this text may be used on the QUEX Institute website.	
<p>Gene drive is a cutting-edge genetic technology which involves the spread of a modified gene through plant or animal populations. To date, efforts have focused on the development of gene drive mosquitoes in Africa which have been modified so they cannot transmit malaria. More recently, researchers have started to explore the possibility of using gene drive to solve environmental sustainability and conservation problems with hopes to control invasive species such as mice and rabbits and protect coral reefs blighted by increasing oceanic temperatures – problems that are especially relevant in Australia. Gene drive is an unusual technology because it is designed to spread through and possibly eliminate whole populations or species making governance difficult -</p>	

gene drive is therefore a global, transboundary technology that will not respect political or geographical boundaries.

This timely QUEX partnership draws together world-leading social science experts at UQ (Environmental sustainability governance) and Exeter (gene drive governance) to understand the governance challenges associated with the movement of gene drive into the conservation and environmental domain. So far, few social scientists have engaged in this area, yet, understanding the governance challenges associated with the movement of gene drive into environmental conservation will be critical in determining whether and how the technology is developed and deployed.

Our partnership will begin the important process of developing a research agenda for gene drive governance in climate adaptation and conservation. We will identify case studies where the technology might address climate adaptation and conservation needs in Australia, the potential risks and concerns raised, and the governance architecture needed. Through workshops, we will expose our research agenda to an interdisciplinary network of researchers at our respective institutions, as well as with a handful of regulators engaged in environmental conservation, and the use of gene technology. Capitalising on this opportunity, we will shape the international debate through a short co-authored publication and prepare for a large-scale funding call to cement our partnership.

6. Describe your project in more detail. (500 words max). Please ensure that you:

- a) Provide background and context
- b) Outline the aims and objectives
- c) Showcase how your proposal is original, novel and has high impact potential

Gene drive is a cutting-edge genetic technology that spreads a desired gene and its phenotypic effect into a whole population. Combining gene drive with CRISPR Cas9 gene editing, scientists can modify an organism's genome, pushing a modification through a population to permanently modify or eradicate species in the wild (Roberts et al., 2016). Gene drive is most advanced in global health, however, its applications are increasingly being explored in the areas of conservation and climate adaptation (IUCN, 2019). In Australia, gene drive's potential lies in controlling the bleaching of coral reefs blighted by rising oceanic temperatures, flourishing of invasive species (particularly mice, rabbits, fox, cats and toads), and resurgence of vector-borne disease (particularly dengue) due to the increasing prevalence of mosquitos with increased rainfall and temperatures (Moro et al., 2018; Scudellari, 2019). The recent downgrading of the Great Barrier Reef's (GBR) health to 'very poor' demonstrates the global impact of climate change and the urgent need for solutions (GBRMPA 2019).

The potential benefits of gene drive for conservation may be significant. However, gene drive raises salient risks and ethical issues which have led to controversy and global opposition (CSWGGD, 2016). Importantly, gene drive is designed to spread across political borders and is therefore a technology with global consequences. For example, the New Zealand Law Foundation (2018) has argued that gene drive presents a 'constitutional moment' for biotechnology governance, which must 'bring local roots into global governance' (Kofler et al., 2018). In Australia, organisations and programmes such as the Reef Restoration and Adaptation Program, CSIRO and the Australian Institute of Marine Science (AIMS) are beginning to examine the potential of gene drive applications in conservation. However, to date, there has been little social science investigation into the governance of gene drive for conservation and climate adaptation in Australia or elsewhere. Without sustained attention to the social appraisal of risk and social expectations and preferences for governance, innovations in science and technology are likely to fail or generate unintended consequences (Hussey et al. 2019).

Combined, and using the QUEX Institute as our platform, we will draw on our expertise to interrogate new social scientific research questions around the use of gene drive for climate adaptation and environmental conservation. We will pay particular attention to challenges associated with (i) securing an appropriate global governance architecture and mechanisms to manage what are inherently transboundary interventions and (ii) identifying the potential perverse outcomes from the use of gene drive technology in environmental conservation, including but not limited to issues relating to biosecurity. The application of gene drive for conservation and climate adaptation is in the early stages so our partnership would enable QUEX leadership in this research space and enable us to inform and shape the development of regional and global intuitions for gene drive governance in conservation and climate adaptation.

Our QUEX partnership will achieve its aims through two work packages (WPs) . Hartley and Hussey will co-manage the project from February-July 2020. The team will meet virtually once a month and face-to-face at two workshops. Hartley and Hussey have a track record of successfully completed grants.

7. The plan - methodologies and approaches. (500 words max) Please provide a clear description of your project plan, including how the funds will be used. Please include the methods / approaches that you intend to use (with some justification as to why they are the most appropriate), a timeline for the proposed plan (taking into consideration that the project must be completed within 12 months) and give some clear idea of who in the collaboration will be responsible for each step along the way.

WP1 - Cross-fertilisation of gene drive and conservation (Feb-Apr)

Aim: Understand how gene drive research is currently being applied or likely to be applied to climate adaptation and conservation and identify viable case studies for further exploration. Through documentary analysis and interviews we will examine the following questions:

- How might gene drive address climate adaptation and conservation in Australia?
- Who is funding and shaping the trajectories of the development of gene drives for climate adaptation and conservation in Australia?

Plan of work:

- Documentary analysis of governance, scientific and position papers, websites, and news articles to identify and describe case studies of gene drive for climate adaptation and conservation (McCalman).
- Development of a short report (whole team) capturing key findings and recommending three key case studies for further exploration (i.e. coral bleaching for climate adaptation and rabbit control for conservation).
- McCalman to visit Queensland (March) for ten days to conduct 10-15 informal scoping interviews with scientists, conservationists and decision-makers attached to the three case studies to explore the possibilities and challenges of gene drive solutions to climate adaptation and conservation. Interviewees will be identified through Hussey and Fidelman's networks, as well as through those of our partner, Lacey (CSIRO). Interviews will be recorded and transcribed (McCalman), and analysed (whole team).

WP2 - Building capacity in gene drive governance (Apr-Jul)

Aim: Solidify expertise in gene drive governance through a well-funded, holistic and interdisciplinary QUEX partnership able to lead international research and shape global practice. Through two workshops, we will examine the following themes:

1. *Transboundary issues and global governance:* How can we develop an appropriate global governance architecture to manage transboundary interventions in ways that include meaningful, empowered and culturally relevant input from local people?
2. *Potential risks and concerns from the application of gene drive to conservation and adaptation:* What are the potential perverse outcomes from the use of gene drive technology in environmental conservation (including biosecurity) and how can governance mitigate these risks?
3. *Interdisciplinary knowledge co-production:* How can critical social science questions on the global governance and potential perverse outcomes of gene drives be integrated into scientific research trajectories and the practice of science?

Plan of work:

- We will hold two workshops, 1 x Queensland (Apr) and 1 x Exeter (Jun), each hosting 10-15 researchers from a broad range of disciplines working in climate adaptation, conservation and gene drive as well as key stakeholders and future collaborators. Each project partner will present on their expertise at the workshops.
- Possible stakeholders include the British Ecological Society (EX), CSIRO (QU), Office of Gene Technology, Australia (QU), Great Barrier Reef Marine Park Authority (QU), Queensland Chief Scientist (QU) Advisory Committee on Releases to the Environment (EX), WHO Cultural Contexts of Health expert group (QUEX), ETC group (EX), Gene Drive Research Forum (EX).
- The workshops will develop and interrogate new research questions around the use of gene drive for climate adaptation and environmental conservation, drawing on the results from WP1 and paying particular attention to our three themes in each of the three case studies. These questions will form the basis of a larger grant application
- A 4-page report drafted for circulation to participants (McCalman) as well as a 1500-word paper drafted for *Trends in Ecology and Evolution* (Hartley/Hussey).

8. Anticipated outcomes, benefits and non-academic impact (300 words max). Please articulate the anticipated outcomes of your project, including

- a) *Expected outputs (e.g. co-publications, policy papers, larger research or teaching grant submissions, teaching or mobility program etc.),*
- b) *Describe how the initiative will contribute to expanding and sustaining the QUEX Institute relationship (e.g. education, further research, growth of collaboration, the inclusion of other world-leading Institutions from across the globe, etc.),*
- c) *Highlight any expected non-academic impacts (influencing policy, end-users, wider public (socio-economic / health / environmental) benefits and influence.*

Our strong networks with those shaping gene drive globally mean we are well-placed to generate non-academic benefits and impact by shaping evidence-based decisions directly, not just in conservation but also in global health and agricultural applications of gene drive.

We intend to use the QUEX platform to:

- Support our nascent collaboration by providing the opportunity to work face-to-face for a period of time and develop the requisite track record for subsequent grant applications targeting ARC, ESRC, CSIRO, and Advance Queensland;
- Map this newly emerging field of research to identify and develop a relevant and internationally competitive research agenda for subsequent grant applications. Hartley and Hussey have a track record of successful grants in gene drive (Hartley) and environmental governance (Hussey, Fidelman);
- Identify colleagues in our respective institutions who may be interested in this research area and in joining our collaboration.
- Co-author a high-level policy report intended for the Gene Drive Research Forum outlining our initial findings and to secure interest in our future research. This Forum shapes gene drive development and includes Gates, Wellcome, FNIH, WHO, INCU, etc. Hartley has direct access to this Forum and will be speaking at its Ethiopia meeting in October 2019; and
- Co-author a commentary paper on the ethical, legal and social issues inherent in using gene drive for climate adaptation outcomes, to be published in *Trends in Ecology and Evolution*. This commentary will build on an existing debate in the journal about synthetic biology in conservation.

In addition, our project will contribute to the expansion of the QUEX Institute by:

- Explicitly ‘triangulating’ our respective collaboration with CSIRO, with both Hartley and Hussey working closely with social and natural scientists within CSIRO on the ethical, legal and social implications of gene drive (and synthetic biology more broadly) through the CSIRO-UQ Collaboration on Responsible Innovation, and Hartley’s involvement in the international advisory board of the CSIRO Responsible Innovation Future Science Platform.
- Expanding to world-leading partner institutions. Hartley brings Makerere University (Uganda), Gulu University (Uganda), NCSU (USA), University of Tromsø (Norway), ANU (Australia). Hussey brings CSIRO (Australia), Penn State (USA), Princeton University (USA), Oxford University (UK), the University of Auckland (New Zealand) and the University of Tasmania (Australia) as well as extensive relationships in state and federal governments, and international organisations.

9. Why the QUEX Institute? (300 words max). Please clearly describe / justify:

- a) Why is the QUEX Institute the best platform from which to launch, support or grow your collaboration?
- b) What will your collaboration and project bring to the benefit of the QUEX Institute and community?

Our expertise on the use of gene drive technology in global health (Exeter) and environmental conservation (UQ), together with our shared interest in the regulation and governance of new technologies, means we are well placed to initiate *new* research projects that build on our *existing*, respective programs of research. Indeed, the Exeter and UQ teams bring considerable research strength in two distinct areas which will benefit enormously from cross-fertilisation:

- Hartley, Ledingham and McCalman through their work on gene drive in global health, and

the governance challenges thereof (Hartley is a leading expert on the social science of gene drive governance for global health, advising Target Malaria, Médecins Sans Frontières, BBSRC, FNIH, Norwegian Environment Agency, and the UK House of Lords.), and

- Hussey and Fidelman through their work on the possible deployment of genetic manipulation (including but not limited to gene drive) in coral reef ecosystems, and the governance challenges thereof. Hussey is a leading expert on environmental governance and sustainable development, advising national and sub-national government agencies in Australia, as well as international organisations such as APEC, and non-government organisations such as WWF, the Climate Council and the Australian Academy of Science. Fidelman has expertise in policy, institutions and management in the context of sustainability and environmental governance serving as lead author for the UN Global Environment Outlook 6, theme co-leader (coastal and marine governance) for Australia’s Centre for Marine Socioecology, and cluster co-leader (climate change) for the Taskforce on Ocean governance of the Earth System Governance Project. Hussey and Fidelman lead the policy and regulatory focus of the Reef Restoration and Adaptation Program and the Blue Economy CRC, which are both focused on the challenges of deploying new technologies in the marine environment.




However, we have not worked together before and thus we do not have a track record yet, which means applying for ARC or ESRC funding would be premature at this point. Consequently, the QUEX Institute is the ideal platform from which to launch our collaboration – it will allow us to ‘test the waters’ of our collaboration, but with very concrete outcomes that reflect the QUEX Institute’s emphasis on “global research impact” and indeed the Institute’s key ambition to “publish high-level policy reports designed to inform and shape key government initiatives across the globe”. These ambitions reinforce the appropriateness of our proposed collaboration and are manifest in our proposed outputs (see Section 8).

10. COSTS: Please provide a breakdown of the costs associated with this project – this should include direct costs only. A brief justification for each element should be provided.

	Cost	Justification
Lead Applicant Institution (1)		
Eligible Staff Costs	£15,194.21	McCalman (PDRA) is costed at E26 for 36.5 hours a week for 5.5 months. Managed by Hartley and Hussey, McCalman be responsible for the documentary analysis, interviews, transcription, and report drafting. She will organise and participate both workshops and contribute to the short academic papers and non-academic reports.
Travel and Subsistence	£3,716.88	International travel, accommodation and subsistence for McCalman for 10 days/9 nights and Hartley for 4 days/3 nights, to allow for data collection and participation in the UQ workshop in April.
External Speakers/Facilitators		
Venue Costs	£603.00	Lunch, refreshments and workshop dinner for 10-15 participants at the Exeter workshop in June.

Other (detail)		
Co-Applicant Institution (2)		
Eligible Staff Costs		
Travel and Subsistence	£9,533.94	International travel, accommodation and subsistence for Hussey & Fidelman for 4 days/3 nights for participation in Exeter workshop. Domestic travel for 5 participants at UQ workshop in June 2020.
External Speakers/Facilitators		
Venue Costs	£919.94	Lunch, refreshments and workshop dinner for 10-15 participants at the UQ workshop in April.
Other (detail)		
TOTAL	£29,967.97	
Eligible Staff Costs	£15,194.21	
Travel and Subsistence	£13,250.82	
External Speakers/Facilitators		
Venue Costs	£1,522.94	
Other (detail)		

11. In submitting this application, you are confirming that: you have read and will comply with the guidance notes for the QUEX Institute Accelerator Grant Scheme; the information given is accurate; the costs have been approved by your departments' internal processes; the work can be carried out within 12 months; and a final report will be provided 2 months later.

SIGNATURE OF LEAD APPLICANT	DATE
	13/09/19
SIGNATURE OF LEAD APPLICANT'S HEAD OF COLLEGE/SCHOOL	DATE
	16.09.2019
SIGNATURE OF CO-APPLICANT	DATE
	15/09/19
SIGNATURE OF CO-APPLICANT'S HEAD OF COLLEGE/SCHOOL	DATE

12. Supporting documentation

Please attach any relevant supporting documentation, e.g. support letter if a third partner is involved, confirming participation and any relevant financial/in-kind contributions outlined in section 10; market research, etc.

13. Conditions of Funding:

Awardees have until **14 October 2020** to complete initiatives and expend the funding.

Funding is only provided for the activities as detailed in your application.

Expenditure of the award must not exceed the value of the award.

Details of the award may be listed on the QUEX Institute websites of The University of Queensland and University of Exeter.

All publications resulting from this project should include the following acknowledgement: *'This project was supported by the QUEX Institute – a partnership of The University of Queensland and the University of Exeter'*.

The QUEX Institute team may, from time to time, contact award holders to monitor progress and expenditure.

A final project report and financial acquittal will need to be completed and submitted by **14 December 2020**.