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Art and Intervention in the Stewardship of the Planetary Commons: Towards a Curatorial Model of Co-inquiry

Nicola Triscott

A commentary submitted in partial fulfilment of the requirements of the University of Westminster for the degree of Doctor of Philosophy by Published Work

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Abstract

This Ph.D. by Published Work examines five projects that took place over ten years, between 2007 and 2016, that were curated as part of the artistic programme of Arts Catalyst, an independent interdisciplinary arts commissioning organisation of which the author is the founding director. This programme of work sought to understand what form of curatorial model and interpretative framework could generate new artworks and co-produce interdisciplinary knowledge across areas of specialist research and geopolitical urgency.

The projects take the form of exhibitions, texts and edited books, which are presented as the portfolio of work. The selected projects are: *Malamp UK*, Brandon Ballengée (2007-2010); *Arctic Perspective Initiative* (2009-2011); ITACCUS – IAF Technical Activities Committee on the Cultural Utilisation of Space – and associated activities (2007-2014); *Holoturian*, Ariel Guzik (2013-2015); and *Wrecked on the Intertidal Zone*, YoHa, Critical Art Ensemble, et al. (2013-2016).

Through analysis of and reflection on the projects, this commentary proposes a curatorial model of interdisciplinary co-inquiry, which can foster an ecology of practices, enabling curators, artists, scientists, specialist experts and people with situated expertise to coproduce knowledge around matters of concern, particularly relating to human-environment interaction and common and extraterritorial spaces. It examines the roles of the curator in this model and how these might differ from those commonly understood as established curatorial practice.

The commentary further presents an interpretative and tactical framework of the planetary commons for curating art-led projects in the realm of ecopolitical concerns, that can engage audiences and publics with the art and ideas emerging from this co-inquiry approach. The combination of curatorial model and interpretative and tactical framework contribute to discourses on both inter/trans-disciplinarity and the role of art in relation to the politics of ecology.

The Ph.D. contributes to the field on several levels. Within curatorial studies, the interdisciplinary co-inquiry model reconfigures curatorial practice as a collective, inquiry-

driven, knowledge-producing practice, and provides a useful methodology for inter-/trans-disciplinary artistic practice in relation to the politics of ecology, while the framework of the planetary commons proposes direction and allows for investment in reciprocity through commoning practices. Beyond contemporary art, a curatorial co-inquiry model deepens and alters existing approaches for listening to, valuing, and synthesising different types of knowledge and expertise around current environmental and related social concerns. While the commentary argues for the planetary commons framework within the contemporary art space, there are wider implications for it as a complement and alternative to the dominant interpretative framework of the Anthropocene.

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Dedicated to my parents, who would have been beyond proud.

Author's declaration

I declare that all the material contained in this thesis is my own work.

Nicola Triscott, January 2017

Commentary

1 INTRODUCTION

1.1 Research rationale

The urgency for contemporary art to engage with other disciplines, especially science, in the face of successive and accelerating ecological crises in indicated by recent high profile art-centred programmes, such as the Haus de Kulturen der Welt's two-year investigation *The Anthropocene Project* (2013/14). In this commentary, I address two key problems relating to this exigency: interdisciplinarity (how to curate it), and art's engagement with the politics of ecology in a technoscientific society (how to frame a response and what experimental tactics might be used).

In terms of contemporary art's response to socioecological issues, a great deal of interest in recent years has been directed to the concept of the Anthropocene. However, the notion of the Anthropocene is limited in its ability to shape practical action (Vansintjan, 2015, Macfarlane, 2016) and Latour advises that "its moment of interest might be short-lived" (Latour and Davies, 2015, p49), which suggests a need for alternative interpretative frameworks. Connected to this is the question of how the expanded field of art can engage constructively with other disciplines, particularly science. While there have been attempts to map the breadth of this interdisciplinary engagement (Wilson, 2002, Sørensen Vaage, 2016), and numerous case studies of interdisciplinary artistic practice,[1] I suggest through my review of literature that less attention has been paid to curatorial practice in the realm of interdisciplinary art and science. In this commentary, I also touch on issues of the 'problem' of expertise in knowledge societies (Jasanoff, 2005, Grundmann, 2016) and recent calls for art to join with indigenous philosophies and environmental activism to challenge normative political and economic systems (Demos, 2016).

The contribution to knowledge of this Ph.D. by Published Work, comprising the commentary and supporting portfolio of published work, is two-fold. Firstly, it demonstrates and outlines a **curatorial model of interdisciplinary co-inquiry**, through

[1] Including many articles in the peer-reviewed journal *Leonardo*, which focuses on the use of contemporary science and technology in the arts and music and the application and influence of the arts and humanities on science and technology.

which I am able to work with curators, artists, scientists and others to explore the inter-relationships of culture, politics, science, technology, environmental change and governance. Secondly, it proposes a **tactical and interpretative framework of the planetary commons** for curating art-led projects in the realm of ecopolitical concerns. It contributes to discourses on both inter/trans-disciplinarity and the role of art in relation to the politics of ecology.

Whilst neither a model of co-inquiry nor the concept of the planetary commons in themselves are entirely new, their adaptation, elaboration and practical application to interdisciplinary art and curatorial practice represents a new contribution to knowledge in these fields. This knowledge takes the form of analytical commentaries (publications, texts), artists' projects (artworks, events and sociopolitical interventions in the public realm), exhibitions, and strategies for audience engagement.

A Ph.D. by Published Work is an opportunity to reflect back on a body of work and to examine it in an academic structure. The research presented in this commentary and portfolio of works was conducted through my curatorial practice over a ten-year period (2007-2016). The practical context has been my position as the founding director of Arts Catalyst, a non-profit art organisation that specialises in new artists' commissions and interdisciplinary projects. This institution-based role has enabled me to pursue a dedicated, coherent curatorial strategy and artistic programme, over an extended period, with the aims of extending contemporary art practices into the spaces and knowledge arenas usually associated with science and technology, and fostering what I term, after Stengers (2005), an "ecology of practices". This practice-centred research has involved field research, commissioning new artworks, curating exhibitions and events, writing and publishing.

Underlying and driving my curatorial practice has been what I see as an urgency, in an era of accelerating technological development and ecological crisis, for art institutions to engage with broader terrains than art history and to support artists to create new work in response to this contemporaneity. The 2007-16 programme built on the previous 13 years (1993-2006) of experimental curatorial practice at Arts Catalyst: commissioning art-science projects, exploring how critical transdisciplinary practice could be cultivated, and

developing thematic interests to explore intersections between art, science, technology and society.[2]

Around 2005 and 2006, I began to identify certain developments in art and scholarship that called for a response and that I felt were not, at the time, being adequately addressed in contemporary art:

- Climate change and environmental damage had reached the point at which the future of the planet was threatened, yet effective political action was not being taken. Many artists and arts organisations were already responding to the urgency of this crisis with programmes themed on climate/environmental change, including, in the UK, Cape Farewell, Tipping Point and the Royal Society of Arts' Art and Ecology programme. Their primary focus was on raising awareness. I felt there were gaps in the art world's response in terms of exploring how climate and environmental change knowledge is constructed, represented and shared with the public, and in addressing structures and systems of planetary governance and stewardship. By 2006, many scientists were using the term Anthropocene (see, for example, Ehlers and Krafft, 2006) as an attempt to conceptualise the extent of the transforming impact of human activity. At the time, this had not been taken up by the arts and humanities to any significant extent.

- Michael Hardt and Antonio Negri's influential book *Empire* was published in 2000 to huge attention. It argued that we are seeing a transition from imperialism centred on individual nation-states to an emergent "empire" that transcends borders: a complex web of sociopolitical forces, including transnational corporations and new networks of communication and control. Around the same time, the early 2000s, the work of political scientist Elinor Ostrom was having a large impact in the field of politics and economics. Ostrom's research focused on common pool resources and how humans interact with ecosystems to maintain long-term sustainable resource yields (Ostrom, 1990, 2002). Her findings on the effectiveness of these commons upended the established maxim "the tragedy of the commons" (Hardin, 1968). I felt that these two strands of thinking - around

[2] Including critical and experimental artistic engagement with biotechnology, biomedical science, ecology, extraterritorial space, orbital space and space systems, microgravity, and nuclear energy, in the context of the relationship between science and society.

supranational forces (Hardt and Negri, 2000) and the effectiveness of the commons - called for urgent reflection in contemporary curatorial practice.

- Sheila Jasanoff published *Designs on Nature* in 2005 and *States of Knowledge: the co-production of science and social order* in 2004, which outlined her ideas on the co-production of knowledge between experts and society, and how these interwove through culture and politics, which I felt highly pertinent to the direction in which I wanted to take Arts Catalyst. Whilst an influential figure in science and technology studies, at the time Jasanoff's scholarship did not seem to have influenced either art discourse or the scientific community.

The global commons emerged as an underlying conceptual framework through which these developments might be addressed. As well as linking three existing themes in Arts Catalyst's 2006 programme - outer space, Antarctica and the air/atmosphere - the concept of the global commons provided a conceptual focus to my ongoing interest in the relationship between science and democracy (Jasanoff, 2005) and in making scientific knowledge more open. With 2007 approaching - the 50th anniversary of the International Geophysical Year (1957-58) – the timing seemed appropriate to initiate an artistic and discursive programme underpinned by an inquiry into the global commons. Since 2009, there have been several significant developments in these areas which have further informed and fed into my inquiry.[3]

[3] In 2009, Ostrom was awarded the Nobel Prize for Economic Sciences for her analysis of economic governance, especially the commons. Her work was recognised for challenging the conventional wisdom by demonstrating how local commons can successfully manage local property without any regulation by central authorities or privatisation. In the same year, Hardt and Negri's *Commonwealth* (2009) was published, paralleling the rise of "the common" as a concept at the centre of both progressive politics and international governance debates, and thence its gradual adoption as a theme in contemporary art.

In 2009, Jasanoff was invited to be a keynote speaker at transmediale festival, Berlin. Her talk on 'Paths of humility in climate governance' was poorly attended but it was significant to see her ideas presented in an art context. Her talk emphasised that we should look to history for ideas of how to think about and respond to current problems, rather than seek the new paradigms that were being called for. I invited Jasanoff to be the keynote speaker at Arts Catalyst's second Eye of the Storm conference at Tate Britain later that year; which was also an opportunity for face-to-face conversation.

Since 2012, the concept of the Anthropocene has become an enormously popular topic in the humanities and culture, sparking wide-ranging debate and critical commentary.

1.2 Research questions

This commentary describes and discusses the research process and some of the outcomes of a curatorial programme of contemporary interdisciplinary art. In doing so, it aims to address the research questions underlying this programme:

What curatorial model can generate art, support artists, and co-produce knowledge across areas of specialist research and geo- and eco-political concerns, particularly relating to human-environment interactions and extraterritorial and common spaces?

What are the roles of the curator in such a model, and how do these differ from those understood as part of established curatorial practice?

What interpretative frameworks and curatorial approaches can engage audiences and publics with the art and ideas emerging from this model, and enrich engagement with the issues raised?

These questions are addressed by looking at a selection of five projects in the context of the Arts Catalyst's overarching 2007-2016 artistic programme. They have been chosen from a large number which I have curated or co-curated during this period. The outputs from these projects take the form of exhibitions, texts, and edited books, which are presented as the portfolio of work. These five projects are:

1. *Malamp UK*, Brandon Ballengée (2007-2010)
2. *Arctic Perspective Initiative* (2009-2011)
3. ITACCUS (2007-2014)
4. *Holoturian*, Ariel Guzik (2013-2015)
5. *Wrecked on the Intertidal Zone*, YoHa, Critical Art Ensemble, et al. (2013-2016)

In my curatorial practice, the elements of collaborative research, exhibition curating and text writing are intertwined and inseparable, as complementary forms of knowledge production. Each project I curate includes both exhibited works and written texts as part of a systematic process of inquiry and reflection. The process of reflection through writing and publishing texts helps to drive the overall project forward. The publications

extend and disseminate the project to wider audiences. Exhibitions and texts jointly serve to shape Arts Catalyst's artistic programme, influencing the choice and shape of future projects. For this reason, each project is presented – with one exception - through multi-part outputs, including both a curated exhibition and associated publication/texts as a single hybrid output. *Wrecked on the Intertidal Zone* is the only project that does not include a text, because this has not yet been published.

These projects are examined in the context of critical discussions about models of curating in contemporary and media art, contemporary art's engagement with other disciplines, specifically science, technology and international governance, and trans/inter-disciplinary knowledge production.

They are further considered in relation to issues they draw out concerning the commons and the global commons, and how the underlying theme of stewardship and governance is used in engaging audiences and publics with the projects.

1.3 Definitions of key terms

1.3.1 Curatorial practice

The word curate comes from the Latin word "curare", which means to take care. Historically, from the 18th century, its primary use in art has been to refer to the act of looking after collections of art and artefacts. However, the profession of art curator and the role of curating has expanded considerably over the last few decades. Today, as well as its original use as caring for art collections, curating also means selecting and displaying works for exhibition (while notions of what constitutes an "exhibition" also continue to expand, as do the presentation contexts for art), and making connections between new work, exhibitions and the history of art. This evolving role of curator and the expansion of the understanding of curatorial practice are discussed in the Contextual Review.

1.3.2 Interdisciplinary, interdisciplinary art, critical art

Through the 1960s and 70s, concern about the loss of unity in science due to

specialisation triggered debates about the need for interdisciplinarity. This was in the context of debates around technology gaps and protection of the environment (Weingart, 2012). Such discussions led to the idea of Mode 2 knowledge production (transdisciplinary) versus Mode 1 (traditional, disciplinary) (Gibbons et al, 1994, Klein, 2012). Rowland (2002) identifies two stories of interdisciplinarity. One is the bringing together of different kinds of knowledge and skill, to expand knowledge or to solve a practical problem.[4] Rowland refers to this as *trans*disciplinarity. A second story is that, far from collapsing the boundaries between disciplines, these boundary areas represent sites of contestation between different "regimes of truth". He calls this more radical approach "critical interdisciplinarity".

While Arts Catalyst is known for its work across contemporary art and science, I am cautious to characterise Arts Catalyst as an "art-science" organisation. This is because Arts Catalyst's cross-disciplinary collaborations are much broader than art and science, crossing also geography, science and technology studies, technology and law.[5] I prefer to describe Arts Catalyst's sphere of activity as interdisciplinary art, a practice that seeks to engage topics and subjects beyond those represented by one branch of knowledge, i.e. beyond art history. This breadth of disciplinary engagement is important to be able to situate science and technology in their cultural, societal and historical contexts. Within this, my approach has been, to use Rowland's terms, transdisciplinary, although informed by a keen awareness of the tensions of critical interdisciplinarity. Arts Catalyst's approach is transdisciplinary, involving art and science, and a sociopolitical critique or perspective. I will therefore sometimes us the term "critical transdisciplinarity". When I use the shorthand term "interdisciplinary art" in relation to Arts Catalyst's work, I imply this wider meaning. When I use the term "critical art", I mean art with focus on socially relevant subjects.

[4] Rowland notes that this approach associates collaborative research with Mode 2 research, in which the discipline is no longer a central construct (as compared with Mode 1 research in which academic knowledge is conceived in terms of disciplines).
[5] Another reason is because the fields and activities that call themselves "art-science" are extremely varied and therefore the term can be misleading, as I discuss in the Contextual Review.

1.3.3 Global/planetary commons

While there is no universally agreed definition of what constitutes the "global commons", it is generally understood to be those international, supranational and global domains in which shared natural resources are found. International law identifies four global commons: the high seas (including the frozen Arctic ocean), the atmosphere, Antarctica and outer space (Buck, 1998). The term "planetary commons" has been variously used to describe the natural resources of the planet, particularly common-pool resources that are not contained within one state (such as air or biodiversity), as well as the spaces within which these resources are found, including the oceans, atmosphere, outer space, the Arctic, the Earth's crust, and so forth. By using the term "planetary commons", my intention is to acknowledge the planetary turn in the arts and social humanities (Elias and Moraru, 2015), and thereby to redirect the emphasis of inquiry from governance, with its systems of regulation, to stewardship, the notion of responsible use and protection, as well as allowing greater consideration of non-human actants (other species, objects). It also gives more definitional freedom to include domains that have been argued, but not legally enshrined, as global commons. These include the Arctic - commonly if not legally regarded as part of the global commons of the Polar Regions -, biodiversity, and scientific knowledge.

1.4 Methodology

1.4.1 Research methodology

Every curator does research as they look for information on their collection of artworks (the collection curator), try to find the most optimal selection and arrangement of artworks for an exhibition or series (the exhibition/biennial curator), work with artists to enable new works to be produced (the commissioner/curator), and research artworks to write analytical commentaries for publication. My interpretation of the role of curator expands established understandings of curatorial practice, however I argue that I am simply contributing to a process of reconfiguring curatorial practice that has been ongoing since the early 1990s (O'Neal, 2012, and others – see Contextual Review).

Following Johnson and Karlsson (2010), who extends Scrivener's concept of *research through art* as "the enhancement of knowing through art" (ibid., p145), I suggest that curatorial projects that give us new knowledge of some aspect of the world also shape our understanding of what curatorial practice can do, and open new possibilities for future curating. Discussing Dewey (1934), Johnson and Karlsson propose "knowledge as a process of intelligent inquiry into and transformation of experience" (Johnson and Karlsson, 2010, p146). They note that "Dewey proposed knowing as an activity of thought in the service of constructive change in the quality and character of our experience …" (ibid., pp146-7). This understanding of knowledge as a process of inquiry and knowing as an activity of thought relates closely to how I understand my curatorial practice as research. Through this understanding, the processes of the curatorial inquiry and art *are* knowledge (as transformation of experience), as well as the inquiries *producing* knowledge.

My research combines collaborative curatorial practice with reflective and analytical thinking and writing that both consider the practice of curating (institutional set-up, commissioning process, exhibition organisation, facilitation of transdisciplinary projects) and develop critical discourse around the work produced. Thus, **curatorial knowledge** – as presented in this commentary and portfolio of published work - is created through reflection on the projects and further research around them. This curatorial knowledge takes two main forms: **curatorial knowledge** *from* the projects and knowledge *about* broader **curatorial methodologies and frameworks**. Project-based curatorial knowledge combines knowledge and ways of knowing from the inquiries with further research, and is presented in written texts by the author in the accompanying portfolio of work. Knowledge about curatorial methodologies and interpretative frameworks is presented within this commentary as the primary contribution of this PhD.

In addition, the inquiries produce knowledge of two types: **informative** and **transformative knowledge**. On an informative level, knowledge is produced through the methods used by the different contributors separately, such as localised propositional knowledge and presentational knowledge in the form of art, images, narrative and film. On a transformative level, knowledge is created by the contributors (including the curator) collectively, including ways of knowing such as various co-inquiry processes,

practical knowledge (e.g. tool usage, data collection and analysis, species identification), and experiential knowing, which can be expressed through presentational knowledge.

1.4.2 Curatorial approaches

My curatorial practice integrates five main approaches. The first two are common to most contemporary art curatorial practices (as described by several commentators, including Acord, 2010):

- Active: commissioning artists and organising exhibitions and events,[6] including collaborating with artists and other curators.
- Dialogic: interpreting and analysing artworks and exhibitions through articles, blogs and other writing.

The other three approaches are more distinctive to my curatorial methodology, reflecting my curatorial interests in relation to co-enquiry and knowledge production:

- Critical interdisciplinary and transdisciplinary
- Experimental institutional
- Experiential/performative

A **critical interdisciplinarity approach** indicates a criticality towards the production and mediation of knowledge, including how science is organised, produced and practiced. It situates my curatorial practice as a negotiation between cultural and knowledge producers and the politics of knowledge production. A **transdisciplinary approach** focuses on cultural production as a collective and cooperative mode of inquiry and research, alongside understanding how art functions to exchange and create knowledge and meaning through exhibitions, publications, events and other experiences.

My practice and position as a researcher require an approach that can straddle different disciplines, particularly of contemporary art and science, and therefore different

[6] Including conceiving exhibitions, research the subject, commissioning artists, consulting with artists over the work's creation, writing the press release, sustaining the exhibition, creating educational programming, archiving and documentation.

understandings of knowledge and research. My philosophical position is broadly that of critical realism (Bhaskar, 1978), informed by Stengers' "cosmopolitics" (2010), in that my critique of science's organisation and practice is not from the perspective of querying the validity of science's discoveries and theories, but from an understanding of science as socially produced and from an interest in the politics of knowledge. I originally trained in science and I am sympathetic to the scientific worldview, which broadly understands reality as independent from the subjectivity of the researcher/scientist (Ratner, 2002). This has often been contrasted with the perspective of the arts and humanities, in which subjectivity is acknowledged in the positioning of the researcher and "reality" tends to be understood as a complex and shifting set of social, cultural and material relations. However, these are abstract, polarised and stereotyped positions (Andersson, 2009) and do not represent how art and science are performed today. There have also been shifts in both the theory of science (including Popper, 1934, Kuhn, 1962, Pickering, 1984) and the position of the humanities (Latour, 2004a) that blur this positioning of art and humanities and scientific research as ontologically different.

An **experimental institutional approach** is key to the self-reflexivity of my curatorial practice. My position as director of a small-scale interdisciplinary arts organisation allows a constant process of reflection and the ability to swiftly reformat and reconfigure Arts Catalyst's curatorial activities, enabling the shape and content of the programme to emerge through the evolving interests, practices and discourse of those involved. I discuss this aspect of my curatorial practice further through an appraisal of the curatorial modality known as New Institutionalism in the Contextual Review (Section 2.1).

An **experiential and performative approach** involves understanding art and other disciplines, including science, as performative, and approaching the presentation of art as experiential. Approaching art as performative has nothing to do with art being performance-like, but is a specific way of approaching the production of meaning in art that draws on the notion of "performativity" (Butler 1993) to bring into perspective the question of what art produces in society. It shifts the focus from what art depicts to its affect and the experiences it produces in the world. This is not new - contemporary art has long been concerned with the artwork's effect on the viewer and the situation in which it takes place - but it is important to my approach to curating across art and science, as I also wish to examine and expose science's performativity. Approaching the

presentation of art as experiential, meanwhile, draws on experiential learning theory (Kolb, 1984) and contemporary art's history of creating and shaping experiences as art,[7] and means thinking about how to provide the visitor or participant the most affective and meaningful experience, so thinking about a person's encounter with art, including finding the work, the process of arriving, and how they interact with the work.

1.4.3 Curatorial methodology

The approaches described above have shaped my curatorial methodology, which seeks to enable long-range transdisciplinary inquiries and interventions into the co-production of science, technology, society and culture, as well as experiments with new forms and processes of curatorial and artistic inquiry and presentation.

In an uncertain and changing world, the question of how we can effectively inquire into complex human and natural systems, and gain new knowledge and understanding, is urgent. In such inquiries, if we wish to consider the dynamic interactions of people with each other, with social, economic, political, and technological systems, and with ecological and earth systems - Guattari's "three ecologies": mental, social and environmental (2000) – we require methodologies that incorporate tools and approaches from different fields.

Drawing together and working with groups of individuals with a range of interests, skillsets, worldviews, disciplines and practices as a curatorial practice is demanding. Over time, I have gradually crafted and evolved a curatorial methodology for creating transdisciplinary knowledge and artistic outputs. In doing so, I have found it invaluable to make a distinction between collective/cooperative and collaborative working.

Whilst cooperation and collaboration are often used interchangeably, they have distinct meanings. The Latin etymology of the words gives little clue to the distinction, since both translate as "working together", so actual usage is what distinguishes the two words. Looking at how the words are used by people across different fields, there is a general accord that collaboration implies an active, chosen involvement (even to the extent that

[7] From Kaprow's happenings in the 1960s to the designed interactions between individuals and objects that Bourriard described as relational aesthetics in the last part of the 20th century.

it was given a negative meaning in World War II, used for a "collaborator" – someone working with the enemy), whereas cooperate is used in a broader and more wide ranging sense of working together harmoniously, and indeed can be used to describe someone who is simply being "compliant". There also appears to be broad agreement that when collaborating, people are working towards an agreed, shared goal, whereas when cooperating people perform together although they may be working on self-driven goals (though common).

The rhetoric – and aspiration - of collaboration abounds in the discourse around interdisciplinarity, particularly in the art-science field, with the implication that those coming together from different disciplines will work to decide clear shared objectives and sets of outcomes (even that this working together may lead to new combined methodologies). However, from my early experience as a curator of interdisciplinary projects, I concluded that collaboration was rarely the most effective model for producing the most interesting outcomes and exchanges. Frequently, a "collaboration" became one-sided, with one of the disciplines making most of the decisions and benefiting most from the outcomes. As I run an art organisation, the primary benefit generally accrued to the artist and the art. This rarely drew out the best contributions from collaborators from other disciplines, particularly science, and sometimes led to tension. From other accounts, there are frequent examples of friction reported between collaborators across art and science, so much so that notions of "agonistic-antagonistic interdisciplinarity" are discussed (Barry, Born and Weszkalnys, 2008).

From the early days of Arts Catalyst in the mid-90s, moving through a series of experiments with different models of interdisciplinary curating - from conventional 1:1 artist-scientist collaborations and artist's residencies in science labs to multidisciplinary research groups, field trips, and remote labs - I found that asking people to work alongside each other (and frequently, in field trips and remote labs, to live alongside each other) produced more fruitful exchanges and ideas than the more laborious collaborative processes (Triscott, 2003). The notion of curating groups of people, or collectives of practices, became a key part of my curatorial methodology.

In the literature about collective curating, this quote from the Manifesta Journal expresses a similar distinction, within a conventional exhibition curating framework:

> It might be useful to make a distinction between collective curating as the shared responsibility of selecting, confronting and putting into a dialogue a series of art works and curational visions, and setting up a collaborative endeavour of shared authorship uttered as a single voice. (Arriola, 2009, p23)

When seeking to foster transdisciplinary knowledge and skills through curating a collective of practices, focusing on cooperation rather than collaboration is enormously helpful. In cooperation, people perform together while working on self-directed goals, yet common concerns. This more open process allows for spontaneous self-directed participation of the type that fuels peer-to-peer systems. A form of curatorial methodology that can link selfish yet common acts together can support and empower individuals, while fostering the emergence of new kinds of collective value. Frequently, of course, small eddies of close collaboration emerge within the directional stream of cooperation. Such systems are found everywhere in nature – cooperative interdependent networks in which selfish goals intersect and sustain each other, enabling larger, unpredictable patterns to emerge.

The curatorial methodology or model that I have developed over the past ten years, as discussed and elaborated in this PhD, is focused on collective and cooperative modes of inquiry. The overarching aims of these inquiries are to co-create knowledge and foster new forms of cultural production. These transdisciplinary inquiries are not separate from the distribution and display aspects of art. Rather, through an understanding of how art functions to exchange knowledge (as ideas, information, facts and skills) and meaning through exhibitions, publications, events and participatory experiences, such wider sharing continues and extends the inquiry and contributes new perspectives.

The role of the curator in the cooperative collective model of curating is challenging both to undertake and to articulate, particularly in the art world where a singular curatorial voice is still the most accepted modality. It is perhaps even more testing within the academic sector, where the principle of cooperative research is understood, yet the concept of a principal investigator demands a specific type of hierarchy.

A further development of this model has come from my desire to extend the notion of knowledge as a commons, to alter traditional relationships between art, knowledge and audience/recipient, and to broaden the scope of curatorial inquiry to incorporate the

knowledge and expertise of various communities affected by the concerns that the inquiry seeks to address. As such, I have found the practice of "cooperative inquiry" from the field of community-based participatory research useful in informing my curatorial practice.

The practice of co-operative inquiry was developed by Heron and Reason (Heron, 1996, Heron and Reason, 2001) from a concept of experiential research proposed by Heron (1971). The key idea of the co-operative inquiry is research *with* rather than *on* people. The model emphasises that participants are fully involved in research decisions as co-researchers. Co-operative inquiry involves two or more people researching a topic through their own experience of it, using a series of cycles in which they move between this experience and reflecting together on it (Heron, 1996, p1).

Co-operative inquiry creates a research cycle between four types of knowledge, reflection and action: propositional knowing (of facts, concepts and ideas, as in modern science), experiential knowing (through direct encounter with a person, a place or a thing, that involves empathy, and is difficult to put into words), presentational knowing (which grows out of the experiential knowing and enables expression through, for example, storytelling, art or movement), and practical knowing (knowing in action: actually doing what you propose). The research process iterates these four stages at each cycle, deepening experience and knowledge of the initial proposition, or of new propositions, at every cycle. (Heron, 1996, Heron and Reason, 2001).

Heron and Reason outline fairly strict defining conditions to the co-inquiry, including:

- all the active subjects are fully involved as co-researchers in all research decisions,
- there is explicit attention to the validity of the inquiry and its findings.
- there is a radical epistemology for a wide-ranging inquiry method that integrates the four types of knowledge.
- there are validity procedures. (Heron and Reason, 2001, p2-3)

Having stated this, Heron and Reason go on to describe numerous variants of the co-inquiry model in practice, including cases in which the initiating researchers are external to the culture or practice that is research focus of the group, and so cannot be full co-subjects.

As I am proposing a curatorial model of co-inquiry, it is pertinent to ask here: is my curatorial model of interdisciplinary co-inquiry fundamentally different from Heron and Reason's model, or is it simply it an application of it in another context? On the surface, there are similarities, particularly given the breadth of the case studies that Heron and Reason describe. However, the context, intent and methodologies of the two models – even in their idealised forms - are very different. Heron and Reason's model is rooted in developing a "science of people" and – in its original formulation - was largely applied in medical-social contexts, whereas a curatorial co-inquiry model is an expansion of curatorial practice centred on how to curate an artistic programme with relevance and impact, while at the same time generating critical transdisciplinary knowledge across other fields. Heron and Reason's model is based on people examining their own experience and action carefully in collaboration with people who share similar concerns and interests. A curatorial interdisciplinary co-inquiry model involves the artists and key co-inquirers (including scientists and lay experts) in examining and reflecting on their experience and actions, but doesn't require including *all* the participants who have contributed to the inquiry in this reflection. The focus of Heron and Reason's research process is on the group, as both researchers and subjects, whereas the focus of the curatorial process is on developing an ecology of practices and remains art-centred. I can imagine conducting a Heron and Reason style co-inquiry within a curatorial project (or at least elements of its methodology), but not using it as a model for the breadth of inquiry

1.4.4 Curatorial methods

I curate the Arts Catalyst's programme around thematic strands of investigation. Within these broad thematic strands, we invite artists to pursue an inquiry (sometimes as a solo project, occasionally within the framework of a group project leading towards an exhibition) and we support and creatively collaborate with them throughout the whole process of research, development, production and presentation. Collective and collaborative working is critical to my curatorial practice. I work with artists, curators, producers, scientists, and other knowledge creators and cultural producers, sometimes on short-term projects, often on projects or series of projects spanning several years.

Critical writing is an integral part of my research and curating methodology. Writing enables me both to reflect in detail on the projects I have curated, and to connect my

curatorial projects to a wider consideration of contemporary art in relation to late 20th and 21st century technoscientific culture and society, and thus to generate curatorial knowledge. My writing takes the form of a blog, papers published in journals, and book chapters. Its audience ranges from contemporary arts audiences and visual arts and cultural studies academics to scholars in other disciplines, including geography and science studies, as a strategy to promote the contribution of contemporary art in other fields.

My practice requires researching and acquiring specialist knowledge across several fields. Specifically, I have found it necessary to acquire some basic knowledge of areas of science and technology (such as synthetic biology, genetic engineering, biodiversity studies, and climate change research), outer space systems and policy, as well as current debates in areas such as STS, cultural and political geography, and international governance. This knowledge has been acquired from books and journals, attending workshops and conferences outside the art sphere, and conversations with specialists.

2 CONTEXTUAL REVIEW

This contextual review is in four sections. The first section surveys the expanding and changing role of the curator in contemporary art, and discusses some relevant curatorial approaches from contemporary art in relation to commissioning new artworks and running institutions. The second looks at curating in connection to interdisciplinary work that crosses art, science and technology, identifying three broad and overlapping sub-fields: media art, contemporary art (in its specific engagement with science) and art-science. The third section discusses key literature relating to knowledge production and interdisciplinarity in the technoscientific society. The fourth section considers current and other potential tactical and interpretative frameworks around contemporary art and the politics of ecology.

Many things lie beyond the scope of this review, including detailed discussion of the definitions, strategies and practice of interdisciplinary research, theories and practices of knowledge co-production, the broad theory, history, politics and governance of the global commons, and the history of environmental art, although I touch briefly on these.

2.1 The expanding role of the curator in contemporary art

The role of the curator in the art world has become increasingly recognised and professionalised, with – since the late 1980s – a growing awareness of the curator's part in shaping exhibitions. The 1990s saw the appearance of the curator as a seminal figure in contemporary art, as new project spaces, biennials and art centres sprung up across Europe. Curatorial debates and published anthologies began to appear. Beginning in the 1990s and proliferating since 2000, MA courses and PhD programmes in contemporary art curating proliferated. These developments have been discussed by several commentators, including O'Neill, 2012, Smith, 2013, Castle, 2015.

Probably the most significant shift in the use of the term curator has been from its primary use in museology, to describe those who cared for, studied and displayed collections, to its adoption by organisers of temporary exhibitions (Gleadowe, 2000, Cook, 2004, O'Neill, 2012). The rise in prominence of the role and profession of curator in the 1990s, as applied to this latter field, led to a burst of discourse around the act of

curating in the contemporary arts and the role of the curator as a creative agent (O'Neill, 2012, Smith, 2013).

Alongside the expansion of the definition and roles of curating, descriptions of what constitute an "exhibition" also developed to include process-led projects and events (Gleadowe, 2000), "… emphasising flexibility, temporality, mobility, interactivity, performativity and connectivity" (O'Neill, 2003, p7). Notions of curating expanded to encompass a whole range of activities surrounding the exhibition, including "… lectures, interviews, educational events, residencies, publications, screenings, readings, and performances … an intertwining net of activities as well as diverse modes of operation and conversation based on more occasional, temporary alliances of artists, curators, and the public." (Páldi, 2011). Hoffman and McDowell (2011) introduced the term "the paracuratorial" to describe a form of curating "that is not understood as bound to exhibition making, but rather as encompassing, and making primary, a range of activities that have traditionally been parenthetical or supplementary to the exhibition proper".

The commissioning and enabling of new work, rather than simply selecting from a range of existing works, became an important component of curating. Even the processes of art production became part of exhibitions and biennials through temporary mediation systems (O'Neill, 2003). Christov-Bakargiev, artistic director of *dOCUMENTA(13)*, explains her reasons for this emphasis on process and commissioning:

> Of course, if the artworks already exist, and you pick them, you're going to get an exhibition full of really good art … it's easy. I believe instead in the journey that you go on with artists to create the works, fresh works, for your exhibition. (Quoted in Smith, 2015. p51)

As the understanding of the types of activity of the curator's profession has broadened, so has the curator's roles. Bishop (2007) discusses the proffered variety of roles of today's contemporary art curator. She notes Groys' comparison of the curatorial role to the cinema auteur, Storr's to both film director and literary editor, Rugoff's to that of a caretaker, Misiano's to the psychoanalyst, and Ammann's to the matchmaker. Bishop remarks on the growing set of skills demanded of the curator, including the enlarged administrative role, team leadership, presentational skills, fundraising, and publishing, many of which are associated with the marketing of large exhibitions.

O'Neill (2012) describes the act of curating as one analogous to artistic practice, particularly focusing on curators of large international exhibitions and independent spaces. In this, he might be challenged by Hans Ulrich Obrist, who has written that his understanding of his role as curator is to help the artist, although perhaps sometimes to "spar" with them. Obrist is emphatic that curating should follow the artist, and that "Artists and their works must not be used to illustrate a curatorial proposal or premise to which they are subordinate" (Obrist and Raza, 2014, p33).

Smith (2013) too emphasises the primacy of artists in understanding and innovating the exhibition-as-medium. Further, he highlights the institutional responsibilities that many museum staff curators have that are integral to the role, including fundraising, administration, team management and relationships with museum stakeholders.

This latter point is particularly relevant to my practice because, at the time of the ascendancy of the curator in the 1990s, I did not call myself one. Curators at the time were usually critics or artists (Ekeberg, 2014). There were no formal training schemes for curators. I referred to myself as the director of Arts Catalyst or as a cultural producer. The discourse around curating large exhibitions felt somewhat disconnected from the day to day reality of running a commissioning art organisation. However, as curating widened the range of activities that its role encompassed and began to comment on the institutional context, it began to seem more relevant to my practice. The introduction and rapid popularising of the term "new institutionalism" in European curatorial discourse in the early 2000s had particular resonance for me. New institutionalism was a term co-opted by Ekeberg (2003) from social science which he used to describe a small group of Norwegian and central European art institutions - mostly medium-sized and publicly funded - that had, in the late 1990s and early 2000s, appointed as their directors several curators who had made their names and developed their practices outside institutions. These directors were then trying to create experimental progressive art institutions in an attempt to change the relationships between curator, artist, art-making process and community (Ekeberg 2003, Möntmann, 2007, Kolb and Flückiger, 2014a). The directors of these institutions attempted to lead their organisations in a reflexive manner.

A defining characteristic of these institutions was that exhibitions no longer took precedence over other types of activity. Instead, equal emphasis was placed on a range of other functions, including research, commissioning, residencies, lectures, screenings, workshops, conferences and new forms of education programming (Kolb and Flückiger, 2014a). Discussion events tended to take the form of separate programming streams, or else exhibitions themselves became themselves dialogic. The organisations produced journals rather than catalogues. Relationships with freelance artists, curators and writers altered. Farquarson (2006) suggested that this new institutionalism in some senses represented "the absorption of institutional critique as theorised and practised by artists since the 1970s".

The curator-directors described by new institutionalism largely rejected the term, feeling it was imposed on their practice (Kolb and Flückiger, 2014b). Charles Esche then introduced his own term for his work "experimental institutionalism" (ibid.). But new institutionalism was an influence on some of us running arts organisations in the UK and, although it had a specific use, there were attempts to apply it to some UK organisations (Doherty, 2004).

The online journal OnCurating in its Issue 21 (January 2014) reflects on new institutionalism and its swift demise. Möntmann (2007) and Ekeberg (2014) note that most of the institutions discussed in Ekeberg's 2003 book soon after lost their funding and closed: "put in their place like insubordinate teenagers", suggests Möntmann (2007). Möntmann reflects on the reasons for this premature end:

> What is not wanted, in short, is criticality. Criticality didn't survive the "corporate turn" in the institutional landscape. This is not only due to the larger institutions that are run like a branded global company in an obvious way, like the Guggenheim, which provides the clearest example of how an institution is conceived and staged by politicians and sponsors. More and more this also applies to mid-sized and smaller institutions … which are supposed to be experimental, but find themselves increasingly forced into curating programs similar to an established Kunsthalle.
> (Möntmann, 2007)

Since these closures, the question is whether anything like an institution of critique still exists. Möntmann finds examples in the South: "Sarai or Khoj in Delhi, PUKAR and crit in Mumbai, or ruangrupa in Jakarta". Lind (2014), meanwhile, suggests it might be

applied "as an example of how deferred value is created, in the sense of how Sarah Thelwall discusses it in her 2012 report *Size Matters*". Thelwall (2012) describes how small-scale visual arts organisations in London produce a lot of value, but which does not become palpable until ten to fifteen years after the investments. These small organisations work with artists who are not yet established and develop new curatorial and educational models, therefore taking a lot of risk. Yet, these organisations are rarely the ones who can benefit from the value this activity creates. Rather it is larger mainstream institutions and commercial sector, which, further down the line, pick up these artists and adopt the methods that have been created, nurtured and supported by others.

In this context, it is important to note that the situation of ongoing precarity continues, if not has intensified, for small-scale non-profit arts organisations. Political attitudes and economic policies play a significant role in pressuring art organisations to move towards more commercial or philanthropic operating modes and such pressures tend to push small institutions towards standard cultural production, delivery-focused models, with attendant risks of dissipating both their artistic vision and institutional knowledge base.

Recently, an expanded notion of curating towards developing "networks of agents" has been floated. Lind (2009) terms this the "curatorial": "A way of linking objects, images, processes, people, locations, histories, and discourses in physical space". The curatorial mobilises history, institutional situation, artists and artworks, and architecture to create situations. Lind emphasises that, seen from the perspective of the curatorial:

> Curating is not so much the product of curators as it is the fruit of the labour of a network of agents. The outcome is a stirring of smooth surfaces, a specific, multi-layered way of agitating environments … The curatorial involves not just representing but presenting and testing; it performs something here and now instead of merely mapping something from there and then.
> (ibid.)

This description of the curatorial chimes with the notion - contained within my curatorial model of interdisciplinary co-inquiry - of developing a community of practices, participants and constituency.

2.2 Curatorial models relating to interdisciplinarity (art, science and technology)

Since the mid 1990s, artistic engagement with the ideas, methods and techniques of science and technology has become increasingly popular (Ede, 2000, Lucie-Smith 2002, Wilson 2002, Shanken, 2011, Myers 2012). These engagements cover such a vast and diverse range that I think it helps briefly to try to segment these in order to consider the different curatorial models used within them.

In this section, I identify three broad fields within which inter- and trans-disciplinary art, science and technology practices take place – media art, contemporary art, and art-science – and examine each separately through a survey of literature and examples of relevant curatorial methodologies. Certainly, these three sub-fields have areas of considerable overlap and very fuzzy borders.

2.2.1 Curatorial models from media art

The most identifiable field within this trend is **media art**, which has established its own system of institutions and university programmes, largely distinct from contemporary art (Shanken, 2011). The definition of media art seems to shift every year; however, definitions tend to be medium-specific: an engagement with media and communication technologies as the tools and media of artistic practice. Critique of these same technologies and their impact on society is an important element of the field. Media art's focus on has gradually expanded over time to include biotechnologies, now often identified as a sub-field called "bioart" (Kac 2007, Myers 2015), and the field is increasingly interested in the ideas and materialities of science, including nanotechnology, high energy physics and radio astronomy.[8]

Media art has its roots in the 1960s (Bijvoet, 1997, Gere, 2002, Packer and Jordan, 2001). Projects from the sixties that have been particularly influential in the emergence of media art include the US-based Experiments in Art and Technology (E.A.T.), launched in 1967 by engineers Billy Klüver and Fred Waldhauer and artists Robert Rauschenberg and

[8] This can be seen in the themes of curated new media art festivals and meetings, including Ars Electronica (Linz, Austria), Mutamorphosis (Prague, Czech Republic), and ISEA, the International Symposium on Electronic Art.

Robert Whitman, and Jasia Reichardt's exhibition *Cybernetic Serendipity* at the ICA, London, in 1968. Both E.A.T. and *Cybernetic Serendipity,* one a process to create new art, the other an exhibition, were curated initiatives, intended to engage audiences with practice and to situate art and technology experiments within the visual art world (one by using a known gallery, the other using artists with established reputations).

Shanken (2011) suggests that the separate development - even divergence - of media art from mainstream contemporary art over the past twenty-five years is due to two dynamics: the "fruitless" attempts by new media art to place its practices within the theoretical and exhibition contexts of mainstream contemporary art, and its success in developing its own language and institutional contexts.

Within the extensive literature of media art, there is relatively little from a specifically curatorial perspective. Cook (2004, 2008), Graham and Cook (2010) and Paul (2008) have made useful contributions. Graham and Cook (2010) interview several media art curators and identify common themes: the market value of media art's ephemeral objects, difficulties in museum administrative culture, challenges of archival documentation, and issues of authorship. Cook (2004, 2008) describes three practical models of curating for new media art: the iterative model, the modular model, and the distributive model. The Iterative Model proposes the development of an exhibition that invites artists to investigate a topic. The curator then skims off the projects that are potentially or actually the most successful or interesting and builds another show around them. The Modular Model is underlain by an expectation that - in the event of unforeseen difficulties – the curator can simply drop the problematic module or node of the exhibition. The Distributive Model assumes the curator is based in a small institution or agency, which "are often office-based and commission work in non-museum contexts" (Cook, 2008, p43). Cook notes that the Distributive Model organisation can, to some extent, "re-form and rebuild itself anew with each project" (ibid.). She cites the organisations low-fi, New Media Scotland, InIVA, Forma, Artangel and Locus+ as examples. Gavin Hogben suggests that Arts Catalyst, as well as Artangel, follows a similar model:

> Artangel and the Arts Catalyst represent the leading edge of this gallery-less nomadism, as they bring together themes, artists, venues, publicity, funding,

> insurances, and more, working in a role that resembles independent film production, or, perhaps, festival development.
> (Hogben, 2012, p308)

Cook's (2004) discussion of an ethico-aesthetic theoretical model for curating new media art contains some useful examples, especially the programming model at Banff Centre for the Arts, Canada, by Michael Century and Lorne Falk, that was non-media based but thematic. Thematic shows in contemporary art museums are the norm these days, but it is perhaps the residencies and commissions that feed into them that makes the Banff case distinctive, as well as its inclusion of new media art with visual art. Cook usefully notes that, in non-medium curating, the driving force is the research agenda.

2.2.2 Curatorial models from contemporary art and science

Contemporary art also engages with science and technology, but is not specifically interested in science and technology as media or tools or as systems for critique. Mainstream contemporary art, Bourriard attests (Art Basel, 2013), is reluctant to discuss specificities of medium through the production mode. Distribution (display) primarily matters to contemporary art, whereas production preoccupies media art. However, it is worth looking at examples where contemporary artists and curators have chosen to engage with science to develop a cross-disciplinary engagement.

Historically, there have been various artists' platforms that have developed collaborations with people from different disciplines. These include E.A.T., noted above, and the Artist Placement Group (APG), conceived by artist Barbara Steveni in London in 1965 and established in 1966 as an artist-run organisation seeking to refocus art outside the gallery, predominantly through attaching an artist in an industry or governmental department context for an extended period.[9] In the US, Newton and Helen Mayer Harrison pioneered collaborative working with biologists, ecologists, architects, urban planners and other artists, initiating dialogues to uncover ideas and solutions which support biodiversity and community development, and then proposing solutions and documenting their proposals in an art context. Another example of a cross-disciplinary artist group from the 1980s is the Ocean Earth Development Corporation, initiated by Peter Fend, described as "a blend of Conceptual art, activism and entrepreneurship"

[9] Among its participants were Barbara Steveni, John Latham, Barry Flanagan, David Hall, Jeffrey Shaw, Stuart Brisley, Hugh Davies, Andrew Dipper, David Toop, and Ian Breakwell.

(Cotter, 2001), it proposed tackling environmental problems through an application of art-as-design (ibid.). Today, the trend for artists' research platforms continues, with groups such as the *Arctic Perspective Initiative* (discussed in Section 3.3), Fernando Garcia Dory's Inland (Northern Spain), the Center for Land Use Interpretation (Los Angeles), and City as Living Lab (New York). I suggest that these artist-driven platforms often have much in common with the curatorial model of interdisciplinary co-inquiry that I am proposing, being practice-centred, reflective, and with a critical orientation. Indeed, part of my practice has been to collaborate with and promote such platforms.

In recent years, as science continues to gain ground as a realm for engagement for contemporary art, many major art institutions and biennales have organised exhibitions and programmes with science-related themes or connections. Mostly these follow traditional art museum exhibition-focused curatorial models. More experimental engagements include Hans Ulrich Obrist and Barbara Vanderlinden's *Laboratorium*, Antwerp, 1999, which paired artists and scientists over several months, the *Extinction Marathon*, a 24-hour discussion programme at the Serpentine Gallery in 2014, curated by Obrist and artist Gustav Metzger, and *dOCUMENTA(13)*, in which artistic director Christov-Bakargiev approached the multi-exhibition's curation through a dialogic, associative process of research between herself, the team, and various artistic and intellectual participants, including scientists. This process was apparent in the exhibition's physical exhibits, which included the staging of a series of milestone experiments in the development of quantum mechanics, led by physicist Anton Zeilinger.[10]

However, despite all the interest in science in the contemporary arts, it is rare on these platforms to hear questions asked, or challenges made, about how science is organised and financed[11], and how scientific knowledge is produced and mediated. This slightly blinkered perspective can lead, at worst, to an event such as Tate Modern's 2010 symposium, *Art and Science Now: The Two Cultures in Question*, at which a series of speakers, including Jonathan Miller, Ben Goldacre, and Alan Sokal, acclaimed the precision and contribution of science, while lambasting artists and humanities scholars for lack of rigour, gullibility, and self-indulgence. None of the speakers praised art's contribution.

[10] Although they were unintelligible to most visitors to the exhibition, even with physicists on hand to explain the physics to the interested

[11] Such as its close – often dependent - links to the military-industrial complex, including within academic science.

2.2.3 Curatorial models from art-science

The term "**art-science"** is increasingly used to describe initiatives that promote art and science in varied forms of interaction. It has even been described as a field or movement itself (Barry and Born, 2010, 2013, Shanken 2011, Edwards 2008). An online search for scholarly articles and books using the terms "art-science", "sciart" or "science-art" primarily provides references to articles in science journals,[12] rather than arts or cultural journals, and it seems that the primary usage of the term is within the broad science communication field, although, to confuse matters, it is also sometimes used as a shorthand for practices of art and technology more usually described as media art, as well as for art-technology initiatives relating to innovation agendas. There are considerable overlaps with media art and contemporary art but, because of its relationship to science communication, I discuss it separately.

The term art-science has been used with increasing frequency in recent years to describe initiatives that bring art and science into some form of interaction, exchange or conversation (Barry and Born, 2010, Wilson, Hawkins and Sim, 2014, Sørensen Vaage, 2016). Features of this art-science include art that incorporates scientific imagery or uses scientific techniques, art that explores scientific ideas, collaborations between artists and research scientists, and artist residencies in scientific laboratories and field stations. It is also used in the context of applying artistic creativity to further scientific innovation (Edwards 2008, Gewin 2013).

It is difficult to discern whether this is a distinct field with its own emerging discourse; however, a distinguishing feature is its association with science and science communication. Sørensen Vaage (2016) describes various museums and galleries that "define themselves as doing some form of artscience" (p4), citing ArtScience Museum Singapore, Science Gallery Dublin, Arts Catalyst London, Waag Society Amsterdam, and Le Laboratoire Paris. She also mentions transmediale, ISEA and Ars Electronica festivals, which arose from the electronic and new media art fields. Certainly, in recent years, there has been a proliferation of large international art-science museum initiatives, including the Wellcome Collection in London, the Science Museum in Dublin, and the ArtScience Museum in Singapore, as well as numerous small-scale art-science galleries

[12] Including *Science, Foot and Ankle International*, *British Medical Journal*, *The New England Journal of Medicine*, *Nature, Journal of Physics*, *Materials Today* and *The Lancet.*

and artists-in-labs schemes internationally. Here I focus on initiatives that began long ago enough to have developed an identifiable model of operating and a significant track record of programming (largely before 2010) and that have not closed. There is a bias in my review towards the UK, and then Europe and the USA, but this is a global trend.

There appears to be little reflective writing about the curatorial models and strategies used by these organisations, but some can be deduced from what is written about their policies, operations and programmes, as well as from observation and a few other papers and publications.

The familiar model of placing artists in labs is linked to various agendas, including cross-disciplinary knowledge exchange, research and development for new artworks, promoting art-technology collaboration for innovation, and promoting art that can help to promote or communicate science. The most famous example is, perhaps, the MIT Visiting Artists program, which has been running since 1961, although visual artists only appear on the roster since 1985 (Arts at MIT, no date). The Swiss Artists in Labs programme provides practical accounts and reflections on its artist residencies in scientific and technological laboratories (Scott, 2006, 2010). Another well-known example is the Collide@CERN artists' residency programme at the large particle physics research facility in Switzerland, a scheme which Ariane Koek, its creator and first director, describes as having a clear curated structure, but an open-ended attitude towards what is produced and when (Koek, 2012).

The innovation model of art-science is described by David Edwards (2008), founding director of Le Laboratoire, Paris (now relocated to Cambridge, Massachusetts, USA). Waag Society in Amsterdam positions itself similarly, stating that it "… provides art and culture a central role in the designing of new applications for novel advances in science and technology" (Waag Society, no date). Such usage of the term art-science also relates to the growing STEM to STEAM[13] movement in the USA, which argues for art and design to be coupled to science, technology, engineering and mathematics (STEM) subjects to help generate innovation.

[13] Science, Technology, Engineering Mathematics (STEM) and the Arts. The movement has had its own international, peer-reviewed, academic, online journal, The STEAM Journal, since 2013. There is also a STEMD movement for science and design intersections.

In the UK, the growth of art-science seems to have been strongly influenced by funding bodies. Barry and Born (2010) and Wilson, Hawkins and Sim (2015) both describe the Wellcome Trust's art awards for science engagement and the AHRC/Arts Council of England's Art and Science Research Fellowship as important influences in the rapid development of art-science in the UK in the early 2000s.[14] Barry and Born argue that these initiatives follow a logic in the relations between science and culture from C.P. Snow's *The Two Cultures* lecture (Snow, 1962), in which Snow bemoaned the gulf of mutual incomprehension between scientists and literary intellectuals. They suggest that these funding schemes drew similar connections between the lack of communication between the arts and sciences and the challenge of the economic demands of a technological society, thereby articulating the logic of innovation. Barry and Born (2013) further suggest that Arts Catalyst's policy and programme influenced the formation of these schemes, but that the funding schemes lacked an important and central aspect of Arts Catalyst's model – that of critical discourse:

> The funding initiatives grew around the foundations created by the Arts Catalyst, a small independent organisation which from the early 1990s pioneered art-science in the UK, which it envisaged in terms of encouraging artists' engagement with science and critical discourse around this field. … The version of "science-art" cultivated by the funding bodies, however, is widely thought to have relatively neglected 'critical discourse' on science.
> (Barry and Born, 2013)

The growing trend in the early 2000s for involving art in science communication led to the introduction of art programmes by science museums, including the Science Museum and Natural History Museum in London and the Exploratorium in San Francisco. Two major science museums in London appointed staff curators: Bergit Arends at the Natural History Museum (2005-2013) and Hannah Redler at the Science Museum (2003-2014). The stated curatorial aims of their artistic programmes relate to enhancing public engagement with the collections and science communication agendas:

> Out of this dialogue (between the Museum and artists) ensues the ability to commission exciting and innovative works that challenge the public's understanding of topical questions relating to the Museum's science communication agenda ...

[14] Barry and Born also cite several others, including the formation of NESTA.

(Arends, 2009)

> In bringing art works into the Museum we hope they will either act as provocative elements, encouraging visitors to add their own questions to those of the artists, or … offer unexpected entry points for visitors to explore science. (Redler, 2009)

Redler further notes that "Critics wouldn't be entirely unfair in claiming that to a certain point we 'utilised' the art … in a good way, to create new opportunities for encountering art and thinking about science". (Redler, 2016)

It is notable that both posts were created in the same period and were made redundant within two years of each other. One can speculate why these two major museums have shifted their priorities. It seems likely that budget cuts had an impact and that the contemporary art programmes were where some of the cuts fell. Redler simply notes that "Neither the Science Museum nor the Natural History Museum have permanent art curators any longer." (ibid.)

Of the larger art-science themed museums which have opened in the last decade, the Wellcome Collection in London, set up in 2007 by Wellcome Trust, hosts the trust's permanent collection and programmes temporary exhibitions juxtaposing contemporary artworks with medical artefacts; ArtScience Museum, Singapore, which opened in 2011, hosts blockbuster art shows with science themes and science museum type shows; while Science Gallery Dublin, which opened in 2008, uses a slightly different model of thematic open calls to source exhibits for its temporary exhibitions, primarily targeted 15-25 year olds and broadly science-related. Of the three, ArtScience Museum is the only one showing art exhibitions without an explicit science communication agenda.

Curating models from the art-science field seem to follow fairly conventional strategies, such as the artist residency and the thematic exhibition. A few other curatorial methods exist, such as the production workshop (for example, MediaLab Prado's Interactivos workshops and Waag Society's BioHack Academies). Recently, Wellcome Trust introduced its Hub Award, which aims to brings researchers and other creative professionals together at Wellcome Collection and seeks to combine research and public engagement. Various processes have been identified as enabling the conditions for art-science or art-technology work (Malina, Strohecker and LaFayette, 2012). Malina (2016)

suggests that the spread of art-science projects and programmes internationally and associated discussions draw attention to a need to establish collaboration methodologies and training. He notes that many draw on design thinking approaches, "which avoid disciplinary framing in favor of problem- or inquiry-driven strategies" (p65).

2.3 Knowledge production and interdisciplinarity in the technoscientific society

Midgley (2003) has strongly criticised belief in the universal applicability of the scientific method and those who attempt to place empirical science as the most authoritative worldview. She argues instead for pluralist thinking – an understanding that there are many independent forms and sources of knowledge, and that we cannot hope to understand our humanity without poetry (or literature or music or the humanities) (Midgley, 2001). Midgley is an outspoken critic of exaggerated claims for science in certain popular science books (Midgley, 1985, 1992).

Latour's work on the social construction of science (Latour, 1987) and its enthusiastic acceptance within the social sciences, cultural studies and the arts, challenged science's assumption of the knowability of nature. Latour presented science as a process of constructing inconsistent models, which, on first readings, I felt misrepresented the rigour of the scientific method. However, over time I came to find his ideas inspiring, particularly when reflecting on commissioning artistic projects and artists' residencies in labs that investigated science and technology "in action" or "in the making". Since 2000, Latour has reframed and softened his constructivist ideas, concerned that the danger comes no longer "… from an excessive confidence in ideological arguments posturing as matters of fact … but from an excessive distrust of good matters of fact disguised as bad ideological biases" (Latour, 2004b, p227). He argues that the critical mind should deal with "matters of concern", and that his earlier mistake was to think that, in order to criticise "matters of fact", he had to move away from them and direct attention to the conditions that made them possible. Reality, Latour argues, is not defined by matters of fact, which are merely a subset of what he calls states of affairs. To extend this idea, while matters of fact are revealed without having to consider need or context, matters of concern are centred in need and exist only through context. The tenacity of climate change denial appears to be a primary trigger for Latour's reconsideration.

Stengers (2010), following Midgley and Latour, sees the problem not with science's particular positive claims but when it has pretensions to universality and denies the validity of other practices and discourses. Stengers does not oppose genetics research, for example, but rather any claim that somehow the "truth" of human nature is to be found in the genome and nowhere else. She sees science as a diverse, interdependent enterprise and argues that we should understand it through its actual practices of discovery and invention. Stengers clarifies her constructivist view of science by explaining that her point is not that scientific objects (neutrinos, genes, etc.) are socially constructed rather than objectively true, but precisely to get away from this binary alternative. This view has led Stengers to what she calls an ecology of practices, by which she means we should take into consideration how particular practices, science especially, relate to and impact on other practices. What science discovers about the world cannot be separated from science's impact on the world. Stengers is careful to distinguish between different sciences, understanding that the demands and obligations of theoretical physics are very different from those of animal behaviour studies, for example.

Uneasiness about the loss of unity of science goes back to the beginnings of specialisation in the early nineteenth century. In the 1960s and 70s, this led to calls for interdisciplinarity in order to produce useful knowledge for the protection of the environment and to bridge technology gaps (Weingart, 2012). The idea of transdisciplinarity was developed by Gibbons et al (1994) who discussed the emergence of a Mode 2 model of knowledge creation. This is contrasted with Mode 1 traditional knowledge production processes, which are investigator-initiated processes carried out by set of homogenous actors within one discipline, such as in a university department, while Mode 2 knowledge production is socially distributed, organisationally diverse, transdisciplinary and problem focused. An example would be when a network of university partners with different disciplinary backgrounds collaborate on an application-oriented problem with stakeholders from, for example, industry or other public institutions. The same authors, Nowotny, Scott and Gibbons (2001), take this further, particularly focusing on the dynamic relationship between society and science. They conclude that this relationship signals the emergence of a new contextualised or context-sensitive science. Further, they discuss how various publics, NGOS and social movements, including feminism, environmental and patients' movements, engage in critique and contestation of scientific research. They propose that this is played out in a

new public space "… where science and society, the market and politics, co-mingle" (p203), a space that they term the "agora". The Mode 2 model draws on the concept of "situated knowledges" (Haraway, 1988), which is knowledge placed within a context, whether socioeconomic, anthropologic, intellectual, historic or cultural.[15]

Much theorising around and practical strategies for interdisciplinary knowledge and technology production has unfolded over the past ten years.[16] Frequently noted in discussions of both interdisciplinary research are the difficulties presented by the different expectations, preconceptions and worldviews of people from different disciplines. In working across disciplines, it is useful to take into consideration the different "discourses" of those fields, a word which Foucault (1972) used to evoke the codes, conventions, representations and uses of language that generated fields of meaning – also as a certain way of speaking. He also introduced the term "discursive practice" to refer to a historically and culturally specific set of rules for organising and producing different forms of knowledge. These ideas alert the practitioner to be aware that, in addition to the spoken and written expressions of the sector or discipline, it is also useful to be sensitive to different codes of conduct, cultures, and unspoken (or rarely spoken) assumptions in other disciplines and fields.

In thinking about how we might produce knowledge from a broader mix of knowledges including community-based participatory research, I have often used the term "co-production of knowledge". My use of this term draws on its definition by Jasanoff as the dynamic interaction between society and knowledge or society and technology - "the ways in which we know and represent the world … are inseparable from the ways in which we choose to live in it" (Jasanoff, 2004, p3) - and also its use by Callon (1999) as a model for public involvement in scientific knowledge production.

Grundmann (2016) notes the limited function of science to provide reliable knowledge for practical political purposes and a need to complement the decision-making process with stakeholder groups that originate outside science. Callon (1999) outlines three models of participation by non-specialists (lay people) in scientific and technological

[15] Haraway's notion originated as a commentary on Sandra Harding's *The Science Question in Feminism* (1986), in which Harding applied standpoint theory (which concerns the ways that authority is rooted in individuals' knowledge and perspectives) to science.
[16] These are outlined and discussed by, among many, Sa (2008), Repko (2008), Frodeman (2012), and Barry and Born (2013).

debates, these being the Public Education Model, the Public Debate Model, and the Co-Production of Knowledge Model. In the first, science is deemed sufficient, but the public is deficient and needs educating. The second - public debate - model allows those knowledge and competencies to enhance and complete those of scientists and specialists. Examples of this include focus groups and citizen juries (Irwin, 1995). Moves were also made to extend this model "upstream" to public consultation in the earliest stages of scientific and technology research (Wilsdon and Willis, 2004). Callon argues that this model too denies the competence of "lay people" to participate in the process of knowledge generation. In the third model, knowledge is co-produced through a process of active collective learning involving those for whom an issue is of particular concern. Callon recognises that publics are situated and differentiated, possessing "specific, particular and concrete knowledge and competencies, the fruit of their experience and observations" (Callon, 1999, p85).

As previously discussed, Heron and Reason have developed a methodology that they call co-operative inquiry, a form of action research in which all participants work together in an inquiry group as co-researchers and as co-subjects. Everyone is engaged in the design and management of the inquiry, everyone contributes to the inquiry, and everyone is involved in making sense and drawing conclusions. In this way, everyone involved is able to take initiative and exert influence on the process. Heron and Reason criticise traditional science's methods in relation to the science of people for two main reasons, firstly, that there is often very little connection between the researcher's thinking and the concerns and experiences of the people who are actually involved, and secondly, that it tends to be a theoretical approach that doesn't help people find how to act to change things in their lives.

Today, we can see how these arguments have relevance to building community resilience in the context of climate change. If we are to understand the processes and complex relationships between environmental change, public wellbeing, political processes, and social action, then we need not only a multidisciplinary approach to the research, but also a way of involving those people who are actually affected.

2.4 Art and the politics of ecology

It is beyond the scope of this commentary to review the history of environmental art. However, it is worth noting that there has been a multiplicity of artworks and exhibitions in recent years addressing ecological issues and that these are part of a trajectory of ecological and environmental art from the 1960s to the present day. At any point in that history, it is interesting to consider the extent to which the artworks and shows of the day perpetuate or challenge dominant environmental paradigms, from wilderness (1960s) through Gaia (1970s) to today's sustainability and the Anthropocene. Two recent books that provide useful perspectives on this explosion in contemporary art dealing with environmental issues, climate change and ecology are Malcolm Miles' *Eco-Aesthetics: Art, Literature and Architecture in a Period of Climate Change* (2014) and TJ Demos' *Decolonizing Nature: Contemporary Art and the Politics of Ecology* (2016). Alongside the literature sit several institutional initiatives that seek to encourage artists' engagement with ecology, environment and climate change, including (in the UK and Europe) Tipping Point, the Royal Society of Arts' Art and Ecology programme, Cape Farewell and ArtCOP21.

In this section, I want to look especially at one of the dominant concepts in contemporary art's engagement with ecological issues - the Anthropocene – and propose an alternative framework of the planetary commons, before moving on to explore art's relation to the commons, the concept of the global commons and when it appears in art, and the recent planetary turn in comparative literature.

2.4.1 From the Anthropocene to the planetary commons

The term Anthropocene has taken a major position in the conceptual and theoretical landscape of the contemporary art world over the last three years, as demonstrated by a spate of recent and forthcoming books (including Davis and Turpin, 2015, Bubandt et al., 2017), a multitude of conferences,[17] conference sessions, and journal articles (for example, Morton, 2012, Braddock and Alter, 2014, Anderson, 2015), as well as recent

[17] Including Haus de Kulturen der Welt's *The Anthropocene Project*, Berlin 2013/14; *Anthropocene: Arts of Living on a Damaged Planet*, Santa Cruz 2014; *Anthropocene and Art*, Taipei Biennial 2014; *The Anthropocene Project*, Tate, London 2015; *Welcome to the Anthropocene*, ARTCOP21, Paris 2015; *Approaching the Anthropocene*, Santa Barbara, 2015; and *Museums in the Age of the Anthropocene – Art, Science and Changes in Contemporary Society*, Taipei 2016.

patterns of curatorial and exhibition-making practices that take the Anthropocene as a critical concept, which include the Taipei Biennale 2015, the Istanbul Biennial 2015, and the Haus der Kulturen der Welt (HKW), Berlin, whose *The Anthropocene Project* 2013/14 was a two-year programme exploring the hypothesis' implications for the sciences and arts through conferences, working groups, exhibitions, films and publications. The Anthropocene has been read as a call to re-envisage human history through biology and geology (for example, DeLanda, 2005, although his book precedes the popularisation of the Anthropocene concept) or, more usually, as a means of highlighting the acceleration and extent of detrimental human impact on the planet, and exploring its mechanisms and responsive politics (Latour and Davis, 2015).

Why the Anthropocene's enormous popularity in art and the humanities? Latour notes that it provided a rare point of contact between critical theory and science, and therefore was a turning point for interdisciplinary dialogue (ibid., 2015). Suddenly, here was a concept of interest to scientists, couched in scientific terminology, but which needed the tools and concepts of critical theory. It is also a compelling and poetic concept – entwining ideas of deep time, biological and geological formation, the circulation of particles in the air, and the history of technology and human agency - and so its wide, and initially rather uncritical, acceptance by the arts and humanities is unsurprising.

As the idea of the Anthropocene has expanded to become part of the social imaginary, and now scientifically acknowledged as being functionally and stratigraphically distinct from the Holocene (Waters et al. 2016), it has received a growing number of critiques. The thrusts of the critiques are several. They include that the Anthropocene is a misleading term stimulating a redundant debate (Scourse, 2016), and that it is arrogant - self-mythologising the human as super-species, the controller and killer of nature (Macfarlane, 2016), universalist, in that it implies all humans are equally culpable and equally impacted (Klein, 2014, Hartley, 2015, Malm, 2015), capitalist-technocratic because it collapses recent Earth history to its industrial and technological history, ignoring the ideologies and economy which drive them (Purdy, 2015, Moore, 2013), and thus tends to foster technological geoengineering solutions (Hartley, 2015), or encourages despair and defeatist (Malm 2015). Moore (2013) proposes it should be renamed the Capitalocene. Critical renamings abound: the Chthulucene (Haraway, 2015), the Anthrobscene (Parikka, 2014), the Misanthropocene (Clover and Spahr, 2014).

Klein's conceptualising of the climate crisis as a confrontation between capitalism and the planet – thus giving short shrift to the Anthropocene's implied notion of a universal human evildoer – has in turn been criticised for denying that we are all implicated (Gray, 2014, Kingsnorth, 2014). Aaron Vansintjan (2015) suggests that the Anthropocene "… fails to adequately frame the current situation, and in-doing-so allows anyone to co-opt it to their own solutions". He notes that it is neither political nor is it precise, and suggests other terms used by the climate movement that are more specific and still powerful: "degrowth, climate justice, ecocide, ecological debt, and 350ppm" (ibid.).

The most compelling of these criticisms are that the Anthropocene misses the political problem - that the origin of the crisis is not humans as an undifferentiated whole but systems of extractive capitalism - and that it provides no direction or dynamic for transformative political or social change. Disaster capitalism benefits from disorientation, and the Anthropocene fails to orientate us towards the type of change that is needed to transform the political economies of extraction, consumption and inequality that underpin the catastrophe and that spread its impact unevenly. Rather than uncritically endorsing and recirculating the Anthropocene concept and terminology, we should be exploring other frameworks, such as multi-species thinking, institutional liberation (Not An Alternative, 2016), ecological justice (Baxter, 2014), and community-based practices of resilience and adaptation.

I propose that the planetary commons provides a valuable alternative framework. It is evident that we are failing to manage our planetary commons - the planetary natural resources and domains that sustain us as a multi-species community of life on the planet - and that existing international laws and regulation are inadequate to address environmental crimes, particularly those taking place in the supranational and transnational spaces of the global commons.

Political economist Massimo De Angelis (2010) proposes that a concept of the commons needs three things: first, a common-pool of resources (non-commodified resources that fulfill people's needs), second, a community to create and sustain the commons (a group of commoners who define the rules of the commons), and then a commoning practice. De Angelis explains commoning practice through the example of the way that English commoners maintained and developed particular customs (such as grazing animals on

land, or collecting wood in a forest), which forced the king to recognise their rights (Linebaugh, 2008). De Angelis notes the importance of understanding that these rights were not "granted" but created as customs and then acknowledged as rights. "Commoning practices" then broadly describe the processes and struggles to access, share, care for, responsibly manage and benefit from the resources that sustain a community. Tactics of commoning involve drawing together a network of relationships towards mutual support and stewardship of our environment, with a shared understanding that some things belong to all of us: "res communis"[18], the essence of the commons.

Introducing the concept of planetary commons suggests a focus on practices of commoning that operate at multiple scales, from the planetary to that of locality or place, as well as on the legal and institutional structures that can support them. Through existing legal and institutional structures, artist Nabil Ahmed suggests, we may exploit the internal contradictions of capital, and thereby mobilise nation-states and juridical power as guarantors of rights: "from the rights to resources, land, culture, and commons to multispecies rights; a collective biocentric rights in the web of life". (Ahmed, 2014).

Across the planet, there are many struggles over resources and territory that suggest processes of commoning (Chatterton, Featherstone and Routledge, 2012). De Angelis (ibid.) notes that "communities" do not necessarily have to be bound to a locality; they can also operate through translocal spaces – networked rather than specifically geographical. Chatterton, Featherstone and Routledge (2012) further argue that the idea of "the common" can operate as a demand or principle - or a practice - of translocal political networks. In this way, tactics of commoning are not so much about creating locally controlled commons for marginalised people - although this is important – but about organising geopolitical challenges to shift the balance of power away from the multinationals and nation-states - Hardt and Negri's "empire" - towards grassroots movements for greater equity and climate justice, which are ideally globally connected.

[18] Res communis is derived from Roman law that preceded today's concepts of the commons and common heritage of mankind. It has relevance in international law and common law. The term can be contrasted with res nullius, which is the concept of ownerless property, often the justification for colonisation and the basis for enclosure by capitalism.

Translocal commoning practices, and their application to the planetary commons (the spaces and common-pool resources of the global commons), need new political and geographical imaginaries, and it is here that art can have particular power.

In the next sections, I will give a brief overview of the global commons, note significant literature around the governance of the commons and the global or planetary commons, and explore contemporary art's existing engagements with the global commons.

2.4.2 Art and the commons

Since the 1990s, artists, curators, and cultural theorists have asserted the importance of creating new social models and political collectives based on the notion of the common/s (Elias, 2016, Casarino and Negri, 2008, Roberts, 2015). Elias suggests that the late 20th century's relational aesthetics and the participatory art movement can be viewed through this perspective, and that these ideas ally with Naomi Klein's identification in 2001 of a radical reclaiming of the commons as part of an anti-globalisation movement (Elias, 2016, Klein, 2001).

Alongside this ongoing critique of, and attempted challenge to, neoliberalism through the reclaiming of the commons has been a growing awareness of the scale of degradation of the planetary ecosystem.

2.4.3 An introduction to the global commons

A detailed discussion of the definitions, distinctions and issues of governance of the global commons is outside the scope and size of this commentary. However, it is helpful to give a brief overview of the concept and use of the term global commons, note significant literature around the governance of the commons and the global commons, and give a brief overview of key literature exploring the interplay between global and local when it comes to environmental governance.

The concept of the global commons applies the ideas of the commons to the Earth's shared and unowned – or ownership contested - natural resources. The global commons

are generally defined as those resource domains or areas that are international, supranational or global. International law identifies four global commons: the high seas (oceans and seabed, including the frozen Arctic ocean), the atmosphere, Antarctica, and outer space (United Nations Environment Programme, no date). Vogler (2012) also considers the definition of the global commons to include the radio spectrum and possibly cyberspace. He notes that the global commons form an interconnected complex. Vogler points out that the global commons are both constructed and inherently political, rather than necessarily possessing particular inherent and objective characteristics. He remarks on the contradiction of resources such as biodiversity, which forms a vital part of the global ecology, being excluded from the category. He suggests that, while this may be due to their location within the sovereign territory of states, it is also the case that even to designate them as a commons, or as part of the common heritage of humankind, would have unacceptable implications for property rights and the economic sovereignty of states.

In discussions of the governance of the commons, the work of political scientist Elinor Ostrom is enormously important. Her decades of field research and analysis effectively discredited popular theories of the "tragedy of the commons" (Hardin, 1968), which maintained that private property was the only effective way to prevent finite resources from being depleted or ruined. Unlike most economists' methods, Ostrom started from reality rather than a hypothesis. Over decades, she studied and documented how various communities managed common resources, including grazing lands, forests, irrigation waters, and fisheries, equitably and sustainably. Ostrom (1990) showed how common property can be successfully managed by user associations, and she highlighted the need to consider the diversity of institutional responses when facing problems of collective action around common-pool resources (Ostrom, 2002). Ostrom's and other studies showed that, when individuals within a community are left to organise themselves, this leads to far more effective and sustainable management of the resource than when managed by sources external to the community affected, such as government agencies. She argued, however, that governments and larger organisations still have an important role to play in setting up the systems within which such self-organisation can take place. Her work had enormous impact amongst political scientists and economists, earning her the 2009 Nobel Prize in Economic Sciences.

Federici (2011) regards Ostrom's Nobel Prize as "official recognition" of a trend towards the commons becoming popular among mainstream economists and capitalist planners, and therefore sees this as indication that the idea of the commons is being appropriated and adapted to serve market interests. However, Wall (2014) praises Ostrom from an anti-capitalist perspective. Wall examines what the notion of the commons can contribute to constructing an ecologically sustainable future through an overview and analysis of Ostrom's work. He compares Ostrom's analysis with that of autonomist Marxism (Federici's tradition), which recognises the ability of the working class to organise themselves against capital.

Ostrom's work, and Wall's overview, offer valuable contributions to a debate that so often assumes the fate of our global commons - including the atmosphere - is tragedy. Respectively, they provide methodologies and clear insights into the role the commons can play in building a sustainable future, through the role of people who govern the commons, both locally and transnationally.

Jasanoff and Martello (2004) similarly argue for environmental-governance approaches that balance the local and the global. They note that global governance in coming decades will have to accommodate cultural, religious and aspirational differences, and respect - or even defer to - many aspects of the local when designing institutions that wish to transcend localism. They note how the meanings of the words global and local connect to political struggles around various environmental regimes, and consider that "Issues of this complexity can only be grasped by bringing together perspectives from several disciplines" (Jasanoff and Martello, 2004. p4). Jasanoff also discusses the visual repertoire of environmentalism, noting striking differences in how the Earth is imaged and imagined around the world with consequences that matter for environmental action, with implications for the relevance of art (ibid.).

Steinberg (2001) too emphasises the tension between the global and the local in terms of the governance of the sea, noting two opposing regimes with contrasting governance regimes: the coastal zone which is susceptible to being claimed by nation states, and the deep sea, designated by the United Nations as a global commons, "an unclaimed and unclaimable 'international' space" (Steinberg, 2001, p17).

As well as the extraterritorial spaces designated officially as global commons, the term global commons is frequently used to encompass the natural resources of the planet, such as air and biodiversity. Hess (2013) notes that it is in this wider notion of the global commons (as well as the designated ones) that we seem to be experiencing Hardin's disputed "tragedy": climate change, species extinction, water scarcity, acidification of the seas, antibiotic resistance. Because of this, Hess notes, there is an important relationship between global commons and knowledge commons:

> When global commons problems are not presented as commons, the message is that the public is not involved; that solutions do not lie within our grasp; that "someone(s)" in state and/or corporate governments will, hopefully, solve the problem. At the same time, too often policymakers are not even aware that a commons solution is an important and viable option to the state/private scenario.
> (ibid.)

Ostrom showed that solutions are found on the ground, through strong collective action, and Hess adds that these solutions also begin to reveal themselves in the collective sharing of local and scientific knowledge.

2.4.4 Art and the global commons

To what extent have art and cultural studies engaged with the notion of the global commons, as applied to its various domains? Clearly, there have been many artists' projects and exhibitions which deals with its geographical spaces - the **atmosphere**, the **oceans**, the **Polar Regions** and **outer space** – but to what extent do they connect these spaces with the politics of their governance and stewardship?

One of the clearest and most direct engagements has been artist Amy Balkin's *Public Smog*, an attempt to create a public park in the atmosphere through financial, legal and political activities. Her tactics, which I suggest are a form of commoning practice, have included purchasing and retiring emission offsets in regulated emissions markets, thus making them inaccessible to polluting industries. Thus, her park exists in airspace above the region where the offsets have been purchased and withheld. With the support of *dOCUMENTA(13),* Guzik also attempted to submit the Earth's atmosphere for inscription on UNESCO's World Heritage List. Her work draws attention to the

bureaucratic apathy and inertia that surrounds contemporary environmental governance on a global level.

While the Anthropocene points towards the rocks beneath us, many of the particles that are changing its geology (carbon particulates, radionuclides) are carried in our atmosphere. Sloterdijk (2009) argues that the 20th century was witness to a terrorised air space, in which people were deprived of a natural and assumed right to breathable air. He identifies the starting point for this age of "atmospheric terrorism" as the year 1915, in World War I, when Germany first used chemical gas as a weapon. Ideas of the relationship between air as medium (artistic medium, carrier of biological and other particles, habitat for birds and insects), air as human environment, and varied histories of air flight and warfare have been explored through the Arts Catalyst's series of Artists' Airshows,[19] and its commissioned film and installation with Critical Art Ensemble, *Marching Plague* (2006). Other well-known artists' projects working with air as medium in relation to its toxicity or other threat include HeHe's *Nuage Vert (Green Cloud)* (2008), in which the artists highlighted the vapour cloud emitted from Helsinki's Salmisaari power plant with green light, Hamad Butt's *Familiars Part 3* (1992), a Newton's cradle of glass containers containing chlorine gas, and Nut Brother, a performance artist from China who spent 100 days vacuuming the air in Beijing in 2015, taking the dust collected and using it to make a brick.

Turning to the oceans, literary scholar Buell (2001) notes of Melville's *Moby Dick* that, in Melville's imagining, oceans did not change. They were eternal and inexhaustible; endless oceans endlessly populated. The whale is therefore "… immortal in his species, however perishable in his individuality" (Melville, 1967, p354). But today, Buell remarks, the global commons of the deep seas are on the brink of tragedy and this has led to an "… oceanic reimagination" in literature (Buell, 2001, p29). This changing imagination of the sea can also be seen in visual art, although belief in its vastness and enduring mythical status are still evident in exhibitions such as *Aquatopia* (Nottingham Contemporary, 2013). But the ocean's degradation and contested status find representation in several

[19] Artists Airshow, 2004, Farnborough Royal Aeronautical Engineering Workshops; 2nd International Artists Airshow, 2007, Gunpowder Park, Essex; and the Great Glen Artists Airshow, 2010, HICA, Inverness-shire. Participating artists include Tomas Saraceno, Simon Faithfull, HeHe, Adam Dant, Stefan Gec, Esther Polak and Ivar van Bekkum, Ruth McLennan, Anne Bean, Rachel Chapman, Camila Sposati, Ben Blakeborough, Brandon Ballengée, Sonia Khurana, Flow Motion, Tim Knowles, Louise K Wilson, Luke Jerram, Zina Kaye, Miles Chalcraft, London Fieldworks, Alec Finlay and Susanne Norregard Neilson.

contemporary artworks. Helen and Newton Harrison's *Greenhouse Britain* (2007-9) is an audiovisual installation, which comments on the melting ice caps by mapping the impact of future sea rise on Britain's coastline, set alongside proposals for water barriers and environmentally friendly rehousing plans for the displaced. Meanwhile the contested ownership of the Arctic seabed is revealed in media circulated photographs of a Russian mini submarine planting the national flag on the seabed, staking a symbolic claim to the energy riches of the Arctic. The image was reproduced by artist Caleb Larsen in his ironic photographic diptych *Land Grab* (2008).

Images from the Arctic and Antarctic are widely used to represent climate change in both contemporary art and popular culture, often utilising an aesthetic of an idealised landscape (icebergs, glaciers) and the notion of melting ice. Doyle (2007) notes that, by presenting images of distant empty landscapes, these images effectively "relegat[e] climate change impacts to a remote and inaccessible place" (p142). I discuss the pervasiveness of this form of representation of the Arctic in contemporary art in a text in my portfolio of published work (V2 6.2.3, Triscott, 2011), noting that such images are also problematic in removing people, technology and politics from the picture. Miles (2014) also suggests that the focus on aesthetic images in several well-meaning projects addressing ecological concerns can serve to depoliticise the content. He praises the "… more engaged and long-term approach" of the *Arctic Perspective Initiative*'s work, one of the projects presented in the portfolio of published work (V2 6.2) and discussed in this commentary (Section 3.3). Other significant initiatives that have recently emerged connecting to the Polar Regions as a theme of remoteness and fragility (but questionably whether as a contested geopolitical space), include the Antarctic Pavilion in Venice Biennale, initiated by artist Alexander Ponomarev, and its associated Antarctic Bienniale, planned to be held in Antarctica in 2017 aboard international research vessels. The initiative joins a long list of boat expeditions taking artists to the Arctic and Antarctic, including those initiated by the organisation Cape Farewell and the artist Pierre Huyghe.

Over the last fifteen years, there has been a resurgence of interest in outer space in the contemporary arts, with a succession of international exhibitions on themes of space exploration and cosmology.[20] Alongside works that somewhat uncritically engage with

[20] Including *@rt Outsiders: Space Art* (Maison Europeene de la Photographie, Paris 2003), *Return to Space* (Hamburg Kunsthalle, 2005), *Stardust ou la dernière frontier* (MAC/VAL, Vitry-sur-Seine, 2007), *Space is the*

the images and ideas of off-planet exploration and cosmology is evidence of artists' ambivalence towards and questioning of the value and values of space activity, past and present. It is space activity in lower Earth orbit that most clearly impacts on the notion of space as a global commons, as it is here that clashes over property rights and exploitation of a common resource are mostly found. Artist Joanna Griffin has developed a body of work exploring our relationship with space technologies, often drawing attention to the human-made "architecture" of Earth's orbit – the ring of satellites, space stations and orbital junk that encircles the planet today. She has proposed a substitution of the notion of authorship of outer space for than of ownership (Griffin, 2015). I discuss Griffin's work and ideas further in an essay submitted as part of my portfolio of published work (V2 6.3.3, Triscott, 2016b), so I will simply note here the important contribution of Griffin's work and writings to the notion of space as a commons. Artist Marko Peljhan's *Makrolab* project (1997-2006) is similarly important to discussing the orbit-spectrum commons. Traditionally, the electromagnetic spectrum and satellite orbits have been regarded as common resources that no one country is entitled to appropriate. *Makrolab* was a conceptually layered and complex project, which has been interpreted in varied ways, however its action of scanning activity in the skies and lower earth orbit (such as radio and satellite communications) directly engaged with issues of ownership and regulation of the electromagnetic spectrum.

Two further commons that I argue to include within the global/planetary commons are biodiversity and scientific knowledge.

Biodiversity has been a regular theme in contemporary art for many years. In 1983, art dealers Ronald and Frayda Feldman commissioned Andy Warhol to address the issue. He produced silkscreen prints of ten endangered species: a bald eagle, black rhino, African elephant, bighorn ram, giant panda, Grevy's zebra, orangutan, Pine Barrens tree frog, Siberian tiger and San Francisco silverspot. Thirty years later, there are numerous art exhibitions and events on the theme, notable examples being the Serpentine Gallery's *Extinction Marathon*, a two-day event in 2014 conceived by artist Gustav Metzger and

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Place (ICI, USA, touring, 2006-8), *Space: About a Dream* (Vienna Kunsthalle, 2011), Tom Sachs' *Space Program: Mars* (Creative Time, NY, 2012), and *Space Odyssey 2.0* (Z33, Hasselt, 2013).

Serpentine curator Obrist, and the oeuvre of Mark Dion's work, exemplified by his exhibition *Systema Metropolis* at the Natural History Museum, London (2007).

Within contemporary art, I claim a place for Arts Catalyst at the forefront of combining art tactics with an engagement with science as a knowledge commons through a series of projects that aim to "democratise" science: sharing expertise and new tools with people and experimenting with different forms and approaches. We are accompanied by a new wave of amateur science activity, broadening from the traditional amateur astronomers and ecologists to a new breed of DIY bioscientists, and citizen and civic science projects, such as Public Lab in the US and the work of UCL's Extreme Citizen Science Group.

2.4.5 The planetary turn

The concept of planetarity emerged in the field of comparative literature. Spivak (2003) coined the term to name an ethical alternative to globalisation. As globalisation is driven by capitalist requirements for extracting resources and making profits, and imposes sameness over the face of the globe, Spivak proposed to overwrite it with a planetary vision of the world, which could pay attention to multiple perspectives and differences. Rather than a model of the world - the globe - constructed of political borders, latitude and longitude, and contour lines, the planet is concrete and ecological.

The notion of planetarity has been picked up and expanded on by several scholars across comparative literature, the arts and the social humanities. Dimock (2006) elaborates the idea by seeking out what she calls a "deep time" dimension to literature (but is, rather, a long human history), Blum (2015) relates planetary studies to ocean studies, while Elias (2016) aligns the planetary with the commons, drawing in the Internet as a new planetary collective. Elias and Moraru (2015) consider planetarity's refocusing from the regulative principles of the globe to the "stewardship" of the planet: "The regulative principle … raises uncomfortable associations with paternalism, colonialism, and monopoly capital" (ibid. p.xxiii). They note that the notion of "stewardship", which is interwoven with the "ecocritically informed" discourse of planetarity, can be positioned to take on politically less fraught connotations.

The notion of planetarity can also be associated with the scientific concept of planetary boundaries, an attempt to identify boundaries for nine Earth system processes, which (if they are not crossed) mark the safe zone for the planet (Rockström, Steffen and Noone, 2009). These boundaries relate to climate change, biodiversity loss, biogeochemical measurements, ocean acidification, land use, freshwater consumption, ozone depletion, atmospheric aerosol particulates in the atmosphere, and chemical pollution.

Following Cosgrove (2001), who examined how the evolving image of a unified globe shifted political concepts in the West, helping to shape ideas of globalism and globalisation, DeLoughrey (2014) zooms out to consider how the Earth has been imagined as a totality through satellite and space imagery and its relationship to environmental consciousness of the planetary biosphere, connecting this to the history of Cold War militarism. She proposes the term "satellite planetarity" as the vision of the globe that arose after the development of satellite imaging technology, a product of the Cold War space race (ibid., p265).

2.5 Summary

In this Contextual Review, I have examined the literature on contemporary curating and the expanding field of the curatorial, identifying key strategies such as new/experimental institutionalism that have informed my curatorial practice. I have surveyed curatorial practices relating to art and science and described several curatorial models and approaches that aim to generate art in engagement with the disciplines of science and technology. These models tend to follow conventional curating strategies from contemporary art or design and innovation incubator processes, although Cook (2004) identifies some useful examples of more research-driven models. The most valuable approaches, those that have most influenced my practice of co-inquiry, are those of artist-led research platforms and collectives, such as the Harrison Studio, Ocean Earth, and Inland.

The art world's engagement with science has moved, over the past two decades, from postmodern scepticism to a warm embrace, with the inclusion of scientists as discussants and exhibitors in major art events. Within this welcome surge of dialogue taking place today between contemporary art and science, however, there are rarely questions about

science's institutional structures and its knowledge production and mediation practices, and few of the curatorial models of art and science that I have identified are underpinned by a criticality towards the systems and politics of scientific knowledge production and mediation. I have therefore found it useful to look to discourses around knowledge production, interdisciplinarity studies, and science studies. From the latter fields, I have identified several key principles that underpin the curatorial model of interdisciplinary co-inquiry that I am putting forward as a significant contribution to curatorial knowledge. These principles include centring the inquiry in matters of concern, fostering an ecology of practices, co-producing knowledge through processes of active collective learning, and using an expanded epistemology to incorporate different types of knowledge.

I have also looked at interpretative frameworks relating to contemporary art and the politics of ecology, especially the dominant interpretative paradigm of the Anthropocene and its criticisms, and discussed the emergence of the common/s as a key idea in contemporary art practice since the 1990s. I have briefly surveyed key concepts and discourses around the global and planetary commons, and found that these have had relatively limited attention paid to them within curatorial and art practice and discourse, despite their ability to address political and social issues relating to environmental concerns. In proposing a tactical and interpretative framework of the planetary commons for guiding a curatorial approach to art that seeks to address environmental issues and geopolitical issues, I have drawn on ideas of commoning practices, knowledge commons, and planetarity.

In the next section, I very briefly describe and discuss a selection of projects that I have curated in the last ten years in my role as director of Arts Catalyst, examining the shaping and development of the curatorial model of critical transdisciplinary co-inquiry through the projects and the curator's roles within it. In discussing the projects, I will also consider how an underlying framework of the planetary commons has helped to shape their direction, production and presentation.

My curatorial practice has pioneered combining strategies, approaches, methods, and subjects of inquiry from across contemporary art and other fields, specifically environmental science, science and technology studies, interdisciplinary studies, and

community-based participatory research. Drawing on ideas as diverse as New Institutionalism, Mode 2 knowledge production, and Heron and Reason's co-inquiry model, I have contributed to a sustained and ongoing reconfiguration of the curatorial from an exhibition-focused approach to an inquiry-driven, artist-centred methodology, with a critical perspective and research strands that extend over multiple projects. In doing so, I have created an exemplary and influential model of a nonprofit arts organisation as reflexive art and research platform, able to undertake sustained cross-disciplinary inquiry, exchange, production and exhibition programmes, focusing on issues and knowledge arenas that are usually associated with science and technology.

3 PUBLISHED WORK

3.1 Introduction

Arts Catalyst's overarching artistic programme from 2007 to 2016 provides the context for the selected projects that are analysed in this section. Arts Catalyst's programme is itself an extended curated co-inquiry, in which I curate the conditions and the constellations of artists, curators, experts, partners, venues and resources necessary to develop a series of open-ended interdisciplinary inquiries, as well as the outputs. Within this, specific strands of inquiry are developed.

One of the underlying questions to this programme has been how to develop an interpretative and tactical framework[21] for projects that seek to engage with the complex inter-relationships between society, culture, ecology, science and technology. Around 2006, I began to be interested in the concept of the global commons as a way to draw together my interests in Earth system science, governance, and trans/supra-national spaces (such as outer space and the Polar Regions). This paralleled my interest in the knowledge commons and science commons, developing from Arts Catalyst's expressed interest in democratising science. Curatorially, I began to explore how people, locally, might engage imaginatively or practically with the global and science commons.

To open up and explore these ideas, I set broad themes and then sought to develop projects with curators and artists that could generate and weave new ideas and perspectives around my underlying questions. These broad thematic strands included:

- The Polar Regions
- Outer space
- Biodiversity and ecosystems
- Air/atmosphere
- Oceans
- Science in society and culture

[21] In using the term "tactical", I draw on the ideas of tactical media, a form of activist art practice, originating in the 1990s, that intervenes actively within a system (Garcia and Lovink, 1997).

The main research and exhibition programmes at Arts Catalyst from 2007 to 2016 are set out in the table in Appendix 1: Arts Catalyst Main Projects 2007-2016. All these exhibitions or activities were curated, co-curated or facilitated and advised by me as director of Arts Catalyst. The first five themes address specific domains of the 'global commons' – the Polar Regions, Outer Space, Biodiversity/Ecosystems, Air/Atmosphere and the Oceans. The sixth programme area – Science in Society – addresses underlying structures and impacts of the interplay between scientific research, technological development, society and culture.

The five projects I have chosen to discuss here are all projects for which I have created contexts for inquiries and then curated platforms for outputs. The projects illustrate a variety of ways in the planetary commons has been an underlying curatorial concept, through their focus on global commons domains (polar region, outer space, oceans), tactical deployment of "commoning practices", or critique of the structures and regimes that govern the global/planetary commons or the forces that enclose them.

Through curated exhibitions and events that manifest, share and continue to open the art and knowledge produced through the inquiries, and through published texts and books, I have contextualised these projects within both contemporary art discourses and debates across other fields. Around the overarching contexts of the global commons domains (polar regions, outer space, oceans, biodiversity, etc.) and interwoven research themes of knowledge production, planetary commons, commoning practices, multi-species perspectives, critiques of the structures that govern the global commons, and interventions into the spaces of important planetary commons, I have built translocal networks and communities of interest. I also have set up curating and writing collaborations with researchers from different fields, including biology, geography, polar studies, space research, marine conservation, and ecology. My writing, transdisciplinary collaborations and extended networks have enabled me to contribute to interdisciplinary discourses that cross multiple fields and weave back into contemporary art and curatorial discourse.

Thus, *Malamp UK* has modelled an artistic practice as realignment of scientific research and engagement, contributing to both experimental zoology (Ballengée and Sessions, 2009) and environmental art discourse (Triscott, 2010, Roberts, 2010, Nowlan, 2015).

Arctic Perspective Initiative has contributed to discourse on contemporary art's response to environmental change (Scott, 2013, Miles, 2014), including art historian TJ Demos' (2016) call for art to join with indigenous philosophies and environmental activism to challenge normative political and economic systems, and geopolitical discourse around an inhabited technologised Arctic (Bravo and Triscott, 2011). *ITACCUS* has helped to legitimise the role of art in the space sector, and contributed to discourse on the co-creation of society and outer space (Ormrod and Dickens, 2016, Triscott, 2016a), and the geopolitics of outer space (Triscott, 2016b). Guzik's *Holoturian* is contributing to animal studies discourse around the rights of other species, and progressive arguments in animal science that cetaceans having language and culture (Triscott 2016c). Through combining critical art practice with citizen science and participatory activities in a community setting, *Wrecked on the Intertidal Zone* presents a model of practice that both critiques expertise and empowers and makes possible different forms of knowledge making (Harrison, 2015, Hawkins, 2017).

Each project also represents a key stage in the emergence of the principles and practices of a curatorial model of interdisciplinary co-inquiry, which is discussed in more detail in the following project descriptions.

3.2 *Malamp UK*, Brandon Ballengée (2007-10)

3.2.1 Introduction

Malamp UK was a long-term research and exhibition programme, initiated by my invitation to artist Brandon Ballengée to undertake an artist-led investigation into amphibian deformities in the UK. The programme had several outputs, including commissioned artworks and film, public events programme and public lab, exhibition, edited book and published article, the following of which are submitted as part of my portfolio of research outputs.

Type of output	Title and date	My role
Exhibition: website and documentation (V2 6.1.1)	*The Case of the Deviant Toad: Brandon Ballengée*, Royal Institution of Great Britain, London 16 – 31 March 2010	Curator

Edited book (V2 6.1.2)	*Malamp: The Occurrence of Deformities in Amphibians*, *Brandon Ballengée*, 2010. Published by Arts Catalyst/ Yorkshire Sculpture Park.	Editor, with Miranda Pope.
Text (an introduction to the above book) (V2 6.1.3)	'An Itinerant, a Messenger and an Explorer: the work of Brandon Ballengée', Triscott, N, in *Malamp: The Occurrence of Deformities in Amphibians, Brandon Ballengée*. Arts Catalyst/Yorkshire Sculpture Park, 2010.	Author

3.2.2 Aims

My aims in commissioning and curating Ballengée's *Malamp UK* investigation were:

> To curate a structure for an open-ended artist-led interdisciplinary investigation, utilising artistic, scientific, activist and pedagogical tools and methods, in order to work towards a realignment of accepted models of how science is conducted and of public engagement in science.
>
> To co-produce new interdisciplinary and participatory knowledge-as-commons around a specific ecological issue (declining amphibian species) and issues of biodiversity loss, in order to develop an art-led model of collective inquiry and knowing that situates solution seeking within the scope of the community, rather than solely the domain of the expert.
>
> To explore exhibition formats and interpretative events to share and communicate the transdisciplinary and collective nature of the inquiry and knowledge produced.

3.2.3 Methods and project development

The methods chosen can broadly be divided into two parts: those of process and those of delivering outputs.

In curating a context within which to extend Ballengée's practice, I set up several opportunities, including a two-year residency at Yorkshire Sculpture Park, partnerships with the Landscape + Arts Project at Gunpowder Park, Essex, and Space Studios, London, and a collaboration with Professor Tim Halliday from Open University.[22] Participatory fieldtrips, biodiversity surveys, lab research and artist residencies were set up as part of a process suitable for the artist's interdisciplinary practice. The art institution residencies were chosen to position this cross-disciplinary inquiry within the art world.

Figure 1: Brandon Ballengée holding toadlets at Yorkshire Sculpture Park, 2008.

[22] In Yorkshire, Ballengée also connected with ecologist Richard Sunter and, in the US, worked with his long-term scientific collaborator Dr Stanley Sessions.

Figure 2: Brandon Ballengée's public biolab at Yorkshire Sculpture Park, 2008.

Ballengée and ecologist Richard Sunter identified a population of deformed metamorphosing toads near Yorkshire Sculpture Park (YSP) with a very high incidence of deformity and collected specimens for examination (Figure 1). During his residency over two summers at YSP, Ballengée led a series of public biodiversity surveys and workshops, alongside which he collected specimens from the toad population. He then worked with biologist Stanley Sessions to examine the collected specimens, involving a process known as "clearing and staining", which renders the soft parts of the specimen transparent or semi-transparent to study their morphologies.[23] Further research focused on predation studies, analysing specimens, and making further surveys at the site. Ballengée set up a series of tanks at YSP as an open biology lab, within which he investigated the possible effects of parasites and predators to try to determine what might be the cause of the malformations. Park visitors could drop in, chat with the artist or help with his research (Figure 2), extending his public pedagogic process. Ballengée also led public field trips, projects with schools, workshops, study days and events. Ballengée returned to North America to work with Sessions to study the morphologies of the collected toad specimens.

From this work, I chose to commission a film, curate an exhibition and publish a book about Ballengée's amphibian studies. Ballengée and Sessions also published a scientific

[23] The University of Leeds provided access for the artist to their laboratory and imaging equipment.

paper. The curated exhibition, *The Case of the Deviant Toad*, was shown at the Royal Institution of Great Britain. The book, *Malamp: The Occurrence of Deformities in Amphibians, Brandon Ballengée,* edited with Miranda Pope, was published by Arts Catalyst and Yorkshire Sculpture. I selected the writers, commissioned the texts and wrote the introduction.

3.2.4 Discussion of findings and outputs

Ballengée and Sessions introduce their "selective predation hypothesis", resulting from the Yorkshire study, in the paper 'Explanation for the missing limbs in deformed amphibians' (2009), published in the *Journal of Experimental Zoology*. The paper describes their finding that small predators, such as Dragonfly nymphs, selectively predate tadpoles and describes how, in their UK studies, this caused missing limb deformities. Although the scientific paper does not specifically state that the research was conducted as part of an artistic project, the art context is intimated by acknowledging and thanking both Arts Catalyst and Yorkshire Sculpture Park for commissioning, supporting and facilitating the study and the lab research.

In choosing to curate the exhibition, *The Case of the Deviant Toad* (2010) (V2 6.1.1), I wanted to reveal the interdisciplinary inquiry alongside the prints and specimens that are usually understood as Ballengée's artistic work, and to show how these facets of his practice are interwoven. I planned the exhibition and interpretative material to convey the complexity of interpreting the produced knowledge, rather than reducing it to a simple meaning. The exhibition was produced in close collaboration with the artist and with Arts Catalyst producer, Gillean Dickie, at the Royal Institution in London. It presented outcomes from the Yorkshire study, including high-resolution scanner photographs, videos and delicate preserved specimens of toadlets. The Royal Institution's atrium was a challenging space in which to work, and particularly difficult to light, but by placing Ballengée's large eye-catching prints - high resolution scans of cleared and stained specimens - upstairs on the well-lit balcony, we drew people down to the exhibition in the darker space below. Downstairs, the installation comprised wall-mounted videos showing feeds from the different tanks from his lab experiments (Figure 3), 'cleared and stained' specimens of toadlets (Figure 4), displayed in petri dishes on a

large light box, drawings and sketches made by the artists of nature specimens, and a documentary video.[24]

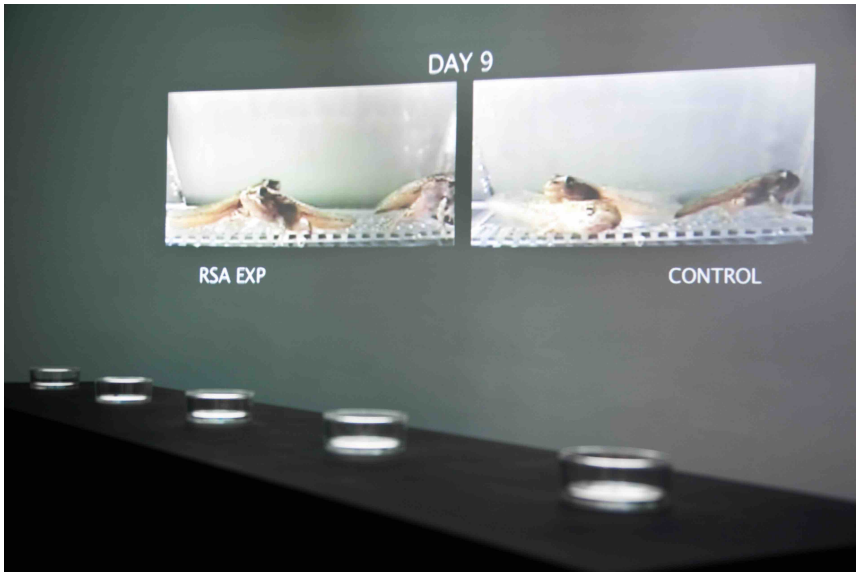

Figure 3: Detail of installation. *The Case of the Deviant Toad*, Brandon Ballengée, Royal Institution of Great Britain, 2010. Photo: Kristian Buus. Courtesy of Arts Catalyst

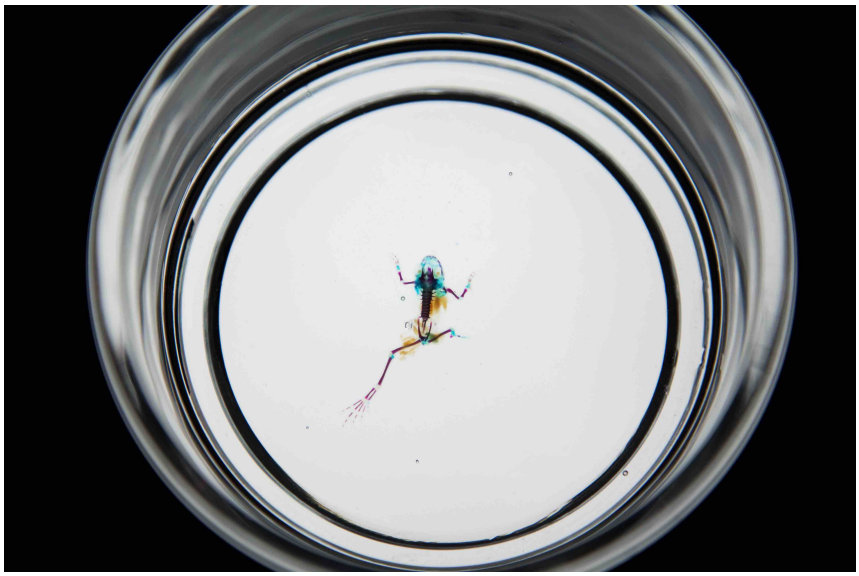

Figure 4: Detail of installation. The Case of the Deviant Toad, Brandon Ballengée, Royal Institution of Great Britain, 2010. Photo: Kristian Buus. Courtesy of Arts Catalyst

[24] The exhibition included a discussion event, with Ballengée in conversation with curator and scholar Giovanni Aloi, which I chaired. This event was a further opportunity to explain the interdisciplinary nature of the artist's practice as well as the complexity of interpreting his findings.

My aim with the book *Malamp: The Occurrence of Deformities in Amphibians*, *Brandon Ballengée,* (Figure 5, V2 6.1.2), was to reflect in depth on the project and Ballengée's practice, in the context of discourses around environmental art practice and biodiversity decline. The book brings together Ballengée's UK research with findings from his global amphibian studies. It includes texts on his practice from arts, science and ecological perspectives, including a keynote essay by the art critic and curator Lucy R Lippard, and essays by Clare Lilley, Head Curator at Yorkshire Sculpture Park, Dr Stanley K Sessions, Professor of Biology, Hartwick College and Dr Kerry Kriger, Director of Save the Frogs. In my introductory text to the book, 'An Itinerant, a Messenger and an Explorer: the work of Brandon Ballengée' (V2 6.1.3, Triscott, 2010), I discuss the interlinked components of Ballengée's artistic, scientific and pedagogical practice, and express my initial understanding of his work as providing a model of performative scientific research rooted in contemporary artistic practice, an interdisciplinary inquiry combined with public participation.

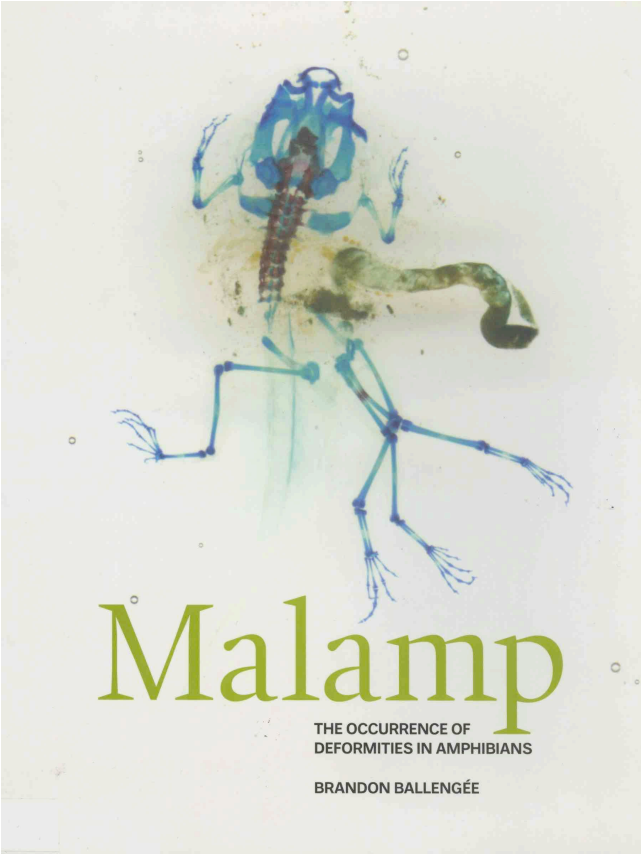

Figure 5: Book cover - *Malamp: The Occurrence of Deformities in Amphibians, Brandon Ballengée*

3.2.5 Summary and conclusions

Malamp UK presents a significant alternative to - or a realignment of - the standard model of scientific research and engagement, as well as a further extension of artistic practice into the realm of scientific knowledge production. The artist-led interdisciplinary and participatory inquiry focused on a **matter of concern** (Latour, 2004b), in this case, amphibian deformities, an increasing area of concern for scientists and environmentalists. (Amphibians are species that are extremely responsive to changes in their environment and therefore that serve as an "advance guard", serving as an early warning of habitat degradation (V2 6.1.3, Triscott, 2010) Ballengée's practice in collective knowledge production is consciously performative; in that he understands how his practice impacts on the world as well as reflects it (Pickering 1995).

While the study resulted in significant findings that were accepted for scientific publication, thus contributing to understanding the mechanisms for the abnormalities increasingly found in amphibians, the ground-breaking aspect of the project was the achievement of an integrated model of collaborative, participatory and pedagogical inquiry as an artistic practice. Through the exhibition and publication, the artist and I were able to articulate and share the ways in which his practice dismantles traditional boundaries that determine how science is experienced and disseminated. The usual scientific method consists of the collection of data through observation and experimentation, and the formulation and testing of hypothesis, the hard-won knowledge thereby obtained is then (sometimes) released into the public domain via a press release. Ballengée's practice short-circuits and realigns this process. From his position as an artist, Ballengée appropriates and adapts processes and formats of scientific research and opens them up for wider cross-disciplinary and "non-expert" participation. This approach strongly informed my later curatorial practice, as well as building on some earlier experiments at Arts Catalyst.[25]

The project co-produced new shared, collective, relevant and open knowledge about amphibian deformities in the context of declining biodiversity, through the involvement of a broad cross-section of people and disciplinary experts in a combined scientific and

[25] Examples include Kitsou Dubois and the Imperial College Biodynamics Group's art/science microgravity research project (2000-2005), and our work with Critical Art Ensemble and Brandon Ballengée in the CleanRooms exhibition (2002-3).

cultural process of knowledge creation.[26] By conducting primary biological research and field surveys (using rigorous scientific methods and standards) in which local ecologists, park visitors and local people co-operated, by setting up a public lab to look for and understand the causal mechanisms in producing toad deformities, utilising tools of visualisation, collective research and dialogue, and by creating an exhibition to share outputs and processes, the project engaged public participants, scientists, artists and curators in a multi-layered conversation about the implications and meanings of this practice and research.

As curator, my primary role was as "context creator". Context production is a term that Cook (2004) uses to refer to the curator's role in creating a space for debate around an artwork. Context creation works at an earlier stage in the formation of a project and more broadly, entailing the curating of people, locations, processes, histories and discourses (as well as objects of display) to create the conditions for the production of new art, new ideas about artistic practice, and new understandings of the meaning and significance of artistic and scientific practices in a social context.

As Cook notes, context production - or context creation – sits alongside content production in the roles of the curator. Content production is the facilitation of the presentation of art, whether that is new object into the world, or a new idea or new knowledge. In the case of *Malamp UK*, this included the interconnected ideas, facts and processes manifested through commissioned objects and films, curated in an exhibition, a discussion event, a short documentary film, and a published book.

By creating localised scientific, ecological and cultural knowledge around the issue of a deformed toad population in Yorkshire through a participatory inquiry, and contextualising this in terms of the planet-wide decline in amphibians and the implications for biodiversity, *Malamp UK* demonstrates a model by which science may be realigned with its cultural, environmental and sociopolitical contexts, and repositions scientific and ecological research as a commons, the shared responsibility and the right of citizens, rather than an abstracted and distant source of knowledge.

[26] The knowledge was made open through placing the film and summaries of the research findings online on the Arts Catalyst website, although the book was not free and initially the scientific paper was published behind a firewall.

3.3 *Arctic Perspective Initiative* (2009-2011)

3.3.1 Introduction

The *Arctic Perspective Initiative* (API) is an art, science and culture working group founded by Matthew Biederman and Marko Peljhan. I was one of the original members of the group. My curatorial involvement in API had a background in Arts Catalyst's previous partnership with Peljhan on his Makrolab project, from which API evolved.

API has produced multiple outputs, including community workshops in the Arctic, exhibitions, public events, an open space conference, and publications. The following are submitted as part of my portfolio of research outputs.

Type of output	**Title and date**	**My role**
Exhibition – website and documentation (V2 6.2.1)	*Arctic Perspective Initiative*, Canada House, London. 21 May-30 September 2010	Curator
Edited book (V2 6.2.2)	*Arctic Geopolitics and Autonomy*, 2011. Published by Hatje Cantz & API	Co-editor with Dr Michael Bravo
Text (chapter in the above book) (V2 6.2.3)	'Critical Art and Intervention in the Technologies of the Arctic', in *Arctic Geopolitics and Autonomy*, eds. Michael Bravo and Nicola Triscott. 2011.	Author

My interest in joining API was shaped by the Arts Catalyst programme, POLAR: Fieldwork and Archive Fever (2007-8), an artistic and interdisciplinary programme exploring cultural and scientific issues surrounding climate change. POLAR was a partnership between Arts Catalyst, artist and geographer Kathryn Yusoff (Open University) and the British Library. We were interested to discover how we could bring the contributions of artists, geographers, writers, historians and indigenous people of the North into the formal and scientific systems of climate change knowledge from the Polar Regions, and explore what new perceptions and understanding might open up.[27]

[27] For POLAR, we invited more than thirty diverse experts to take part in a lecture series and an international symposium at the British Library, and then to contribute to a book of polar archives, *Bipolar*,

3.3.2 Aims

My aims in becoming a curatorial team member in the *Arctic Perspective Initiative* (API) were:

> To contribute to developing a new artist-initiated research and production platform for working in the Arctic.
>
> To contribute to bringing together artists, indigenous people and other expertise to create conditions through which Arctic peoples, with the help of open-source technologies, systems of creativity and training, would be more able to collaborate equally and sustainably in the acquisition and exchange of information about the environment and changes to it resulting from climate change.
>
> To explore ways to share and legitimise ideas and material outputs from the project as both contemporary art practice and knowledge co-production, and in ways that draw public attention to the Arctic as an inhabited and contested space of ecological, technological and political interests.
>
> To develop my curatorial role and voice within this complex collaborative and multinational project, and to reflect critically on ideas and ongoing discourses within and surrounding the project.

3.3.3 Methods and project development

As with the previous project, the methods for API fall into those of process and those of delivering outputs. The difference with this project was that API had a wider group of collaborators and was far more remote.

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edited by Kathryn Yusoff and published by Arts Catalyst. In addition, I curated an exhibition and commissioned two new artworks.

API sprang from an initial field trip to the Canadian Arctic made by Peljhan and Biederman. Initially, they went to seek a permanent site for *Makrolab,* Peljhan's nomadic art-science research station. However, in response to the social and political context of Igloolik in Nunavut, this was radically rethought.[28] As tactical media artists, Peljhan and Biederman realised they had a set of skills and international networks that could contribute, working in collaboration with the situated knowledge of local people, to addressing some of the challenges faced in the North, particularly those that were a consequence of global warming. We put together small team and the project evolved into the *Arctic Perspective Initiative.* A consortium of art partners in Germany (HMKV), UK (Arts Catalyst), Slovenia (Projekt Atol – Peljhan's group), C-TASC (Canada – Biederman's group) and Iceland (Lorna), secured a European Commission Creative Europe grant to conduct a two-year programme of activities and events.

Figure 6: *Arctic Perspective Initiative* field exchange trip to Foxe Basin, northern Canada, with members of the Igloolik community, Summer 2009. Photo: Matthew Biederman. Courtesy Arctic Perspective Initiative

We selected methods that could develop a useful skills and knowledge exchange with people in the Canadian Arctic. Field exchange trips were a key method, together with collaboration with a group of creative media producers in Igloolik.[29] Peljhan and Biederman visited Igloolik, Iqaluit and Mittimatalik three times during this phase of the project on field exchange work, a term they coined to differentiate their collaborative

[28] Peljhan and Biederman realised that siting a new South-initiated research station in the Arctic would not be sensitive to local history and was unneeded by the communities.
[29] Through Isuma Productions, an indigenous media production company.

approach from science or social science field work.[30] While on field exchange trips, the artists took part in expeditions away from permanent settlements with their collaborators and other community members, where they conducted experiments in data collection, using UAV mapping and remote sensing, and gave community workshops on open source and free software tools for video and audio production (Figure 6, Figure 8).

Another tactic was to plan and organise an international design/architecture competition to design a mobile research and living unit, suitable for use by indigenous Arctic media workers and researchers, living and hunting away from permanent settlements (Figure 7). My role was as the lead organiser of the competition and member of the selection jury.[31] Iterative idea development took place between the team members throughout the design competition, meetings, field exchange trips and workshops in the North, and an Open Space conference in Dortmund, Germany. Michael Bravo of the Scott Polar Research Institute and University of Cambridge, who had been on the POLAR steering group, became a key advisor to the project.[32]

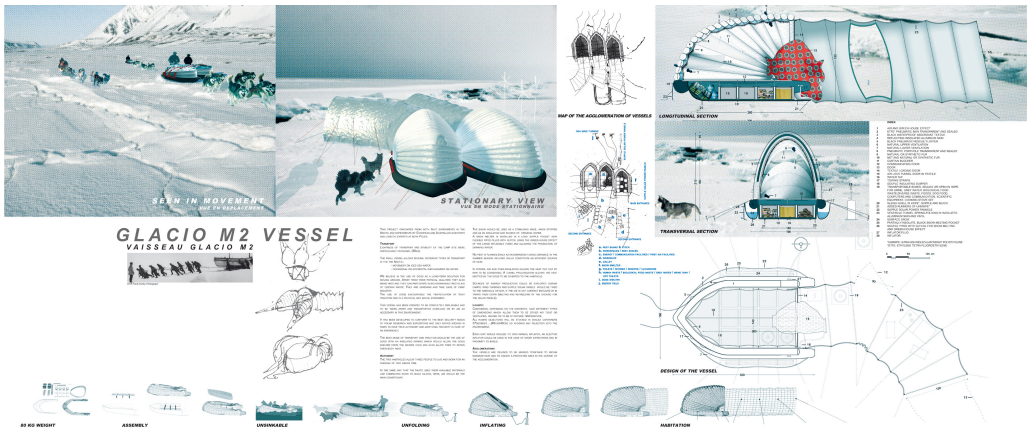

Figure 7: Catherine Rannou's entry, one of the three joint winners in the *Arctic Perspective Initiative* international design/architecture competition

[30] The remoteness of Nunavut and the huge expense of travelling there meant that I did not go on the field trips myself.
[31] We received over 100 submissions from over 30 countries and territories, although we found a relatively poor engagement with the specific nature of the brief for the Arctic (several entries were clearly reworked proposals for an Antarctica station, which is a very different environment and context). In the end, three joint winners were chosen, each design combining new technologies with aspects derived from Inuit life.
[32] As well as being an expert on Arctic geopolitics, Bravo had lived for some years in Igloolik. He had a background in the history and philosophy of science and was a former satellite communications engineer. He therefore brought a unique and invaluable set of knowledge and cultural sensitivities to the project.

For public outputs, I chose to curate a London exhibition and event, and proposed a publication, co-edited with Bravo, as part of a series of planned API books (in the end, only two were produced). Alongside the London exhibition, which took place at Canada House, I chose to curate a public event titled 'Contemporary Nomadism: Autonomy and Technology in the North' to explore some of the ideas and issues raised in the project.

3.3.4 Discussion of findings and outputs

Arts Catalyst's earlier POLAR programme (2007-8) helped to shape my understanding of the potential for curators to provide platforms for knowledge creation and exchange between diverse groups - cultural, scientific and public. I therefore saw the prospect of being a partner on the API project as an opportunity to explore and develop these ideas in a 'real world' context. POLAR had also sharpened my interest in how we might shift from science as the sole resource for addressing (global) ecological challenges to a broader and more inclusive approach to knowledge. Taking place during International Polar Year (2007-9), POLAR focused on the idea of the Polar Regions as global commons. Several participants had emphasised that international governance systems needed to admit local, traditional, and indigenous knowledges, both for sustainability and to connect with constituencies "on the ground". One of the most significant aspects of POLAR for me was a lecture by Aqqaluk Lynge, President of the Inuit Circumpolar Council and a native Greenlandic poet and activist, who noted that political and economic - and even scientific - interests give very little thought to the knowledge, interests and concerns of indigenous people of the circumpolar territories. Lynge called for scientists from the South who come to the North and take data from their "thin ice" to share that data more directly with the people living there (Lynge, 2007).

I was therefore interested in API's aim of co-developing and implementing new communications technologies and environmental monitoring systems and networks for use by indigenous people, bringing together open source and inexpensive technology and scientific expertise with situated knowledge. With the development of new affordable, and often open source, tools – including sensing devices and online networks - it was becoming increasingly possible for people to collect, share and act on local data, as well as to pool data and knowledge internationally. This was opening possibilities for a new locally initiated and self-directed versions of "citizen science". I wanted to be involved in

an art-driven project that utilised and developed these resources to enable people to be more directly active in their own environmental data gathering and interpretation.

Figure 8: *Arctic Perspective Initiative* field exchange trip to Foxe Basin, northern Canada, with members of the Igloolik community, Summer 2009. Photo: Matthew Biederman. Courtesy Arctic Perspective Initiative

Bravo and Triscott (2011, V2 6.2.2) note that: "… new media technologies are essential for maintaining the vitality of narratives that give places meaning" (p18), while Soukup points out that the richer multimedia capacities enabled by broadband internet and digital broadcasting open up a discursive space for communicating indigenous perspectives and representations that are much more sympathetic to their culture, because these technologies are not so narrowly textual (Soukup, 2011). The media and communications technology development was therefore a vital component of the work. As the project progressed through field exchange trips, work also started on developing a system for collecting and sharing environmental data with communities, which was one of my central interests for getting involved in the project after Lynge's lecture.

Curating an API exhibition in London, my aim was both to show the API platform in a UK contemporary art context and to highlight its contribution to community action in Nunavut, Canada, in a geopolitical context. Approaching Canada House (home to the Canadian Embassy) as a venue for the exhibition, I was motivated both by Canada House's high visibility in a central London location on Trafalgar Square and the strategic connection between the project and the Canadian Embassy. The exhibition (V2 6.1.1)

was held in the ground floor of Canada House. The exhibition displayed photographs, videos, maps, texts, and architectural models produced through the field exchange trips and open design competition to give insight into the processes of the project and the geographical, cultural and political context of Arctic Canada. The artists and I selected photographs and films from the API team's trip in summer 2009 made with Igloolik elders and Isuma TV, re-visiting former settlements around the Foxe basin (Figure 9). These included aerial photographic composites (taken from the UAV) of Igloolik and the Foxe basin area. To illustrate the process of designing the habitable mobile media and environmental monitoring unit, Arts Catalyst commissioned three detailed, coloured architectural scale-models of the winning designs from the competition (Figure 10). The three designs fuse new technologies with elements of traditional Inuit craftsmanship. Katherine Rannou's design uses a traditional dog sleigh design, using a sleigh and lightweight pneumatic skin for a tunnel-like working space. Richard Carbonnier's design draws on the plywood shelters that have been part of Arctic architecture since the last century, integrating it with aluminium to make it more resilient during sea-ice crossings. Giuseppe Mecca's design is the most visually striking, but the least functional as it cannot be transported easily, and integrates local materials with an aluminium space frame and high-efficiency insulation materials. We also included in the exhibition an interactive screen with ebook version of the API publication on arctic architectures and the design competition

Figure 9: Installation view of *Arctic Perspective Initiative* exhibition, Canada House, London, 2010. Photo: Kristian Buus. Courtesy of Arts Catalyst

Figure 10: Installation view of *Arctic Perspective Initiative* exhibition, Canada House, London, 2010. Photo: Kristian Buus. Courtesy of Arts Catalyst

The panel discussion event 'Contemporary Nomadism: Autonomy and Technology in the North', which took place on the occasion of the exhibition's opening, featured speakers Marko Peljhan, science sociologist David Turnbull, architect Richard Carbonnier, joint winner of the API open design competition, and Inke Arns, artistic

director of HMKV. Michael Bravo chaired. A key part of the event was a live satellite Internet video link to Inuit filmmaker Zacharias Kunuk and API artist Matthew Biederman at a temporary cabin in the wilderness of Foxe Basin in the Canadian Arctic, a connection powered by solar energy (Figure 11, Figure 12). Kunuk spoke of his pleasure at being able to speak live and directly to people in the South about the changes taking place in his environment. Kunuk and the panelists discussed the significance of access to new technologies in terms of the opportunities for the next generation of Inuit youth.

Figure 11: *Arctic Perspective Initiative*. Remote cabin with solar-powered satellite connection to internet, Foxe Basin, northern Canada, 2010. Photo: Matthew Biederman. Courtesy of Arctic Perspective Initiative

Figure 12: Live link to Zacharias Kunuk and Matthew Biederman, Foxe Basin, Canada, from the Contemporary Nomadism panel, Canada House, London, 2010. Courtesy of Arts Catalyst

Opening a month after the London exhibition, a much larger exhibition was held at the Phoenix Halle, Dortmund, Germany, curated by API partners HMKV.[33] Arts Catalyst was involved in the exhibition's development and as a co-organiser of the Open Space conference, which took place within the exhibition. Participants in the conference included community leaders from the Inuit and Sami people, artists, scholars, technologists, policy makers and writers. The group proposed several directions for strategies of collaboration between northern communities and *Arctic Perspective Initiative*.[34]

Two publications came out of API: *Arctic Architecture* and *Arctic Geopolitics and Autonomy*. Dr Michael Bravo and I co-edited the latter title (V2 6.2.2). In the book, we set out to explore and unfold some of the complex interrelations between geopolitics and technology, indigenous culture, and contemporary art in an age of rapid environmental change. We each wrote a text and commissioned texts from Lassi Heininen and David

[33] As part of the European Capital of Culture RUHR 2010 and ISEA 2010.
[34] API has continued beyond the end of the European Commission funds and Arts Catalyst's involvement has also continued in a limited way. In 2013, Arts Catalyst's research engineer Lisa Haskel collaborated on an API workshop in Finland on the development of a hybrid sensor network for harsh environments, work that we presented in a workshop at the London Citizen Cyberscience Summit that year.

Turnbull, as well as including an existing text by Inuit filmmaker Katarina Soukup. In my text for the book, 'Critical Art and Intervention in the Technologies of the Arctic' (V2 6.2.3), I look at the cultural and political character of technology in the Arctic, through the work of contemporary artists, to explore how they, and non-aligned citizens more broadly, are intervening in the politics of technology. I consider the significance of these interventions against ideas of nomadism and autonomy in contemporary culture and the specific milieu of indigenous Arctic people's lives.

3.3.5 Summary and conclusions

Moving far beyond the gallery-bound world of 90s relational aesthetics (Bourriard, 1998), API is contemporary art that generates Stengers' ecology of practices in its careful consideration of how scientific and other practices relate to and impact on local practices - and cultures - and vice versa. In its response to Lynge's call for science to share its data with those in the area of study, API takes forward a history of science in Igloolik that attempted to benefit the local community, discussed by Bravo (2011) in *Arctic Geopolitics and Autonomy* (V2 6.2.2), and moves it towards directly enabling local people to collect and use environmental data.

API works as a collective inquiry and project, bringing together the situated knowledge and expertise of Arctic community members (Figure 13) with that of specialists (media artists and others) to co-produce knowledge about the environment via technological systems co-designed with community members from Igloolik, Iqaluit, and Mittimatalik or influenced by traditional designs in use within the Arctic today. As an example, the *Adaptable Community Environmental / Wildlife Assessment Mesh Network* is a sensor network designed for environmental monitoring (including GPS, light (lumens), temperature, pressure, humidity, wind speed and direction), that is open source and customisable to suit the needs of the community, individual hunter, or researcher. An example of how this can be used might be that a hunter "checks out" a mobile node, and then heads out on the land to hunt. As they journey, a set of environmental measurements is automatically logged. On return, the node automatically uploads its data to a central server. The data slowly aggregates, building a database of land use and measurements of microclimates along the way. By this form of "citizen-sensing", the community owns its

own science, allowing for healthy, sustainable monitoring of their local environment, rather than relying on outsider researchers.

Figure 13: *Arctic Perspective Initiative* holds meeting with members of the Pond Inlet Tribal Organisation in northern Canada, 2010. Photo: Matthew Biederman. Courtesy of Arctic Perspective Initiative

Through its co-production of technological systems for environmental monitoring and assessment, and communication, and – through research, meetings, conferences and workshops, both in the Arctic and in Europe, involving Arctic community members and other experts – its gathering and generation of knowledge and understanding of the changing environment and sociopolitical context of the Canadian Arctic in a historical, and cultural context, API demonstrates art's potential to operate both as a sociopolitical intervention in the public realm and as a transdisciplinary inquiry into a complex and changing social-cultural-ecological-technological system.

Furthermore, through its localised and media-centric "citizen sensing" and other ways of creating and sharing knowledge and skills, and by connecting local knowledge to an international audience, API – through close partnership with Arctic communities - contributes to the challenges of isolation, lack of useful information, and communication links that are urgent issues for people living in zones on the frontline of climate change, helping to equip local people to adapt to changing local environmental conditions in the Arctic, and exemplifying Ostrom's observation that solutions to problems of the commons are best found on the ground, through collective action (Ostrom, 1990).

As a curatorial collaborator in this collective project, my roles included traditional curating roles of enabling artists, content production for exhibition and publication, and seeking other ways to engage audiences in the ideas of this complex project. At the same time, it enabled me to extend and practice the less traditional curatorial roles, particularly those of transdisciplinary researcher - researching, connecting and applying information from multiple fields and sources to feed into the project and writing contextual texts that contributed to shaping the project's scope and direction -, and inquiry network builder, involving researching and bringing people with relevant and complementary expertise into the inquiry.

In our book, *Arctic Geopolitics and Autonomy*, Bravo and I identify a paradox of representation in both the media and the arts relating to the Arctic, as well as in the dominant discourses of Arctic geopolitics, both of which tend to reflect the Arctic as a contested, rich yet fragile global commons, but neglect the complexities of the Arctic as an inhabited region with indigenous cultures and local interests (Bravo and Triscott, 2011, V2 6.2.2), an understanding of which is critical to global governance of the region (Jasanoff and Martello, 2004).

My intent with the curated exhibition and event, as well as the book, therefore was to highlight the complexity of an inhabited (human and non-human), technologised, and politicised Arctic environment, far removed from images of remote barren landscapes of melting ice, and to fix it in people's minds as a region in which vast reserves of natural resources, increasingly accessible because of global warming, are leading to geopolitical tensions and new enclosures of these global and planetary commons. At the same time, I deliberately revealed the processes of the API project to show how art can function as a sociopolitical intervention and contribute to community-based politics for managing and living within a changing Arctic environment in in a time of rapid environmental change and geopolitical flux. The exhibition, event and book framed the global context and demonstrated how the API project shifted the focus for management of the Arctic from global regulative principles to local stewardship of the planet.

3.4 ITACCUS (2007-2014)

3.4.1 Introduction

ITACCUS (IAF Technical Activities Committee on the Cultural Utilisation of Space) was a strategic initiative of which I was joint initiator and co-chair. Given its strategic role, the outputs were varied and often at one remove. There were several directly organised by Arts Catalyst. The following are submitted in my portfolio of research outputs.

Type of output	**Title and date**	**My role**
Exhibition – website and documentation (V2 6.3.1)	*Republic of the Moon*, 2011, 2014	Co-curator
Text (book chapter) (V2 6.3.2)	'Transmissions from the Noosphere: Contemporary art and outer space', Triscott, N, in The Palgrave *Handbook of Society, Culture and Outer Space*, eds. Peter Dickens and James Ormrod. Published by Palgrave Macmillan (scholarly division), 2016	Author
Text (conference paper) (V2 6.3.3)	'Critical Art and Outer Space: a curatorial inquiry into space as a global commons', Triscott, N. Presented at Association of American Geographers Annual Meeting. San Francisco, 2016	Author

My curatorial interests in outer space have been driven by my understanding of outer space as a transnational space and my interest in democratising access to space. As well as curating a series of space-related research and exhibition projects,[35] I led a European Space Agency funded consortium study into "cultural utilisation of the International

[35] Between 1999 and 2007, I co-curated, with my colleague Rob La Frenais and others, a series of projects that involved working with international agencies and institutions of space faring and enabled artists to access their work spaces and technologies, including astronaut training facilities in Russia and France.

Space Station (ISS)", involving wide consultation with the European arts community and with agency staff. My final report proposed a series of strategic initiatives.[36] We also made preliminary feasibility assessments for several possible pilot projects, which ESA was initially keen to move forward.[37] However, after a change of senior staff at ESA, progress on implementing the recommendations slowed and then stopped entirely.

My observation was that culture had a very low priority at ESA, even if specific individuals were enthusiastic or supportive. The difficulties we faced, I realised, were not specific to the study, but systemic to an institution with a primarily scientific and technological agenda, and symptomatic of a lack of understanding of contemporary art within the wider space community. Taking a strategic approach to this systemic problem, in 2007, as part of a group of international collaborators, I made a successful proposal to the International Astronautical Federation (IAF), to set up a Technical Activities Sub-Committee that we titled the IAF Technical Activities Committee on the Cultural Utilisation of Space (ITACCUS).

3.4.2 Aims

My aims in setting up ITACCUS and in organising associated activities were:

> To develop a curatorial and advocacy platform for contemporary art and culture within the international space exploration and space science community.
>
> To explore curatorial strategies that could enable artists and audiences to reflect on contemporary activity in outer space, including near Earth space and the Moon, its relevance to our lives and locality, and therefore on the governance and stewardship of space.
>
> To reflect critically on these strategies and the relationship between space activity and art, both historically and in the present.

[36] Including an artists' residency programme, a scientist-artist network, artist-astronaut creative partnerships, and partnerships with cultural organisations.
[37] ESA issued a new contract to Arts Catalyst to begin implementing recommendations and commissioned me to curate an exhibition of artists' projects for a conference in Berlin to raise awareness of the project within the agency.

3.4.3 Methods and project development

As the initiators and original committee co-chairs, astronomer Roger Malina and I decided that the committee would invite members as liaisons to their organisations, rather than as representatives. We accepted recommendations for membership, on which the committee would then vote. The committee met at least twice a year, usually at the IAF Spring meeting in Paris and at the International Astronautical Congress.

The committee chose to prioritise three main activities:

- to sponsor sessions at the annual International Astronautical Congress,
- to endorse artistic and cultural projects engaging with space to raise the profile (and quality) of such projects,
- to contribute to the IAF's annual report to the United Nations' Committee on the Peaceful Uses of Outer Space, on which the IAF has observer status.

Through the regular meetings, both formal and informally through the network that developed, long-term conversations were enabled between cultural professionals, diplomats, space scientists and engineers, and others working in the space sector.

As one of the Technical Activities Committees of the International Astronautical Federation (IAF), ITACCUS contributed to several IAF annual reports to the United Nations' Committee on the Peaceful Uses of Outer Space (COPUOS), which oversees the UN treaties and agreements governing activities in outer space,[38] including one direct address at the COPUOS annual meeting.

Projects endorsed by ITACCUS during this period included two initiated by Arts Catalyst: the Kosmica event series and the *Republic of the Moon* exhibition.

[38] COPUOS oversees international cooperation in peaceful uses of outer space, encourages research and information dissemination, and oversees the implementation of UN treaties and agreements relating to activities in outer space, including the Outer Space Treaty, the Moon Treaty, the Liability Convention, the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Under Water.

3.4.4 Discussion of findings and outputs

Republic of the Moon (V2 6.3.1) was an Arts Catalyst exhibition exploring the future of the Moon and its international governance in an era of potential exploitation and occupation. The exhibition's title was taken from a remark from one of the ITACCUS members, Ciro Arévalo Yepes, a Columbian diplomat who was the Chair of COPUOS. In a conversation about the politics of defending the Moon as a global commons, Arévalo made the passing comment: "I'm not talking about a Republic of the Moon ...".

Figure 14: Installation view of *Dynamic, Affordable, Apollo-Free*,
We Colonised the Moon, *Republic of the Moon*, Bargehouse, London, 2014.
Photo: We Colonised the Moon

For *Republic of the Moon* (Liverpool 2011, London 2014), we invited artists to create and show artworks that could prompt a re-imagining of our relationship with the Moon in the 21st century. *Republic of the Moon* had two iterations. In the first version, at FACT in Liverpool, Rob La Frenais, lead curator for the exhibition, took a utopian approach, framing the exhibition as artists' imaginings of how we might live on the Moon. For the London re-staging of the exhibition some years later, opening in January 2014 a few weeks after China successfully landed a probe on the Moon, La Frenais and I collaboratively re-curated the exhibition to address this challenge to the Moon as the common heritage of mankind. We decided to declare a Republic of the Moon through a manifesto, and to curate the exhibition as an Earth-based embassy of the Moon. This curation involved a slightly different selection of artworks, by Agnes Meyer-Brandis (Figure 15), Liliane Lijn, Leonid Tishkov, Katie Paterson and Joanna Griffin, as well as

an exhibition residency and evolving installation by artist group We Colonised the Moon (Sue Corke and Hagen Betzwieser) (Figure 14, Figure 17), and a series of varied events, including workshops, roundtables, talks, demonstrations and music performances (Figure 16).

We re-framed this iteration of the exhibition as a reassessment of our historically romantic relationship with the Moon; a way of creating new myths and imaginings more responsive to the reality of a coveted, contested Moon, rather than continuing to regard it simply as a fixed and remote celestial body.

Figure 15: Installation view of *The Moon Goose Analogue: Lunar Bird Migration Facility*, Agnes Meyer Brandis, *Republic of the Moon*, Bargehouse, London, 2014. Courtesy of Arts Catalyst

Figure 16: Lunar Breakfast led by We Colonised the Moon, *Republic of the Moon*, Bargehouse, London, 2014. Courtesy of Arts Catalyst

Figure 17: Sue Corke and Hagen Betzwieser (We Colonised the Moon) and Rob La Frenais during the lunar remonstration, *Republic of the Moon*, 2014. Photo: Nicola Triscott

Interwoven with the strategic initiative of ITACCUS and the curated outputs, I researched and wrote two texts, which reflect on the strategies of engagement and explore how artistic and curatorial practices contribute to the social imaginary of space.

In 'Transmissions from the Noosphere: Contemporary art and outer space (V2 6.3.2, Triscott, 2016a), I take a historical perspective to explore how artists have shaped our imaginaries of outer space and why this is important to the future of space activities. I chart the construction of a space imaginary from both Soviet and Western perspectives, drawing on late 19th century and early 20th century art and literature, and argue that this had a direct impact on shaping the space exploration programmes of both nations up to the space race and the Apollo programme. In 'Critical Art and Outer Space: A curatorial inquiry into space as a global commons' (V2 6.3.3, Triscott, 2016b), I argue that critical artistic practices can contribute to society's understanding of outer space as a socially constructed space and as an important global commons by directing attention to otherwise mostly unseen contested spaces and by intervening in space technology and politics. By these actions and through their artwork, artists draw attention to outer space as a space of exclusion, where activities by certain groups or individuals are prohibited or dismissed against claims of ownership or assumed authority by nations, corporations or institutions.

3.4.5 Summary and conclusions

ITACCUS uses a tactical framework of the global commons to demand a transnational and inclusive approach to governance of the near-Earth region of outer space. ITACCUS has been a hub and meeting point for those within the space community open to the idea of art and culture as legitimate parts of space activities, and those from the art and cultural communities interested in space exploration and space science. It has enabled a space for knowledge sharing and idea generation, and a platform for cultural practitioners to speak to the global governance institutions for outer space.[39] It reinforces the role of the curator as a strategic context creator, able to draw together multiple collaborators, forms of practice and knowledge expertise, and the curator as "diplomat".

[39] For example, in my role as co-chair of ITACCUS, I was invited to address directly a meeting of the UN COPUOS committee in 2008.

Drawing on Latour (2004a), I have previously explored the idea of the "curator as diplomat" in terms of understanding my curatorial role in negotiating entry for artists to specialist scientific and technological environments, such as space agencies (Triscott, 2008). In *Politics of Nature: How to Bring the Sciences into Democracy,* (2004a), Latour introduces the notion of diplomacy in the context of how to mediate between conflicting versions of reality among different groups of people, or "collectives" (a word he uses to describe a group of people with broadly similar viewpoints). In deliberating on how this situation can be handled, Latour suggests that the ancient art of diplomacy - the management of communications and relationships between nations - provides one solution. He notes that, in its modern form, diplomacy is understood as the skill of resolving differences through agreement and harmony. In his understanding of this role in terms of science and politics, Latour's diplomat creates a new reality. As an open representative of their own collective and yet detached from it, the diplomat is essential to the negotiations necessary for two collectives to communicate.

The curator as diplomat is a necessary role in trying to legitimise art within specialised non-arts fields. Negotiating access for artists to specialist domains, such as space exploration, space science and space governance, has become part of my curatorial practice. I do this, in part, because enabling artists to make new work in space facilities and in relation to space exploration helps to localise and humanise space for a wider public. The exhibition *Republic of the Moon* sought to raise public awareness of the Moon as a global commons and to involve audiences in considering governance of the Moon. It emphasised a planetary (or "off planet"-ary) approach, visualising the Moon as both a physical body and an important part of many cultural imaginaries, and placing this in the context of current interests in the Moon as a potential source of resources and profits.

3.5 *Holoturian*, Ariel Guzik (2013-2015)

3.5.1 Introduction

Holoturian is a project by Ariel Guzik, commissioned by Arts Catalyst, through which I directed my curatorial interests onto the extraterritorial space of the ocean and its inhabitants. *Holoturian* resulted in several outputs, including a commissioned

artwork/underwater capsule, an exhibition, performance and public talk, and an edited eBook. The following are submitted as part of my portfolio of research outputs.

Type of output	**Title and date**	**My role**
Exhibition – website and documentation (V2 6.4.1)	*Holoturian*, Ariel Guzik, Trinity Apse, Edinburgh Art Festival, July 2015	Curator
Edited eBook V2 6.4.2)	*Holoturian, Ariel Guzik*, 2016. Published by Arts Catalyst.	Editor
Text (chapter in the above book) V2 6.4.3)	'The Re-enchantment of the Ocean: Ariel Guzik's Cetacean Encounters', Triscott, N, in *Holoturian, Ariel Guzik*. Arts Catalyst, 2016.	Author

Ariel Guzik is primarily known for his sound installations and performances, which have been shown in galleries in Mexico and in the Mexican Pavilion in the 2013 Venice Biennale. My interest in Guzik's work was in his underlying long-term inquiry into the languages and resonances of nature, which takes the form of designing sophisticated instruments that can convert signals from the natural world into sounds and vibrations, and in particular his ten-year project to communicate with dolphins and whales in the wild. Guzik had developed a prototype underwater musical instrument, the *Nereida,* to interact with cetaceans. The *Nereida*, a fused quartz tube with a mechanism of cords and circuits contained in a slim glass cylinder, can be lowered into the sea from a drifting boat with the intention of establishing contact and forming a kind of gentle link with cetaceans through music. The artist had tested *Nereida* several times in the Sea of Cortez (Gulf of California), experimenting with the capsule's sonic capabilities and observing the cetaceans in the locality – mostly bottlenose dolphins and gray whales.

I was fascinated by this research and the possibilities and meanings opened by it. Guzik's understanding of cetaceans as another civilisation provided an eloquent and poetic way to reflect on our stewardship of the oceans. I discovered that Guzik wanted to extend his research by constructing a manned submarine-instrument in which to travel and encounter cetaceans. We agreed to work together towards a next iteration of his research,

and to translate it into an exhibition that could develop and share his research and goals with a wider public.

3.5.2 Aims

My aims in commissioning and curating Ariel Guzik's *Holoturian* were:

> To develop an artist-led co-inquiry into cetacean communication, through creating a new context for Guzik's research in Scotland by which he could take forward his inquiry and research into communicating with cetaceans.
>
> To curate platforms to show and discuss this research in both contemporary art and scientific/ecological contexts, and to position Guzik's research as an integral part of his artistic practice.
>
> To reflect critically on this work and draw out some of the philosophical, scientific and environmental issues that the project raises.

3.5.3 Methods and project development

The first challenge was to create a context for Guzik's research in the UK. I invited UK marine scientist Mark Simmonds to be an advisor on the project. As an expert on whales and dolphins and an activist in conservation issues surrounding cetaceans, Simmonds could advise us on the ethical and legal framework concerning contact with cetaceans in the UK, as well as the ecological challenges facing cetaceans in the seas and oceans, and where and how to encounter cetaceans around the UK. He also contributed to unfolding philosophical, scientific and environmental issues relating to the project. Guzik and Simmonds were both interested in the role and importance of sound in cetacean society and the impact of sonar and noise pollution on whales and dolphins.

Arts Catalyst with Guzik and two members of his Laboratory (Emilio Galvez and Alejandro Colinas) undertook a research expedition to encounter cetaceans in the Moray Firth in the North of Scotland, meet scientists, and make field recordings. This part of Scotland is one of the most important places on the British coast for observing dolphins

and whales, especially the population of bottlenose dolphins (around 2-300 individuals) that live there. We observed dolphins from the shore and made sea expeditions in a chartered small boat from Cromarty, guided by a local expert. On both sea trips, we had extended encounters with schools of dolphin feeding and travelling, and lowered hydrophones to listen to and record the dolphins' clicks and calls (Figure 18, Figure 19). We also met with marine scientist Professor Paul Thompson and his team at Aberdeen University's Lighthouse Field Station at Cromarty, whose work includes studying migratory patterns and movements of the Moray Firth dolphins, and with local people with knowledge through long-term observations of the dolphins, including wildlife photographer Charlie Phillips, who has been observing the firth's dolphins for more than 25 years.

Figure 18: Field trip to Moray Firth, Scotland, 2013. Photo: Alejandro Colinas

Figure 19: Alejandro Colinas and Emilio Galvez, Field trip to Moray Firth, 2013.

Guzik and I decided Arts Catalyst would commission him to develop a new functional submersible capsule, which would could take a plant and instrument into the deep sea (a step before taking a human, his next goal). This capsule-instrument would both be shown as an artwork in a contemporary art context and launched into the deep sea as part of his further research, thereby integrating Guzik's "extradisciplinary"[40] research into his exhibited artistic practice. I approached Edinburgh Art Festival 2015 to propose this as one of their major international commissions, which secured additional resources, provided exhibition context, and ensured a large audience and media attention.

3.5.4 Discussion of findings and outputs

Arts Catalyst and Edinburgh Art Festival commissioned Guzik to create an underwater capsule and resonance instrument, the *Holoturian*. The instrument is designed to communicate with cetaceans in the deep sea through subtle sounds, vibrations and resonance. Named after and its shape inspired by a sea echinoderm, *Holoturian* is a precursor to the artist's larger project to launch a manned underwater craft and instrument, which will drift with the circulating currents of the Gulf of California. My aim was to curate an installation that was both poetic and evocative and that also could convey the depth and rigour of Guzik's research with cetaceans and his visions and

[40] A term introduced by Brian Holmes (2009), which seems particularly appropriate to Guzik's practice.

imaginings of this alternative civilisation, which he depicts through drawings. I wanted this to stir audiences to imagine, and wish to understand, this other civilization - these ocean dwelling, intelligent, sensitive creatures - and to think about how humankind's activities in the oceans affect them. Guzik and I decided to show the capsule as a sound installation alongside a selection of Guzik's drawings, drawing out his research and ideas.

We chose Trinity Apse in Edinburgh, a small gothic church with great acoustics, as the venue. The installation (V2 6.4.1) centred on the *Holoturian*, a large and visually striking object that filled the church with subtle resonant sounds (Figure 20, Figure 21). Alongside the capsule, Guzik displayed a short film of his research, and many drawings and objects on a constructed wall and in large vitrines (Figure 22). The drawings depict his evolving ideas for systems of communication with whales and dolphins, including plans and sketches for underwater instruments and submersibles, and images of an underwater cetacean society (Figure 23).

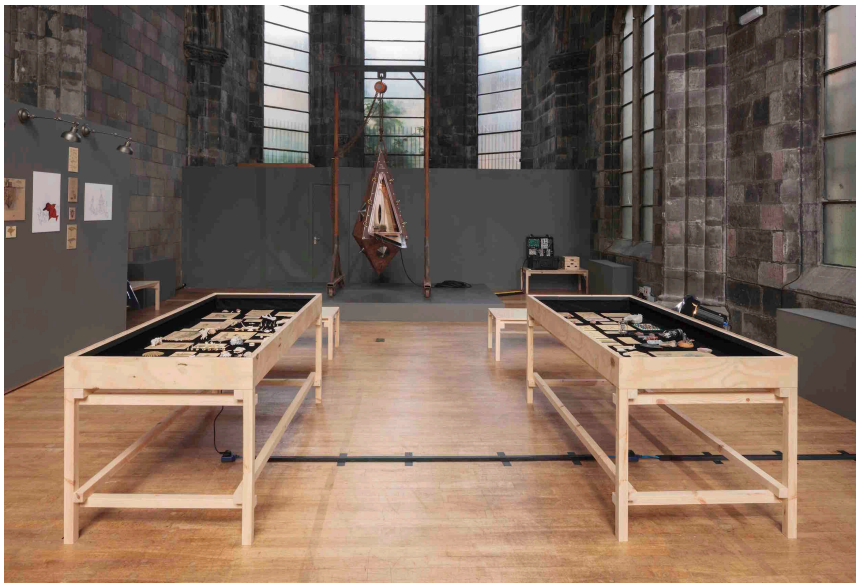

Figure 20: Installation view of *Holoturian*, Ariel Guzik, Trinity Apse, Edinburgh, 2015. Courtesy of Edinburgh Art Festival and Arts Catalyst

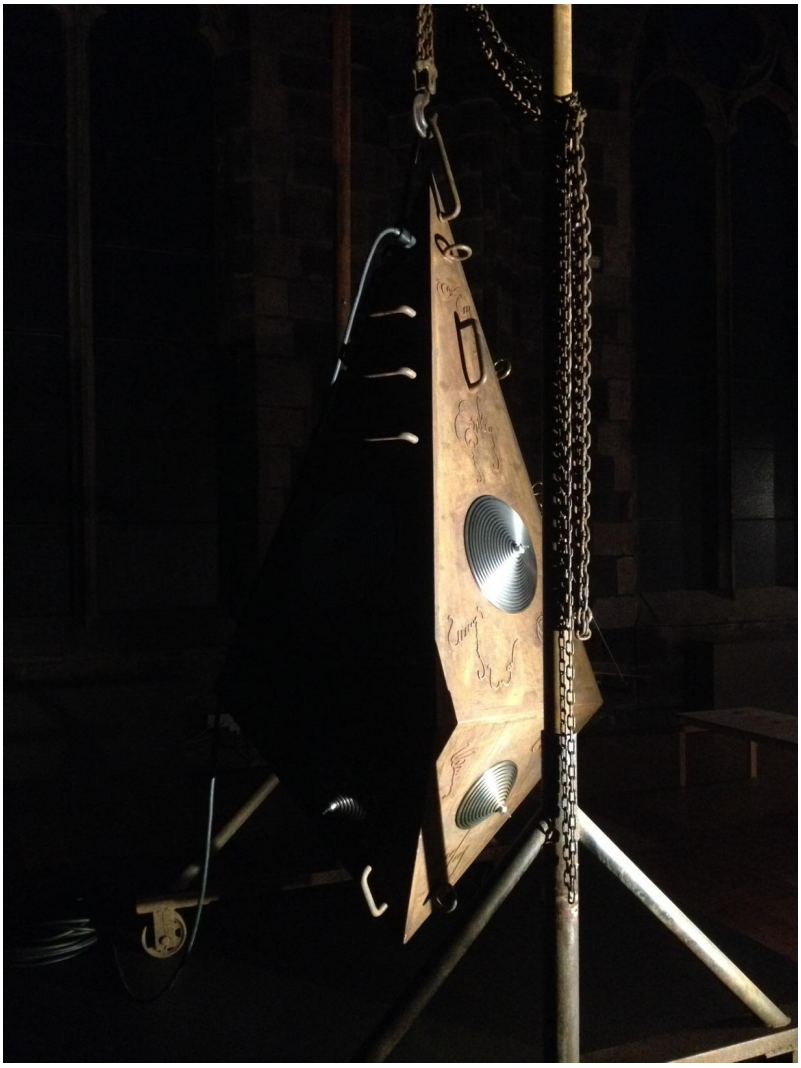

Figure 21: *Holoturian* instrument, Ariel Guzik, Trinity Apse, Edinburgh, 2015. Photo: Adriaán Schalwijk

Figure 22: Installation detail from *Holoturian*, Ariel Guzik, Trinity Apse, Edinburgh, 2015. Courtesy of Edinburgh Art Festival and Arts Catalyst

I organised two events during the opening weekend: a sound performance by Guzik, Colinas and Galvez of a specially devised set combining electronic music with field recordings of whales and dolphins and other sounds from nature; and a public conversation between Guzik and Mark Simmonds that explored the artists' intentions, uncovered the meanings of the capsule's visual appearance, and discussed issues of cetacean language and culture and the environmental threats to them in today's oceans.

To reflect on the exhibition and the project, I edited and published an eBook *Holoturian, Ariel Guzik* (V2 6.4.2), comprising texts written by myself and Mark Simmonds and a selection of photographs from the field trips and *Holoturian* installation, and drawings. In my essay 'The Re-enchantment of the Ocean: Ariel Guzik's Cetacean Encounters' (V2 6.4.3, Triscott, 2016c), I discuss Guzik's artistic research into the sounds of nature and his work with cetaceans, and draw out some of the philosophical and scientific issues around whether whales and dolphins can be said to have language or culture and how this relates to norms of human exceptionalism.

I will continue working with Ariel Guzik on the test launch of the *Holoturian* at sea, and plan to produce a short documentary film following the project from initial research in Scotland through the Edinburgh installation and performance to its launch.

3.5.5 Summary and conclusions

Blum (2015) writes, of a world before GPS navigation, that "… to know one's place at sea was to know one's place on the planet" (p25). Consider this statement in respect to the blue whale, which once, as recently as 1940, could communicate by its vocalisations, and therefore map its world, across an entire ocean basin. Today the blue whale's acoustic "bubble" - the distance over which a whale can communicate, hear and be heard - has shrunk from some 1000 miles to only about 100 miles, due to human-origin ocean noise (Simmonds, 2013). As a species, we have disrupted another species' "knowing" of its place on the planet and, in doing so, I suggest we have also lost sense of our own.

In curating the inquiry, my role was again in creating context, this time for Guzik's work in Scotland. This context was both located (in the Moray Firth, Scotland), transdisciplinary (through which he was able to draw on scientific expertise), and open to

the situated and embodied knowledges of both local wildlife watchers and the dolphins themselves. This Scottish context also worked very well for an approach to the Edinburgh Art Festival to situate the work fully within an art context.

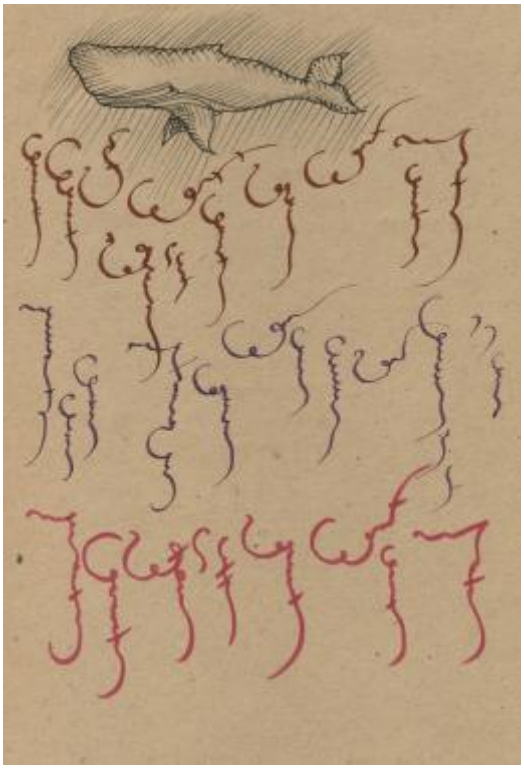

Figure 23: Drawing by Ariel Guzik. Courtesy of the artist

Guzik's research into cetacean communication does not have an investigative intent. Rather the artist simply seeks to understand, in an intuitive and emotional way, the ways in which cetaceans understand their world and communicate with each other, and to connect with them symbolically as intelligent "others". His work captures people's imaginations and inspires them to think about our relationship with other species in new ways. The curatorial model of co-inquiry is useful in this situation (and in many similar), where an artist does not wish his work to be regarded as scientific or as making any claims to facts, as it enables different types of inquiry to work side-by-side, to co-operate rather than demanding collaboration (which requires a continued attempt to construct and maintain a shared conception of a problem), and benefit from each other. Thus, Guzik is keen to engage with scientists for the purpose of mutual discovery and insight, while scientists (particularly those with activist agenda, like Simmonds) feel the benefit of working with Guzik's research, which presents new perspectives on shared matters of

concern – the health and wellbeing of other species and the environment – about which the scientists who study them are often passionate and (increasingly) distressed.

In curating the exhibition, and through the publication, it was important to me to frame Guzik's research with cetaceans as an integral part of his artistic practice, rather than as separate from it. This reframing, with the dolphins and the sonic encounter at the centre of the work, was enormously popular with audiences, who reported being spellbound by the combination of sound, objects, images, ideas and craftsmanship. [41] It was a central curatorial intent to convey the idea that Guzik's work opposes the normative anthropocentric notion of the oceans as a planetary commons for *human* good, instead suggesting that we acknowledge the needs and rights of species that inhabit the oceans. A key insight that emerged through the inquiry was that whales and dolphins are beings with language and culture, as argued by progressive marine scientists (Whitehead and Rendell, 2014), and that the cetacean world is one of sound, a sense that is profoundly affected by human activity in the oceans. This became the shared "matter of concern" that brought Guzik and Simmonds together inquiry and then later as an in-conversation event during the exhibition: their awareness of this non-human intelligence and civilisation in our oceans, and of the threats to that civilisation. In this way, the *Holoturian* project extends Stengers' notion of an ecology of practices beyond that of human knowledge disciplines to include the practices - the actions, ways of communication and knowing - of non-human creatures, specifically cetaceans.

[41] The comments book in the space showed this appeared to be the case, with people describing the installation with words such as "poetic", "spiritual", "haunting", "uplifting" "magical", "inspiring", "enchanting", "profoundly moving", "mesmerising", "purifying" and "addictive".
As important to me was that the exhibition was also provoking thought and the story was coming across:
"I've never thought about dolphins the same way. Beautiful"
"… lovely storytelling."
"I'm delightfully inspired by your dream."
"Love the Holoturian and technical drawings."
"Wouldn't ever have imagined anyone was trying to do this. It's specially interesting you're planning to submerge this."
"I wonder what the whales will say about it. Beautiful craftsmanship (from a human perspective)"
"… a vital contemplation on our place in this world as humans."

3.6 *Wrecked on the Intertidal Zone* (2013-2016)

3.6.1 Introduction

Wrecked on the Intertidal Zone (YoHa, Critical Art Ensemble, Arts Catalyst, et al) is an extended artist-led co-inquiry to uncover and highlight local knowledge about the changing ecology, society and industry of the Thames Estuary. The programme is ongoing. Its outputs to date take varied forms, including public events and workshops, an exhibition and event series, a commissioned public monument, and an edited book. The following are included in my portfolio of research outputs.

Type of output	Title and date	My role
Exhibition: website and documentation (V2 6.5.1)	*Notes from the Field: Commoning Practices in Art and Science*, Arts Catalyst, London, 2016	Co-curator
Commissioned public monument: website and documentation (V2 6.5.2)	*Graveyard of Lost Species* – Critical Art Ensemble and YoHa, site specific, Leigh-on-Sea, 2016.	Co-curator

The trigger for the project was artist Graham Harwood's (who lives in Leigh-on-Sea) observation of the vast industrial infrastructures being constructed along the Thames estuary, their impact on local people, traditional industries and the estuary's ecology. Such rapidly changing situations and intense economic interests in the area greatly concern communities, but they feel they have had little or no say.

Our core team included YoHa (Graham Harwood and Matsuko Yokokoji), Critical Art Ensemble (Steve Kurtz, Steve Barnes and Lucia Sommer), Claudia Lastra and myself from Arts Catalyst, Andy Freeman and Fran Gallardo.

3.6.2 Aims

My aims in jointly initiating and co-curating *Wrecked on the Intertidal Zone* were:

To test the model of the co-inquiry into the changing ecology, society, industry and culture of the Thames estuary that could explore new ways of generating knowledge about the estuary through artists' practices, citizen/civic science techniques, and by bringing to light situated information.

To explore and think about the notion of the estuary as a commons and how we might represent local knowledge and concerns in the governance of the estuary.

To explore what forms of public realm artworks could be created through these processes.

3.6.3 Methods and project development

Following my collaboration in the *Arctic Perspective Initiative*, a project that both inspired and frustrated me, I wanted to use my learning from API to initiate a project that was UK-based. My frustration stemmed from the logistical difficulties of API's remoteness - both the site of inquiry itself (Arctic Canada) and the location of the artists in other countries.

Wrecked on the Intertidal Zone was initiated by myself with Graham Harwood of YoHa and Steve Kurtz of Critical Art Ensemble. Its focus is the Thames Estuary, particularly near Leigh-on-Sea and Southend (Figure 24). My interest from my previous involvement in API in developing a co-inquiry that used both art as inquiry and citizen science techniques informed my early conversations with Harwood and Kurtz. Initially, we were interested in the local politics and environmental impact of the vast super-container port that was being built upstream from Leigh-on-Sea. However, after a short time, we realised that there was no real impact we could have on the process of this massive infrastructural development and decided to broaden our inquiry. Andy Freeman, a local artist, technologist and former oyster farmer, joined our team, bringing his interest in citizen science tools for community empowerment.

Figure 24: Wide angle image of Thames Estuary, view from Two Tree Island bird hut, Leigh Marshes, Essex, 2015. Photo: Fran Gallardo

We decided to proceed through consultation and iterative idea development. Our first step was to convene a consultation workshop to ask local people about their concerns with respect to the new wave of industrialisation of the estuary and its impact on local culture and estuarine ecology. Much of the ensuing discussion focused on concerns about the impact of the super-containership port development's dredging activity on fish stocks, cockle beds and ecological diversity, and the potential impact of the port's activity on estuary wildlife, including migrating birds. Another area of discussion was the local nature reserve of Two Tree Island, where many people walk their dogs and forage for blackberries, which was built on a former landfill site that has no records of what was dumped there (as there were no regulations in force at the time of its operation).

Three initial strands of inquiry emerged. Critical Art Ensemble (CAE) proposed to collect stories of lost and declining species and then to create a kind of "graveyard" to mark those changes on the estuary. Harwood wished to work with fishermen to design a method to dredge messages on the sandbars in the estuary, to be visible at low tide. A third strand was to investigate Two Tree Island and to try, through speaking with people who worked there and by running civic science workshops, to build up a picture of what might lie under the nature reserve, how toxic it might be and how it might be affecting the soil, plants and water.

Initially, with little funding confirmed, we chose to run some public activities and workshops to start the inquiry, raise awareness of the project and attract participants and contributors. We set up an event at Leigh on Sea Marine Festival in which we invited visitors to "eat, small and taste the Thames estuary": tasting estuary vapours through e-cigs, smelling distilled oils from local fauna, and eating delicacies made from foraged and

prepared foods from Two Tree Island. Alongside, Freeman presented his proposed citizen science and monitoring initiatives.

Following this, we offered three free public exploratory workshops focused on Two Tree Island: a mud walk led by amateur biologist Paul Huxster, using geo-locating devices to study eelgrass and cordgrass spatial fluctuations across the tidelands; a digital mapping workshop led by Freeman, introducing participants to a range of citizen science tools and techniques (Figure 25); and a wild eating and foraging workshop led by Gallardo and YoHa, guiding participants through the potential hazards of eating wild herbs, plants and fruits on this former landfill site.

Figure 25: Digital mapping workshop led by Andy Freeman, *Wrecked on the Intertidal Zone*, 2014. Photo: YoHa

Once funding was secured, activities and investigations could unfold in a more structured way. We invited Critical Art Ensemble to undertake a month-long residency to take forward their project, *Graveyard of Lost Species*. Harwood, Matsuko Yokokoji (YoHa) and Lastra undertook much of the work on Graveyard. Two local artists - Warren Harper and Stuart Bowditch - joined the project as researchers and conducted research with local people, collecting stories and examples of "species" from wildlife, marine creatures, livelihoods, fishing methods, landmarks and dialects that once flourished in the estuary but are now disappearing. The artists chose to create a temporary monument to these losses and transformations, using a boat wreck, as a "lost species" itself. Harwood identified a wreck - the Souvenir, a 40ft 12-ton Thames Bawley grounded on the estuary mudflats. Over the summer, the boat was cleaned and reconfigured, largely by Harwood and Stuart McHardy, miraculously sailed ashore, and - for its preparation and engraving -

sited in a prominent public setting by the shore on the main thoroughfare between Leigh-on-Sea station and the old town. The Souvenir attracted the attention of hundreds of interested passers-by, many of whom stopped to share their stories and reminiscences with the artists and researchers.

Figure 26: Citizen science workshop led by Andy Freeman, *Wrecked on the Intertidal Zone*, 2015. Photo: Warren Harper

The Two Tree inquiry unfolded through a series of public workshops and activities. Freeman led citizen/civic science workshops with environmental chemist Mark Scrimshaw (Figure 26). These looked at how verifiable methods of information and data gathering, such as monitoring networks and ambient sensors, might be used by people in the community. This data gathering was set into broader social and environmental contexts. Alongside, Gallardo led tasting and smelling activities at local festivals, focusing on local delicacies and foraged plants, engaging members of the public and providing a context within which to discuss food, ecology and human health, as well as the traditions and conditions of traditional marine occupations.

A website was set up as a platform to collect and showcase the collected information, including data, maps, artists' updates transcripts of interviews, photographs and short films, contributed by the growing number of participants in the project, forming an alternative archive of knowledge about the estuary.

3.6.4 Discussion of findings and outputs

As the project unfolded, I felt it was important to create an exhibition to situate the project in the contemporary arts. With Alec Steadman and Claudia Lastra, my colleagues at Arts Catalyst, I co-curated an exhibition at Arts Catalyst's new Centre for Art, Science and Technology in King's Cross that began the process of examining and contextualising the work within a contemporary arts discourse. The exhibition - *Notes from the Field: Commoning Practices in Art and Science* (V2 6.5.1) - set out to examine the notion of art as a tool or tactic for action with communities, and to reflect on the *Wrecked* project in and against this context.

Figure 27: Exhibition display of films and media from *Wrecked on the Intertidal Zone* in *Notes from the Field: Commoning Practices in Art and Science*, Arts Catalyst Centre for Art, Science and Technology, London, 2016. Photo: Arts Catalyst

In one gallery space, we presented the *Wrecked on the Intertidal Zone* project as an installation of short films on monitors and objects (Figure 27). In the second gallery, we showed a selection of documented projects from the Arte Útil archive.[42] The Arte Útil archive is a project initiated by artist Tania Bruguera, which chronicles a history of art projects that create tactics to change how we act in society. Steadman and I selected

[42] In a display space designed by Collective Works and ConstructLab.

projects that involved science and technology or were driven by ecological concerns. The exhibition included a series of workshops and discussion events to discuss the archive's intent, the notion of usefulness in connection with contemporary art practice, and the position of *Wrecked* and other projects in relation to this. We also invited several resident researchers to research and propose projects to expand the science, technology and environment sections of the archive, understanding the "exhibition" as a process of inquiry and discourse through the notion of the "paracuratorial" (Páldi, 2011).

After much work by Harwood, McHardy, Lastra and Yokokoji, including Lastra's lengthy negotiations with Southend Council and Natural England to gain planning permission for its siting and installation, Critical Art Ensemble and YoHa's temporary monument, *Graveyard of Lost Species* (V2 6.5.2), was placed in its final site - and resting place - on the Leigh Marshes (Figure 28). With the names of many lost species carved into the boat's hull, decks and interior (Figure 29), the artwork is visible to the public from the shore, and publicly accessible by foot at low tide, so that visitors can read the text on and inside the boat. It will gradually decay over many years back into the mud.

Gallardo's work within *Wrecked* culminated in an ecopolitical recipe book *Talking Dirty – Tongue First, Recipes from the Mouth of the Thames*, co-authored by Gallardo and Lastra and published by Arts Catalyst, produced in collaboration with the situated knowledge of South Essex people.

Figure 28: *Graveyard of Lost Species*, Critical Art Ensemble and YoHa, Leigh-on-Sea, 2016.
Photo: Simon Fowler

Figure 29: Detail of *Graveyard of Lost Species*, Critical Art Ensemble and YoHa, Leigh-on-Sea, 2016. Photo: Simon Fowler

3.6.5 Summary and conclusions

Wrecked on the Intertidal Zone brings together and extends my learning from earlier projects, such as *Arctic Perspective Initiative* and Ballengée's *Malamp UK*. It is a significant step in developing the concept and principles of a curatorial model of critical and transdisciplinary co-inquiry. These principles include centring the inquiry in a matter of concern (in this case the changes taking place within the complex system of the Thames Estuary by forces seen as outside local people's control); the intentional co-production of different types of knowledge – artistic, scientific and situated; and being aware of how these different knowledges and practices relate to and affect one other (an ecology of practices).

As a multifaceted project with many authors and an artist(s)-led inquiry, my role as a curator in *Wrecked* requires some unravelling. My curatorial role can be summarised as three interlocking things. Firstly, as a creative collaborator – jointly initiating, conceptualising, planning and critically reflecting on the project. Secondly, as a "diplomat" (a term explained in Section 3.4.5), working between disciplines, both privileging artistic practice and arguing for the inclusion of citizen science activities and specialist scientific expertise to inform the work on Two Tree Island. Thirdly, as an

initiator and organiser of platforms for outputs (exhibitions, public realm events, publications).

Wrecked on the Intertidal Zone has used the tactical framework of the commons throughout the co-inquiry as a way of thinking about the estuary and encouraging people to become interested or engaged in its stewardship and governance. Without regarding the commons as a panacea for solving environmental problems, following Wall (2014), we see it as a tactical way of discussing, raising awareness of, and inquiring into who owns the land, air, estuary waters, river bed, salt marches, mud flats and other intertidal zones and how we use those domains and their resources. The knowledge co-produced can then offer insights into how we value the environment and how it might be governed on both an informative and transformative level.

On an informative level, the knowledge produced by the inquiry includes localised propositional knowledge (e.g. the levels and geographical distribution of toxicity of water, blackberries, etc., on Two Tree Island), collated anecdotal information about disappearing or lost flora, fauna, occupations, diseases, works and landmarks from the locality, and presentational knowledge which manifests experiential knowing and captures propositional and practical and shapes them into art, images, narrative and film, including the *Wrecked on the Intertidal Zone* films and *Graveyard of Lost Species* monument.

On a transformative level, the knowledge and insights produced include ways of knowing (such as how to draw out localised matters of concern, organise inquiries, and connect with local networks and actions already active), and practical knowledge (such as how to use specific citizen science tools, identify species, collect and analyse data, conceptualise ideas, create narratives, craft stories, and share this knowledge through media). This transformative knowing also includes experiential knowing, a more elusive concept but which is the process of perceiving through a meeting or an encounter with what or who is there. Experiential knowing is essential for an extended co-inquiry that involves people, animals, or an environment, and, in terms of research outputs, is perhaps best documented through films, art and narrative.

Together these insights and the experience of the project have suggested that "commoning" processes – in which people become engaged in the stewardship or

governance of their local commons – can be shaped and may be activated through imaginative and locally-sensitive co-inquiry methods of art action, knowledge co-production, and experiential modes of presentation.

4 CONCLUSION

When I embarked on this programme of work in 2007, I saw a need for a model of institutional curatorial practice that could systematically nurture and support artists' engagement with disciplines beyond art history and commission deeply-informed work to respond to an age of accelerating scientific and technological development and ecological crisis. The main research question in the Introduction summarises the challenge that I set myself, in my role as artistic director of Arts Catalyst. How could I develop a coherent programme that would generate new artworks and interdisciplinary knowledge across areas of specialist research and geopolitical urgency? What sort of curatorial model and interpretative and tactical framework would support this?

Over the last ten years, I have gradually evolved a model of curatorial practice that focuses on the construction of processes and platforms for collaborative art-centred critical transdisciplinary inquiry into matters of concern. In the course of this, an interpretative framework of engaging with the 'planetary commons' has become slowly more explicit. This model, my own role as a curator within it, and the interpretative framework have been developed through an extensive series of projects - a selection of which have been discussed - within the context of an overarching programme of work, with many collaborators, between 2007 and 2016.

I will describe my findings as answers to the three elaborated research questions concerning the model of curating, the role of the curator, and the tactical and interpretative framework and curatorial approaches that develop from this approach.

4.1 A curatorial model of interdisciplinary co-inquiry

The curatorial model of co-inquiry that I have been developing at Arts Catalyst has, as key characteristics, a commitment to **contemporary artists' practice**, **critical transdisciplinarity** (Rowland, 2002), **reflective organisational leadership** or 'experimental institutionalism' (Kolb and Flückiger, 2014b), and an **experiential and performative** understanding of the exhibition.

My research proposes a suggestive model that contributes to an expanded understanding of the role of curating in contemporary art, with particular reference to practices concerned with interdisciplinary. The approach described is presented less as a "to do" list that if followed would lead to the successful completion of curatorial projects, but rather a set of principles and approaches that, tested in practice, have been found to usefully guide an interdisciplinary curatorial programme and frame its presentation in the contemporary art field.

It extends approaches in curatorial practice by drawing on models of **knowledge co-production** between science and society (Jasanoff, 2004, Callon 1999). I suggest that this model provides a way to focus attention on **matters of concern** (Latour, 2004b) and to foster **an ecology of practices** (Stengers, 2005) in relation to complex social-ecological-cultural-geopolitical entanglements. While there are some likenesses with the model of co-inquiry proposed for the 'science of people' by Heron and Reason (2001), and I find their scheme valuable, it differs from their model in its intent, its disciplinary emphasis, and its form of reflexivity.

To summarise the key principles that can be identified in this model:

Matters of concern. That our inquiries be directed towards significant issues that concern us. These might include, for example, biodiversity loss, climate change, our actions towards other species, or the unequal sharing of the orbital commons.

Co-production of knowledge. That we focus on a process of intentionally co-producing knowledge between art, science and society that is context-focused and, ideally, driven or directed with the involvement and contribution of individuals affected by that knowledge (e.g. of ecologically fragile environments).

Ecology of practices. In bringing together specialists and publics, that we take into consideration how particular practices relate to and impact on other practices, and that other practices be respected and considered as other ways of knowing.

My research and curatorial practice adapts, elaborates and applies these primarily theoretical ideas within a practical curatorial context. It adds to standard models of co-

producing scientific and interdisciplinary knowledge by insisting on widening the types of knowledge and ways of knowing that we need to understand, represent and transform the world. The projects presented as published work in this thesis and portfolio each develop knowledge on informative and transformative levels. All five projects, in varied ways, emphasise knowing as experience and knowledge as a transformation of experience, and in doing so have contributed to emerging fields of research and discourse across art and other disciplines. Ballengée's *Malamp UK* models a way of doing rigorous environmental research as part of an artistic practice, as well as science as a participatory activity. Scott, writing in the context of critical art and ecology, considers that *Arctic Perspective Initiative* "underscores the crucial value of trans-disciplinary and 'extra-disciplinary' inquiry for navigating political ecological subjects" (Scott, 2013). Space scientist Bernard Foing acknowledges the role of ITACCUS in the development of artistic and sociological projects that engage the wide public in space exploration (Foing, 2014). Ariel Guzik's *Holoturian* contributes to the investigation of resonance phenomena in nature, as well as using resonance as a means of communication and for creating art installations that combine sound, architecture and visual art, while *Wrecked on the Intertidal Zone* is already noted for innovation in digital art (Harrison, 2015).

As well as extending existing models of knowledge co-production and contributing to emerging fields of research, the curatorial co-inquiry model adds to the field of curatorial practice through an expansion of the curatorial (as a field of knowledge) by expanding the practice of curating (as a set of professional practices) into domains outside the realm of contemporary art and art history, particularly those associated with science and technology. In this way, the co-inquiry model contributes to the current phase of interest within artistic and curatorial practice towards knowledge production, collectivity, and participation, but extends this beyond the art universe.

To elaborate on some of the model's main characteristics:

A commitment to contemporary artists' practice. This model is able to incorporate a wide range of media and artforms, from art using new technologies to socially engaged art to live art to established contemporary artforms (sculpture, video, installation, etc.). Art historical discourse informs and underpins it, but is not its central concern, which rather focuses on interweaving the contributions of different disciplines and knowledges

with artistic practice, and the engagement of various publics with its processes and outputs.

Critical interdisciplinarity and **transdisciplinarity.** Bringing together of different kinds of knowledge and skill, to expand knowledge or to solve a practical problem, with a critical awareness of the social, political, cultural and ethical contexts.

Reflective organisational leadership or **experimental institutionalism**. Valuing long term development over short term gains, and reflecting on the relationships between curators, artists, collaborators, art and audiences, and seeking to create meaning from activities.

An experiential and performative understanding of art and exhibition. A focus on how to integrate art and knowledge into a lived or embedded experience for audiences and publics, being conscious of the relationship of curated experiences and opportunities for reflection to experiential learning (Kolb, 1984), and understanding the work of art and of science as performative (Butler 1993, Callon 1998, Pickering 1995) in that the activities both affect and are affected by their interaction with society, audiences and publics.

In the interdisciplinary co-inquiry, art both *is* the process and artistic outputs are also generated through the inquiry, which can then be curated as an exhibited or performed. In the five projects presented, artistic outputs have included treated specimens, high resolution scans, drawings, objects, photographs and short films, representations of inquiry processes (e.g. real time films of the toadlet tank experiments), artworks that are also devices for further research (e.g. the *Holoturian* instrument-submersible and models of designs for the Arctic media/monitoring mobile units), temporary monuments (*Graveyard of Lost Species*), sound art produced from field recordings (both as sound installation and performance), artists' publications, and collections – of objects, materials, specimens, lost species, recipes, sounds, and data points. These have been presented both in the public realm and as curated exhibitions of contemporary art (at Arts Catalyst Centre, Canada House, Edinburgh Art Festival, the Royal Institution, and the Bargehouse, London).

In Section 1.4.1 on research methodology, I have outlined how knowledge is produced through the co-inquiry of three broad types: **informative** and **transformative knowledge** as part of the inquiry, and **curatorial knowledge** from reflection on the inquiry. Informative knowledge includes localised propositional knowledge and presentational knowledge (art, images, narrative and film). Transformative knowledge includes co-inquiry processes, practical knowledge, and experiential knowing. **Curatorial knowledge** is then created through reflection and further research and takes the form of **curatorial knowledge** from the projects themselves and knowledge about **curatorial methodologies and frameworks**.

4.2 The role of the curator in the co-inquiry model

As discussed, the role of the curator has changed and expanded over the past few decades. Twenty years ago, this expansion was remarked on in terms of the curator's changing role within the production and display of art:

> The curator is now often implicated in the production of the work, working closely with the artist as a commissioner or enabler, and is concerned with the whole physical and intellectual experience of an exhibition or off-site project.
> (Gleadowe, 2000, p29)

Today, the curatorial is itself demarcated as an area of knowledge beyond solely that of professional practice, and therefore the curator's role and activities are said to produce knowledge (Martinon, 2015). However, the discourse around the curatorial is still focused largely on knowledge production within the realm of art history, artistic practice and professional curatorial practice whilst, as noted above, I extend the curatorial, and therefore the role of the curator, to the production of knowledge within broader realms.

The curator's role in the co-inquiry is multiple and includes both established and expanded roles.

Established roles include:

- Context provider: creating a space for debate around the artwork.

- Artist enabler: helping artists to develop new forms of artistic practice, content and processes, and sustain their careers.
- Content commissioner: producing artworks, activities and other outputs.
- Experience provider: seeking ways in which various audiences and publics can engage in experiential interactions with art and ideas.
- Educator: moving academic and philosophical debates into the public domain.
- Cultural entrepreneur: organising cultural, financial, social and human capital to enable artistic, cultural and educational activities to flourish.

Expanded curatorial roles include:

- Research platform and strategic context creation: curating people, locations, processes, histories and discourses to create conditions for the production of new art and new ideas about artistic practice and knowledge production.
- Transdisciplinary researcher: researching, absorbing and applying information from a wide range of sources including and outside art history. In the projects presented, these contexts have included biology, ecology, marine conservation, geography, science and technology studies, space administration, international governance, international relations and local governance.
- Inquiry network builder: developing networks and communities of interest around areas of thematic inquiry.
- Diplomat, on which I expand below.

In *Politics of Nature* (2004a), Latour achieves a rather brilliant conflation of how science operates and how politics operate, and thence of how "collectives" construct provisional agreements that describe their version of reality. Provisional because they continue to be reshaped as the collective decides to take on new things/ideas that it may have ignored until that point (usually because of a clash with the collective's accepted "reality"). Therefore, when you have different collectives, with different cultures and information sources, there will be conflicting versions of reality. Latour suggests that this difficult situation can be handled by the ancient art of diplomacy.

What I find particularly compelling in Latour's idea of diplomacy are the two features – "advantages" - of his diplomat, which are firstly that the diplomat understands that they are not objective, that, unlike an arbiter, "… the diplomat always belongs to one of the

parties to the conflict" (Latour, 2004a, p212), and secondly that the diplomat's negotiation cannot assume anything at the start, "… a potential traitor to all camps, he cannot know in advance in what form those whom he is addressing are going to formulate the requirements that many lead to war or peace'." (ibid.).

4.3 The planetary commons as a framework for artistic inquiry

If we understand the Anthropocene as a failure of societal governance, then I suggest that a co-inquiry approach focused on a tactical and interpretative framework of the planetary commons - one that expands interdisciplinary inquiry and artistic expression to create affect, shared knowledge, opportunities for local self-expression, and tools to help enable community action - can address matters of concern relating to environmental stewardship more usefully than the geologically-derived concept of Anthropocene alone.

A concept of the planetary commons requires a **common-pool of resources** (for example, the atmosphere, the diversity of species on the Earth, the Arctic, the electromagnetic spectrum, the Moon, the oceans, scientific knowledge), a **community** to create and sustain the commons, and **commoning practices** (De Angelis, 2010). Commoning practices may be particular customs relating to the use of a resource or territory (such as hunting seals in the Arctic, using radio frequencies, cockling in the Thames estuary, communicating by sound in the ocean, gathering information about an environment through citizen science), and practices of caring for a resource (for example, resisting or monitoring pollutants and polluters, ensuring or legislating for restocking a resource, restoring degraded environments, and gathering robust and useful knowledge about an environment). "Planetary commoning" proposes tactical actions towards asserting, enabling and promoting these customs and activities, as well as building networks of relationships to sustain these customs and to mobilise existing legal and institutional structures to guarantee and protect rights. Communities that create and sustain a planetary common-pool resource may be translocal and networked.

Drawing on Chatterton, Featherstone and Routledge (2012), the **planetary commons** can operate as a set of principles, demands and practices focused on organising geopolitical challenges aimed at shifting the balance of power away from the regimes of commerce and strategic interests that seek to enclose the commons, and instead towards

networked grassroots movements working for increased equity and environmental justice. The projects that I have discussed in this commentary and presented in the accompanying portfolio of published work contribute to the development of planetary commoning practices and tactics (both locally and translocally) and to forming the political and geographical imaginaries necessary to move the notion of the planetary commons to wider consciousness.

Ballengée's *Malamp UK* promotes ecological science as a common knowledge and practice, as well as building a wider consciousness and community of interest in biodiversity as a commons through its artistic outputs and publication. *Arctic Perspective Initiative* works towards the co-development of communications technologies and environmental monitoring systems that can contribute to community-based practices for managing and living within a changing Arctic environment. API is underpinned by principles of technology and knowledge as commons, and – through exhibitions and publications – promotes a geopolitical imaginary of the Arctic as a complex technologised and politicised environment, and raises awareness of geopolitical tensions and attempts at new enclosures of the Arctic commons. ITACCUS intervenes in the institutional structures of governance of the outer space commons to argue for art and culture as tools in the defence of space as a global commons, while the exhibition *Republic of the Moon* raises awareness of the Moon as a threatened commons. Through the art's affect on audiences, Ariel Guzik's *Holoturian* exhibition contributes to acknowledging that cetaceans have language and culture and therefore – as is argued more specifically in the *Holoturian* publication – to arguments and movements to grant rights to non-human animals. *Wrecked on the Intertidal Zone*, meanwhile, proposes the Thames Estuary as a commons and builds a community of local people to explore how art can represent and initiate local knowledge into the realm of governance for the Thames Estuary, and connects this community to translocal networked communities through online and exhibited outputs and discourse.

4.4 Concluding remarks and further areas for research

In this commentary, I have described how, through a programme of practice-centred research, I have been developing a curatorial model of interdisciplinary co-inquiry to produce new artworks and knowledge, through processes and forms described above in

Section 4.1, discussed in the context of the projects, and documented in the portfolio of published work.

I have outlined the main principles and key characteristics of the curatorial model of interdisciplinary co-inquiry, described the expanded role of the curator within it, and described how it produces art and knowledge, as well as contributing to community-based spatial politics. Through the Contextual Review, I have looked at existing models of curating and knowledge production, and the roles of curators, demonstrated how this model builds on and complements these, and discussed how this represents new curatorial knowledge. The curated projects that I have presented each represent stages along the development of the co-inquiry model, which has emerged through my practice over the ten years. Each project has involved commissioning new artists' projects through cooperative inquiries and curating new work for different spaces. Each project and the resulting presentations of work have engaged with contexts, concerns, artists' and contributors' practices, communities (human and other species), spaces and audiences in distinctive and reflective ways.

Alongside, I have explained how a framework of the planetary commons has emerged through the projects, steering my curatorial and critical thinking over a period of ten years, and enabling insights and understanding to develop and be shared with audiences and wider publics. I have explained the features of this planetary commons framework, drawing on the work of researchers including Ostrom and Jasanoff, which include a recognition that, when addressing matters of concern in which science, society and environment are intertwined, we need to be aware of multiple levels of governance: from international and national institutions to the roles that stakeholder communities and local practices can play, as well as to evolving discourses across several fields. Contained within this, the idea of the scientific commons points to tactics of democratising science to address issues that affect people.

The research presented in this PhD contributes to discourses around curatorial practice and cultural leadership, the relationship between the expanded field of art and interdisciplinary research including science, and discourse in relation to art, environmental stewardship and extraterritorial spaces.

The curatorial model of interdisciplinary co-inquiry that I have developed needs further testing in the field. As a model, it is a challenging, and frequently unwieldy, to implement, as it requires considerable curatorial focus and time to facilitate a group of people to perform together, pursuing individual goals within an overall common concern, and to nurture any specific collaborations that emerge. It is a system in which directionality tends to emerge through process, and so it can be uncertain or insecure at stages. It is also idealistic, in its requirements of common purpose, equal privileging of different specialist and situated knowledges and expertise, and the desire to co-create knowledge of value in the world beyond contemporary art, whilst also being positioned and acknowledged within contemporary art. In the real world, with the vagaries of funding and resourcing, the rarely compatible expectations of funders, the competing priorities for artists and other contributors' time, and the divergent demands of running a small-scale nonprofit art organisation, idealism is always compromised.

However, the model should be of interest to other researchers, curators, artists and collectives attempting to work in transdisciplinary and collaborative ways. There seems to be an ongoing need to examine and test forms of co-inquiry, in art, in research, and in community settings, originating from different collective perspectives: science researchers using various co-inquiry methods with communities, practitioners of art (artists, curators) working within interdisciplinary inquiries, community activists needing to generate knowledge.

As a complex, interdisciplinary model of curation, one aspect that I wish to focus on - being conscious of my position as a diplomat from the world of contemporary art - is how better to bring scientists into the co-inquiries, and how more systematically to develop civic/citizen science tools, systems and projects with and for communities.

There are many areas of further research to which this suggested co-inquiry model as a methodology, and the use of a framework of planetary commons, might be applied and through which can be further developed and evaluated. Scholars in art and design fields may find use in applying aspects of the co-inquiry model to processes of developing collaborations with scientists and technologists. They might usefully apply the model or framework not only to environmental protection concerns, but across a range of issues including social and racial justice and helping to safeguard health and well-being. This

could lead to establishing and disseminating working models for curatorial interdisciplinary co-inquiries. There is also a need for further investigation by contemporary art historians of precedents of collaborative cross-disciplinary inquiries, particularly those driven by artists' research platforms.

Other subject areas in need of development include:

- Curatorial practice, when examining the expanded role of the curator and the meaning of curating and the curatorial in the expanding interdisciplinary field of the arts.
- Geography and science studies, in which scholars seek to collaborate or work with visual artists and communities.
- Environmental science, medical science or health studies, in exploring approaches to collaborative, experimental and publicly situated research and inquiry, particularly with "lay" communities.
- Science engagement, in seeking to engage with "hard to reach" communities and audiences.

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6 LIST OF PUBLISHED RESEARCH IN DIGITAL VOLUME (V2)

6.1 *Malamp UK*, Brandon Ballengée (2007-2010)

6.1.1 The *Case of the Deviant Toad*, Brandon Ballengée

Type: Exhibition: website and documentation

Venue: Royal Institution of Great Britain, London

Dates: 16 – 31 March 2010

Role: Curator

6.1.2 *Malamp: The Occurrence of Deformities in Amphibians, Brandon Ballengée*

Type: Edited book

Publisher: Arts Catalyst/Yorkshire Sculpture Park

Date: 2010

Role: Editor, with Miranda Pope.

ISBN: 978-0-9534546-7-9

6.1.3 An Itinerant, a Messenger and an Explorer: the work of Brandon Ballengée

Type: Text (an introduction to the above book)

Title: 'An Itinerant, a Messenger and an Explorer: the work of Brandon Ballengée', Triscott, N, in *Malamp: The Occurrence of Deformities in Amphibians, Brandon Ballengée*.

Publisher: Arts Catalyst/Yorkshire Sculpture Park

Date: 2010

Role: Author

6.2 *Arctic Perspective Initiative* (2009-2011)

6.2.1 *Arctic Perspective Initiative*, Canada House

Type: Exhibition: website and documentation

Title: Canada House, London.

Dates: 21 May-30 September 2010

Role: Curator

6.2.2 *Arctic Geopolitics and Autonomy*

Type: Edited book

Publisher: Hatje Cantz and Arctic Perspective Initiative

Date: 2011

Role: Co-editor with Dr Michael Bravo.

ISBN: 978-3-7757-2681-8

6.2.3 Critical Art and Intervention in the Technologies of the Arctic

Type: Text (chapter in the above book)

Title: 'An Itinerant, a Messenger and an Explorer: the work of Brandon Ballengée, in *Arctic Geopolitics and Autonomy*, eds. Michael Bravo and Nicola Triscott.

Publisher: Hatje Cantz and Arctic Perspective Initiative

Date: 2011

Role: Author

6.3 ITACCUS (2007-2014)

6.3.1 *Republic of the Moon*

Type: Exhibition: website and documentation

Title: The Bargehouse, London.

Dates: 10 January - 2 February 2014

Role: Co-curator

6.3.2 Transmissions from the Noosphere: Contemporary art and outer space

Type: Text (book chapter)

Title: 'Transmissions from the Noosphere: Contemporary art and outer space', Triscott, N, in *The Palgrave Handbook of Society, Culture and Outer Space*, eds. Peter Dickens and James Ormrod.

Publisher: Palgrave Macmillan (scholarly division),

Date: 2016

Role: Author

ISBN: 978-1-137-36351-0

6.3.3 Critical Art and Outer Space: a curatorial inquiry into space as a global commons

Type: Text (conference paper)

Title: 'Critical Art and Outer Space: a curatorial inquiry into space as a global commons', Triscott, N. Presented at Association of American Geographers Annual Meeting. San Francisco

Date: 2016

Role: Author

6.4 *Holoturian*, Ariel Guzik (2013-2015)

6.4.1 *Holoturian*, Ariel Guzik

Type: Exhibition: website and documentation

Venue: Trinity Apse, Edinburgh Art Festival,

Dates: 30 July - 30 August 2015

Role: Curator

6.4.2 *Holoturian, Ariel Guzik*

Type: Edited eBook

Publisher: Arts Catalyst.

Date: 2016

Role: Editor

ISBN: 978-0-9927776-8-5

6.4.3 The Re-enchantment of the Ocean: Ariel Guzik's Cetacean Encounters

Type: Text (chapter in the above book)

Title: 'The Re-enchantment of the Ocean: Ariel Guzik's Cetacean Encounters', Triscott, N, in *Holoturian, Ariel Guzik*

Publisher: Arts Catalyst

Date: 2016

Role: Author

6.5 *Wrecked on the Intertidal Zone* (2013-2016)

6.5.1 *Notes from the Field: Commoning Practices in Art and Science*

Type:	Exhibition: website and documentation
Venue:	Arts Catalyst Centre for Art, Science and Technology, London
Dates:	28 January 2016 - 19 March 2016
Role:	Co-curator

6.5.2 *Graveyard of Lost Species*, Critical Art Ensemble and YoHa

Type:	Commissioned public monument: website and documentation
Venue:	Site specific, Leigh-on-Sea marshes, Southend, Essex. Ordinance survey grid ref: TQ 82738 85478
Dates:	Opened 23 July 2016
Role:	Co-curator

7 APPENDICES

7.1 Appendix 1: Arts Catalyst Main Projects 2007-2016

Those projects highlighted are those presented as Published Work. Unless the artists are specified, all projects have multiple artists and participants. The list does not include Arts Catalyst's schools programme.

POLAR REGIONS			
Title	**Type of output**	**Artists/main participants**	**Year**
POLAR/Bipolar	Symposium, public talks, commissions, exhibition, publication	Kathryn Yusoff, Jennifer Gabrys, Anne Brodie, et al.	2007-8
Arctic Perspective Initiative	Field trips, commissions, exhibition, design competition, conference, talks, publications	Marko Peljhan, Matthew Biederman et al.	2009-11
Ice Lab: New Architecture and Science in Antarctica	Exhibition, commissions, talks, publication	Various	2013-15

OUTER SPACE			
Title	**Type of output**	**Artists/main participants**	**Year**
ITACCUS (includes the projects below)	Network		2007-14
Less Remote	Conference	Various	2008
KOSMICA series	Events, talks, festival	Various	2011-16
Republic of the Moon	Commissions, exhibition, performances, events, talks, publication	Agnes Meyer Brandis, Leonid Tishkov, Liliane Lijn, We Colonised the Moon, Katie Paterson, Andy Gracie, Sharon	2011-14

		Houkema, Joanna Griffin, et. al	
Moon Goose Analogue: Lunar Bird Migration	Commission, exhibition	Agnes Meyer Brandis	2012

AIR/ ATMOSPHERE			
Title	**Type of output**	**Artists/main participants**	**Year**
2nd International Artists' Airshow	Commissions, exhibition (as event), talks.	Ruth McLennan, Anne Bean, HeHe, Brandon Ballengée, Sonia Khurana, Rachel Chapman, et al.	2007
Poetic Cosmos of the Breath	Commission, exhibition (as event)	Tomas Saraceno	2007
Great Glen Artists' Airshow	Commissions, exhibition (as event), bus tour, talks, map.	London Fieldworks, Camila Sposati, Susanne Nørregård Nielsen, Esther Polak and Ivar van Bekkum, Alec Finlay, Adam Dant, et al	2010

BIODIVERSITY/ ECOSYSTEMS			
Title	**Type of output**	**Artists/main participants**	**Year**
Malamp UK and The Case of the Deviant Toad	Commission, public field trips and biolab, exhibition, talks, publication, scientific paper.	Brandon Ballengée	2007-10
Memorial for the Still Living	Commission, exhibition.	Beatriz da Costa	2010
Ecotoxic	Research programme, residencies	Ariel Guzik, Micol Assaël, Brandon Ballengée, Kuai Shen	2013
Wrecked on the	Inquiry, commissions,	YoHa, Critical Art	2013-16

Intertidal Zone	exhibitions, events, talks, workshops, films, publications, public monument.	Ensemble, Fran Gallardo, Andy Freeman, et al	

OCEANS			
Title	**Type of output**	**Artists/main participants**	**Year**
Dark Streams	Public field trips, talk	Brandon Ballengée	2013
Holoturian	Commission, exhibition, performance, talk, publication	Ariel Guzik	2013-15

SCIENCE IN SOCIETY / CULTURE			
Title	**Type of output**	**Artists/main participants**	**Year**
Dark Places	Commissions, exhibition, critical excursion, talks, publication	Office of Experiments, Beatriz da Costa, Victoria Halford and Steve Beard, Steve Rowell, et al.	2007-10
Transformism	Commissions, exhibition, publication	Melanie Jackson, Revital Cohen	2013
Sterile/Sensei Ichi-go	Commission, exhibition	Revital Cohen and Tuur van Balen	2015

Whilst processes of interdisciplinary knowledge development interweave across all our projects, I have assigned a few projects specifically to this category, when the process of knowledge or professional development take prominence over any thematic inquiry.

PROCESSES OF INTERDISC KNOWLEDGE DEVT.			
Title	**Type of output**	**Artists/main**	**Year**

		participants	
Eye of the Storm	Conference	Various	2009
Laboratory Life	Collaborative production workshop, commissions, exhibition, talks	Andy Gracie, Bruce Gilchrist, Kira O'Reilly, Adam Zaretsky, Anna Dumitriu, et al.	2011
Synthesis	Exchange lab, talks, film screenings	SymbioticA, Alexandra Daisy Ginsberg, Prof John Ward, et al.	2011
Data Landscapes	Seminar, exhibition	Tom Corby et al., Lise Autogena and Joshua Portway	2011
Radical DIY series	Event series	Various	2012-13
Lab Easy	Public lab, talks, workshops	MadLab et al.	2013

Other thematic programme strands in Arts Catalyst's programme tangentially relate to the commons or 'global commons'. Material sources of energy, such as uranium and fossil fuels, have been claimed as a commons. Issues of the commons have some bearing also on discourse around our relationships with other animal species, and infrastructural developments such as transport.

ENERGY			
Title	**Type of output**	**Artists/main participants**	**Year**
Nuclear: Art and Radioactivity *	Commissions, exhibition, seminar	Chris Oakley, Kypros Kyprianou and Simon Hollington	2008
Fracking Futures	Commission, exhibition	HeHe	2013

ANIMAL STUDIES			
Title	**Type of output**	**Artists/main participants**	**Year**
Interspecies: animals as equals	Commissions, exhibition, seminars, talks, texts.	Kira O'Reilly, Nicolas Primat, Ruth McLennan, Antony Hall, Beatriz da	2009-10

		Costa, Rachel Mayeri, Snæbjörnsdóttir/ Wilson, et al.	
Primate Cinema: Apes as Friends	Commission, exhibition, talks, publication.	Rachel Mayeri, Sarah Jane Vick	2011-12

TRANSPORT			
Title	**Type of output**	**Artists/main participants**	**Year**
M-Blem: the train project	Commission, exhibition/event	HeHe	2012
SEFT-1 Abandoned Railways Exploration Probe	Commission, exhibition, talks	Ivan Puig and Andres Padilla Domene	2013-14

Other programme activities that fall outside the over-arching theme were:

SCIENCE and DISABILITY			
Title	**Type of output**	**Artists/main participants**	**Year**
Specimens and Superhumans	Commissions, exhibition (live art), events, performance, talks	Multiple participants	2011-12
Konfirm/Grey	Residency, commission, performance, talk	Jon Adams, Simon Baron-Cohen	2012

OTHER			
Title	**Type of output**	**Artists/main participants**	**Year**
Truth Serum	Commission, installation, performance/experiment	Neal White	2008
The Neighbour	Commission, exhibition	Ashok Sukumaran	2009