

Expanding Worldviews: Astrobiology, Big History and Cosmic Perspectives

Birkbeck College London

19-20 September 2019



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Programme

Thursday 19 September

Morning Session: Chair Ian Crawford

09:30	ARRIVAL and COFFEE	
10:00	Ian Crawford/Esther Leslie (Birkbeck)	Introduction and Welcome
10:15	Olivia Judson (Imperial College/Freie Universität Berlin)	Energy, evolution, and the transformation of the Earth
10:55	Fred Spier (University of Amsterdam)	Cultivating pepper plants: Fresh views on the history of the biosphere, life, and humanity
11:35	Esther Quaedackers (University of Amsterdam)	How understanding the emergence of life and human culture can help us understand the development of AI
12:15	Andreas Bummel (Democracy without Borders)	The political implications of a planetary worldview
12:45	LUNCH	

Afternoon Session: Chair Clément Vidal

14:00	Mike Garrett (University of Manchester)	Can SETI expand the horizons of astrobiology and big history ?
14:30	Stephen Baxter (Science Fiction author)	The visibility of big history
15:00	Paul Quast (Beyond the Earth Foundation)	A profile of humanity: The cultural signature of Earth's inhabitants beyond the atmosphere
15:30	COFFEE	
16:00	Robert Poole (University of Central Lancashire)	Where were they? ETI in historical perspective
16:30	Mukesh Bhatt (Birkbeck)	The UnCentred Universe: Transcultural perspectives from India and China
17:00	Ian Crawford (Birkbeck)	Expanding Worldviews: Astrobiology, Big History, and the Social and Cultural Benefits of the Cosmic Perspective
17:30	DRINKS RECEPTION	

Friday 20 September

Morning Session: Chair Ian Crawford

09:30	ARRIVAL and COFFEE	
10:00	David Dunér (Lund University)	Extraterrestrial life and the human mind
10:40	Clément Vidal (Vrije Universiteit Brussel)	Universal ethics: Thermodynamic, computational and cybernetic perspectives to expand our notions of good and bad
11:20	Tony Milligan (King's College London)	Astrobiology and the outer limits of human ethics
11:50	Annahita Nezami (Chartered Psychologist)	The psychology of the 'Overview Effect' - What lies beneath?
12:20	Nick Spall (Space author)	Big history and the significance of the Apollo moon landings
12:50	LUNCH	

Afternoon Session: Chair Mukesh Bhatt

14:00	Lewis Dartnell (University of Westminster)	How the Earth made us
14:30	Thomas Moynihan (University of Oxford)	The summons of a silent universe: Existential risk and the cosmic vocation of Homo sapience
15:00	John Timberlake (Artist)	Breath and darkness: Realism and representation in astronomical illustration and cinematographic special effects
15:30	COFFEE	
16:00	Caroline Edwards (Birkbeck)	From clean energy to climate change: Early Martian literary utopias, 1877-1964
16:30	Rachel Hill (Goldsmith's College, University of London)	"Unfathomable. Bottomless. Very Deep": Astrobiology, water-worlds and Earth's oceans
17:00	Daniela De Paulis (Space artist)	The Dream of Scipio: From classical literature to early aviation experiments in film
17:30	DRINKS RECEPTION	

ABSTRACTS

Olivia Judson (Imperial College/Freie Universität Berlin)

Energy, evolution, and the transformation of the Earth

Throughout its long history, life has been a force of planetary transformation, remaking the air, the rocks, the landscapes, even painting the colour of the sky and increasing the variety of Earth's minerals. But are the histories of life and Earth just one thing after another, or is there an underlying pattern that we can make sense of? Here, I argue that there is a pattern, and that life-Earth history can be understood as a sequence of five epochs, each of which corresponds to the evolution of lifeforms that can access a new source of energy. With each new epoch, the diversity of life has become greater, ecosystems have become richer, and life has increased its impact on the planet. This framework of energy expansions provides a way to think about current human impacts upon the Earth—and about the probable trajectories of life-planet systems elsewhere in the cosmos.

Fred Spier (University of Amsterdam)

Cultivating pepper plants: Fresh views on the history of the biosphere, life, and humanity

In my presentation I will offer what are hopefully fresh theoretical views on the history of the biosphere, life, and humanity. Those three histories must be theoretically interconnected, because a planet turns into a biosphere as soon as life emerges, which, in its turn, influences life, while with the emergence of humans a novel dimension was added to this process.

Such a general insight is not new. But how would it all work theoretically speaking? To the best of my knowledge a general theory interconnecting all of that is still lacking. I had been pondering such questions for many years while teaching and investigating the field of big history. But I only began to see the first answers while cultivating pepper plants at home in Amsterdam in 2017 and observing from various points of view what these plants were doing.

This put me on the trail of discovering a number of biases that had hindered me earlier without being aware of them. After removing these biases, a very simple theoretical structure evolved reuniting fields of enquiry that currently appear to be operating almost independently, even though they must be interconnected.

To be sure, none of the factual ingredients that will be presented are new. Yet my proposal for a fresh theoretical ordering of them may have some novel features. Summarizing the major outlines of all of that will make up the thrust of my presentation, with the request to the audience to inform me of other scholars, if they exist, who may already have proposed such ideas.

Esther Quaedackers (University of Amsterdam)

Big leaps in learning: A little big history of AI?

The development of big history over the past few decades has created many new intellectual and societal opportunities, including the use of big history to study much smaller subjects. One way to do this is by using the little big history approach, that connects these smaller subjects to aspects of the most important phases in big history. This approach has been developed into a student assignment that is being used throughout the world and to generate novel research questions. It has been applied to subjects ranging from seemingly mundane ones such as bricks to much more complex subjects. Most recently, we started using it to study a subject that according to some will usher in a major new phase in big history: the development of artificial intelligence.

One of the new frontiers in this development is the challenge to create systems that can observe the world (or a virtual world) and learn about this world by making a model of it. When viewed from a big history perspective this particular ability seems important, because it is an ability that nature has mastered a few times before, with major consequences. Nature did so when the earliest life invented the genetic code and kickstarted biological evolution, and again when early humans invented symbolic language that allowed for cultural evolution.

After all, both the genetic code and symbolic language can be seen as models of the environment. In a way, these 'natural' models are executive summaries that do not describe all the individual components of and interaction in a system, be it the billions of constantly reacting molecules in a cell, or all the roots, branches, and leaves that make up a tree. Instead these models use a more limited number of more abstract concepts, such as sets of genes or words like 'tree', that together represent the underlying interacting components. The invention of these new models was accompanied by major accelerations in the evolution of complexity. This is not surprising, because these models or summaries could be copied, changed, and transmitted more easily than complete sets of individual components and their interactions. This allowed nature to learn faster, with consequences not just for the models but also for the real world they represent.

These similarities between what happened during the origin of life and of human culture and a what is regarded as a new frontier in AI development today raise many important questions about the current and future development of AI. Can the ways life and human culture learned to make models generate new ideas about how AI can learn to do that? If so, can AI also learn to copy, change and transmit models of the entire world, providing a way to virtually experiment with it, much like life and human culture can experiment with their models? If so, how? And what could be the possible impact for the real world?

Andreas Bummel (Democracy without Borders)

The political implications of a planetary worldview

This presentation looks into the development of a planetary world view and global identity and elaborates on their political implications. A planetary perspective puts notions of national sovereignty into question. But what defines a nation and its constitutive people? Is there an emerging global demos that could underpin the formation of a world state? On what principles would a global polity need to be based on from a planetary view?

Mike Garrett (University of Manchester)

Can SETI expand the horizons of astrobiology and big history?

Big History (BH) attempts to describe the history of humankind in the broadest possible sense. It presents a “big picture” perspective that promotes notions of particular thresholds in complexity, culminating in the emergence of intelligent life and a technical civilisation here on Earth. In doing so, BH borrows from the wide perspectives provided by cosmologists, astrophysicists, geologists, biologists, archaeologists, anthropologists etc. Clearly there is considerable value of exposing humankind to various elements of this big picture but it’s unclear that BH itself provides any real added intellectual value. BH also tends to provide students with an oversimplified account that is uncomfortable with acknowledging the limitations of current knowledge. In addition, important events in the BH timeline receive very limited coverage – e.g. from a BH perspective nothing much happens between the creation of the first heavy elements in stars and the creation of our own Solar System – the result is that more than 8 billion years of cosmic history is largely ignored!

Can the study of astrophysics, and in particular the pursuit of SETI (the Search for Extraterrestrial Intelligence) re-broaden the BH narrative? For SETI, the detection of techno-signatures from advanced civilisations located beyond our own solar system may soon be within reach. The detection of life and in particular intelligent life elsewhere in the Universe, would certainly reverse the myopia on which BH quickly converges upon. If there are other technological civilisations out there, what are the common (and indeed uncommon) elements of their evolution? What are their common challenges and how can they inform each other? Do most technical civilisations enter a post-biological phase? What if increasingly sensitive SETI surveys continue to fail to detect these signatures? These questions, and others like them, certainly re-broaden the horizons of BH but also challenge it to deliver on topics that are key to SETI research, including the likely future of humankind and the typical longevity of techno-civilisations in general.

Stephen Baxter (Science fiction author)

The visibility of big history

In a SETI sense, how visible is big history? At one end antimatter starships would be visible across light years, and maybe interplanetary /interstellar bubbles of resource depletion. But how far back were we visible? Since radio emissions? May be planet spotters could see industrial products in the atmosphere, and maybe earlier perturbations in CO2 through colonialism, farming, even forest clearance and mega-fauna extinctions. Perhaps we have been visible since the Neolithic! ... and across thousands of light years. A cosmic context: Big history may be big in space as well as time. And, possibly, our actions may be witnessed, and judged.

Paul Quast (Beyond the Earth Foundation)

A profile of humanity: The cultural signature of Earth's inhabitants beyond the atmosphere

The eclectic range of artefacts and 'messages' we dispatch into the vast expanse of space may become one of the most enduring remnants of our present civilization, but how does his protracted legacy adequately document the plurality of societal values and common, cultural heritage on our heterogeneous world? For decades now, this rendition of the egalitarian principle has been explored by the Search for Extra-Terrestrial Intelligence community in order to draft theoretical responses to 'who speaks for Earth?' for hypothetical extra-terrestrial communication strategies. However, besides the moral, ethical and democratic advancements made by this particular enterprise, there remains little practical exemplars of implementing this garnered knowledge into other experimental elements that could function as mutual emissaries of Earth; physical artefacts that could provide accessible details about our present world for future archaeological observations by our space-faring progeny, potential visiting extrasolar denizens or even for posterity. While some initiatives have been founded to investigate this enduring dilemma of humanity over the last half-century, there are very few comparative studies in regards to how these objects, time capsules and

transmission events collectively disseminate content about the aggregate of our species and the Earth system it inhabits. This catalogue, assembled for extended study as part of the Beyond the Earth foundation, is intended as an initial, dialogic step towards evaluating such a 'profile of humanity'. This investigation will endeavour to collate all cultural resources that can presently be garnered from spacecraft (non-mission orientated, cultural material that conveys an impression of Earth) and non-terrestrial transmissions (electromagnetic signals that are intentionally aimed off-world to embody humanities' evolving, philosophical identity) in the expanse beyond our planetary borders in order to cross-analyse how we presently illustrate the diversity of our planet before, subsequently, deducing how we could appropriately depict our collective human civilization [and biosphere] within deep space and cosmic time.

Robert Poole (University of Central Lancashire)

Where were they? ETI in historical perspective

The late 1950s and early 1960s saw the rapid establishment of the scientific belief in the existence of extra-terrestrial civilizations, becoming something like an orthodoxy within a decade of the beginning of radio astronomy. It achieved scientific acceptability by distancing itself from the belief in UFOs; aliens would not visit Earth but would be detected remotely in a search governed by the mathematically-framed conjectures of the 'Drake equation'. Never have so many non-religious scientists been so certain about something in the absence of evidence. Of the members of the Order of the Dolphin, only Ernst Mayr would have been unsurprised that, after nearly sixty years, searches on a scale unimaginable in 1960 have accumulated overwhelming evidence of absence.

This paper will argue from an historian's perspective that the beliefs of the pioneer Searchers were determined by the conditions of the cold war. Far from conclusively decentering humanity, the first phase of SETI was deeply anthropocentric, and might even be seen as a kind of cold war cargo cult. The future of life in the galaxy most probably lies here on Earth, and nowhere else. The paper further suggests that claims that Big History embodies 'cosmic' perspectives also be advanced with caution.

Mukesh Bhatt (Birkbeck)

The UnCentred Universe: Transcultural perspectives from India and China

Of the major nations with space capabilities, India and China represent almost a third of the world's population, dominate global research, finance and technology establishments, and have cultures that differ from the Euro- and Christo-centric West. This talk attempts an introduction to these cultures, summarising their perspectives on astrobiology and space exploration, presenting Chinese and Indian versions of Big History that integrate supposedly novel world-views into existing frameworks, with implications for society, technology, religion, politics and rights.

Bio: Mukesh Bhatt is a physicist researching “Law and Evolutionary Agency in Outer Space” at the School of Law, Birkbeck, University of London. This involves running the Centre for Legal Futures, with special interest groups on Law and Outer Space, and Science Fiction and Law. He has experience in Physics, Aerospace Materials, Languages and Law amongst other trades. He can be found on academia.edu, research gate and linked using the search terms “Mukesh Bhatt Birkbeck”

Ian Crawford (Birkbeck)

Expanding Worldviews: Astrobiology, Big History, and the Social and Cultural Benefits of the Cosmic Perspective

Astrobiology and ‘big history’ are two relatively new intellectual disciplines, the former focused on searching for life elsewhere in the universe and the latter on integrating human history with the wider history of the cosmos. Despite some differences in emphasis these two disciplines share much in common, not least their interdisciplinarity and the cosmic and evolutionary perspectives that they both engender. In this paper I will explore the relationships between astrobiology and big history and argue that both are acting to widen human perspectives in intellectually and socially beneficial directions. These include stimulating the (partial) re-integration of scientific disciplines after a period of extreme specialization, and the (again partial) breaking down of barriers that exist between the sciences and the humanities [e.g., 1-3]. In addition, both disciplines act to enhance public awareness of cosmic and evolutionary

perspectives which, I will argue, constitute a strong, if implicit, argument for the eventual political unification of humanity [e.g., 4-6]. The intellectual and social benefits of astrobiology and big history would likely be enhanced by the discovery of extraterrestrial life, and especially extraterrestrial intelligence, but as the probability of such a discovery is unknown it is fortunate that the search itself will yield societal benefits even if extraterrestrial life is not discovered [3].

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David Dunér (Lund University)

Extraterrestrial life and the human mind

This paper discusses the question of extraterrestrial life and the human mind. It aims to lay the ground for an emerging research field, astro-cognition, studying the origin, evolution, and distribution of intelligence in Universe. First, it concerns terrestrial intelligence, the cognitive phenomena involved in human search for extraterrestrial life and intelligence. Intelligence could be explained as a cognitive flexibility, an ability to adjust to changes in the physical and socio-cultural environment. Three cognitive functions are particularly prominent in the history of astrobiology: perception, conceptualization, and analogy. Second, it deals with extraterrestrial

intelligence, the evolution of intelligence in outer space. The bio-cultural coevolution of cognition explains the emergence of advanced cognitive skills. An indispensable requisite for the evolution of intelligence, sociability, communication, and advanced technology is intersubjectivity. An intelligent being that has developed advanced technology, would likely have a complex social system, complex communication, and a high degree of distributed cognition. My final question concerns terrestrial-extraterrestrial interaction, whether two distinct creatures could be able to understand each other. Cognitive semiotics is a key to understand the semiosis involved in astrobiology and astro-cognition, such as biosignatures and interstellar communication.

Clément Vidal (Vrije Universiteit Brussel)

Universal ethics: Thermodynamic, computational and cybernetic perspectives to expand our notions of good and bad

Standard ethical frameworks are still based on a Newtonian worldview (Vidal and Heylighen 2019) and struggle to deal with new wicked ethical situations involving all kinds of moral agents, such as artificial intelligent agents, robots, organizations of all sizes, and possibly extraterrestrial life forms.

Ethics has been anthropocentric and needs its Copernican revolution towards a universal ethics. By universal ethics, I mean a framework applicable by any moral agent, be it a human, organization, robot, software agent, or extraterrestrial being; but also able to give value to any physical object in the universe. I present three candidate universal ethical frameworks that work towards this end.

First thermoethics focuses on how to best extract, use, store, and distribute energy to maximize the complexity growth of the universe while minimizing entropy production (Vidal 2014, 272–74). Second, the ethics of organized complexity (Vidal and Delahaye 2019), based on the computational concept of logical depth proposes to preserve, augment, and recursively promote organized complexity. The idea is that the harder it would be to rebuild an object from scratch, the more value it has. Thirdly, systems ethics is needed to facilitate real decision making and we propose methods, principles and

strategies from cybernetics, system theory and complexity science. Our aim is to introduce constructive strategies applicable by any moral agent for dealing with wicked, changeful, and complex problems. These three ethical frameworks are not mutually exclusive and highly promising to guide us in our complex, changing and accelerating world.

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Tony Milligan (King's College London)

Astrobiology and the outer limits of human ethics

Our best ethical theories, insights and values are the legacy of a distinctively terrestrial and human history. Part of this history has involved the valuing of non-human objects and beings as important in their own right. Objects such as artefacts and animals, places and things. The list has always included far more than rational agents or sentient beings, but it has rarely included microbes. To include the latter would require a special sort of theory which would be at odds with our routine terrestrial practices. After all, here on Earth, we routinely kill microbial life in vast numbers. We cannot avoid doing so, irrespective of the ethical theories that we happen to hold. However, it is far from obvious that this local, terrestrial, history and the ethical stories that it has led us to tell, have left us particularly well-equipped for the discovery of microbial life elsewhere...life which we would try to protect against multiple

risks of contamination. The fact that such life could be, in biological terms, indistinguishable from microbial life on Earth, yet our attitude towards it could (reasonably, defensively) be quite different, may be used to help make sense of the ways in which our understanding of human ethical obligations is likely to be transformed by the expansion of space exploration.

Annahita Nezami (Chartered Psychologist)

The psychology of the 'Overview Effect' - What lies beneath?

The Overview Effect (White, 2014) describes the psychological effects of viewing natural landscape from an expansive vantage point and seeing Earth from space is considered to be the epitome of this type of experience (Yaden et al., 2016). Less than six hundred people have had the privilege of seeing Earth from above its atmosphere. These individuals have had the opportunity to encounter a drastically different perspective of life, nature, the planet, and the cosmos. Journals, interviews, and autobiographies of astronauts have highlighted how a significant number of space travellers report post mission they felt a deep sense of interconnection with all life, have come to see themselves and their world differently, and have returned to Earth with a renewed sense of purpose (Gallagher et al., 2015; White, 2014; Nezami, 2016, Yaden et al., 2016).

Largely speaking, notions of growth, self-actualisation and meaning are missing from mainstream culture, education and mental health. In order to address this gap we need to reconsider our approach to mental health. Today's talk considers how virtual reality can be deployed as a means to simulate the Earth gazing experience and induce the overview effect with the view of promoting well-being from a Eudaimonic standpoint for individuals, communities and societies.

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Nick Spall (Space author)

Big history and the significance of the Apollo moon landings

Half a century has now passed since Neil Armstrong stepped out onto the lunar surface. Was this really a “giant leap for mankind”, as described in his iconic words and did it mark a key turning point in the development of humanity, so that homo sapiens has now properly become a spacefaring species as anticipated by Konstantin Tsiolkovsky, HG Wells, Olaf Stapledon and Arthur C Clarke?

In 1969 at the time of Apollo 11, British historian Prof. AJP Taylor said that he considered the lunar landing achievement would do little to alter history or the human condition. Fifty years on, the proper assessment of this issue is more achievable.

This presentation will note how humanity has evolved over 2 million years, with the development of tool usage from the Mesolithic period to the Neolithic, eventually allowing for basic civilisations to develop in the last 10,000 years. Humankind was able to adapt to the changing planetary environment during its early development, far outstripping the intelligence potential of competing mammals and other non-human morphology species such as cetaceans, cephalopods, reptiles and birds. Sophisticated language development, social cooperation and the cognitive imagination of Homo

sapiens allowed for an acceleration of technology in the last 100 years, achieving a basic interplanetary travel capability by the early 1960's.

Born out of international planet-wide social and economic conflict during the Cold War period, in fact the Apollo programme bought a heightened level of environmental and cultural interdependence awareness, particularly with its distant Earth "overview" effect. An estimated 650 million people watched the Apollo 11 moonlanding and despite the short-term national competition-led reasons for its birth, it showed that the extraordinary was possible in an inspiring and heroic way. All this was undertaken a mere 66 years after the Wright brothers had conquered powered flight.

It is argued that the "gifts" of Apollo, the technological, scientific and inspirational benefits that came out of the six lunar landings and the follow-up Earth orbital initiatives, have left humanity in a much better state, so that the long-term survival of the species is now more likely. Thanks to Apollo, it is considered that humankind is now better equipped both mentally and possibly physically to go on and extend across the Solar System and, eventually, the wider Galaxy.

Lewis Dartnell (University of Westminster)

ORIGINS: How the Earth Shaped Human History

World history is often discussed in terms of great leaders and decisive events like wars and revolutions. On a broader scale, overarching themes and trends can be discerned in cultural and social change, and technological advances. But beneath these proximate causes and drivers lay deeper layers of explanation. The Earth itself has profoundly influenced the human story.

An unusual combination of tectonic shifts and cosmic cycles in East Africa over the last 5 million years drove our evolution to become such an exquisitely intelligent and adaptable species. Plate tectonics also created the perfect locales for the emergence of the earliest civilisations. The fundamental circulation currents of the atmosphere determined the trade routes of the Age of Exploration and thus the pattern of empire building in this first stage of globalisation that built the modern world. And the underlying signature of

planetary processes can still be clearly seen in politics and current affairs today.

Our human story is the result of all of these planetary forces. This is not to deny that political, social, economic, and cultural effects have of course been critical through history, but beneath these top-level explanations lie the deeper strata of planetary forces. This lecture presents an interdisciplinary approach to Big History combining planetary sciences and geology with evolutionary biology and anthropology to explore how different features of planet Earth have deeply influenced history.

Bio: Prof. Lewis Dartnell (www.lewisdartnell.com) is an astrobiology researcher based at the University of Westminster, London. His research focuses on radiation environments, planetary habitability and biosignature detection. He has appeared in documentaries on BBC, National Geographic, Discovery and History channels. His 2019 book, *ORIGINS: How Earth's History Shaped Human History* (Basic Books) is the Sunday Times top history book of the year. (<http://www.originsbook.com/>).

Thomas Moynihan (University of Oxford)

The summons of a silent universe: Existential risk and the cosmic vocation of Homo sapience

Of late, so-called 'existential risks' have become the topic of serious research. We are increasingly conversant with increasingly distal prospects. The longest-term fate of intelligence within the cosmos is, more and more, the target of serious attention. We become increasingly concerned for the prospects of 'mind'—whatever that may ultimately be—at ever greater spatiotemporal scales.

However, this tendency—of our growing responsivity to the ultimate cosmic fate of intelligence—itself has a history. Or, in other words, *we have been being swept up by the future for quite some time now.*

In this talk I want to thread present-day astrobiological concerns back into this historical upswell, illuminating their position within the centuries-long drama of human discovery within which they were first articulated and within which they continue to unfold. In this, I want to redefine and update the

Enlightenment notion of a 'human vocation' in light of contemporary astrobiology and thus pinpoint the complex and still-unfolding connection between the 'starry heavens above' and 'the moral law within'.

In short, it was realising the silence of outer space that made us first truly appreciate our precarious position on our own planet and thereby summoned us to the daring and Promethean project of asserting ourselves, and our values, in the face of an otherwise inhospitable cosmos. It was only when we discovered that intelligence is *astronomically precarious* that we acknowledged that it is *astronomically precious* and, thus, accepted all the accountability this entails. This, then as now, is the summons of a silent universe.

In this, not only do I want to show how what we now call 'astrobiological concerns' emerge from the broad sweep of modern intellectual history, I want to show how they have also always been *drivers of modernity itself*. And, insofar as the project of answering our cosmic vocation represents an unfinished and ongoing trajectory, recollecting its beginnings may well indicate just where we might be headed.

John Timberlake (Middlesex University)

Breath and darkness: Realism and representation in astronomical illustration and cinematographic special effects

Despite their inevitable lacunae and elisions, extant visual forms within Science Fiction constitute a mode of representation that allows us to understand humanity's engagement with the cosmos as an Other to the normative or habitual conventions of representation found in that which, following Christian Davies, might be thought of as 'small history'.

Drawing on both filmic tropes of human space flight and interplanetary travel since Klushantsev's *Road to the Stars* (1957) as well as Apollo documentation, this paper examines and considers the concept of work both as historic act (Marx), and as something necessitated by conditions of solitude or isolation (Levinas). Reviewing representations found in films such as Christopher Nolan's *Interstellar* (2014) and Sebastián Cordero's *Europa Report* (2014), the paper proposes representations of astronautical work as a foundational element of a

possible 'écriture cosmique' in light of the problematics of the arche fossil described by Quentin Meillassoux.

Caroline Edwards (Birkbeck)

From clean energy to climate change: Early Martian literary utopias, 1877-1964

This article will draw on scholarship on the cultural significance of Mars in the scientific and popular imagination since the nineteenth century (Markley [2005], Crossley [2011], Wark [2016]) to consider how utopian and science fictions of the red planet have responded to specific climatological crises. The earliest Martian texts appear in the fin-de-siècle period, when the flourishing of utopian literature came into contact with prodigious scientific and public interest in the red planet, and texts at this time used the estranging setting of Mars to stage a number of utopian possibilities. The English vicar in W. S. Lach-Szyrma's *Aleriel, or A Voyage to Other Worlds* (1883) travels to Mars in a car fuelled by a hypothetical clean energy derived from aether, which Victorian physicists were considering in relation to matter, atoms and electromagnetics. Clean energy was also being discussed with relation to Mars in the scientific context at this time, as astronomers debated which telescopes minimised the visual distortion caused by smog and light pollution. Literary depictions of Mars could therefore overcome the problems of industrial revolution at both the environmental, as well as the socio-political, level. In the pink skies of the perfect Martian society in Alice Jones and Ella Merchant's *Unveiling a Parallel: A Romance* (1893), fin-de-siècle readers were treated to a utopian world of clean electric power, full automation and a life of aesthetic pursuits enjoyed in impeccable health. The labour issue on Mars is given a similarly positive treatment in Alexander Bogdanov's *Red Star* [*Krasnaya zvezda*] (1908), which sketches a Bolshevik utopia forged through highly developed scientific culture that has perfected factory management. Bogdanov's Martian factory is "completely free from smoke, soot, odors and fine dust" and is powered not by "the crude force of fire and steam, but the fine yet even mightier power of electricity" (p. 63).

But whilst early Martian utopias offered a glimpse of abundant clean energy, it is the question of climate change that most characterises Martian SF in the 20th century. Evolutionary cosmology suggested that as a smaller planet Mars would have cooled more quickly than Earth, first developing, and then

evaporating, oceans and also losing its atmosphere. This led to speculation (both scientific and literary) that sentient life would have adapted to living on a dying planet of declining resources; and Percival Lowell's canal thesis – published in *Mars* (1895), *Mars and Its Canals* (1906), and *Mars As the Abode of Life* (1908) – captured the public imagination with a compelling vision of extra-terrestrial life on a desertified world, locked in an entropic struggle over dwindling resources. The relevance of Lowell's thesis was obvious to a late-nineteenth-century readership, which had started to connect food, hydrology and climate since the great droughts in India and China during the 1870s. SF pulps, in particular, were inspired by the adventurous and strange opportunities afforded by this image of a hostile Martian landscape. Edgar Rice Burroughs' Barsoom series, which began with *A Princess of Mars* (1912) and continued into the 1960s, is set in an unambiguously Lowellian Mars accessed from an Arizona cave (near the Lowell Observatory) that transports his hero onto the dying frontier of the red planet, linking America's deserts with the desiccated Martian topography. Meanwhile, Leigh Brackett's *Black Amazon of Mars*, which originally appeared in the March 1951 issue of *Planet Stories*, uses the "wild mountains and barren plains" (p. 15) to stage a civilisational struggle over Mars' magnetic fields and radiation.

It's worth returning to these early Martian texts, many of which have been overlooked in SF scholarship, at a time when scientific and literary discourse is moving towards a post-anthropocentric perspective of climatological deep time beyond the reach of human experience. The curious relationship between scientific and literary speculation that can be felt in many early Martian narratives thus reveals what Robert Markley calls the "ecological imagination" of Mars, in which the red planet's function as an analogy to Earth offers writers the chance to conceive of ecological change on a planetary scale.

Bio: Dr Caroline Edwards is Senior Lecturer in Modern & Contemporary Literature at Birkbeck, University of London. Caroline is author of *Utopia and the Contemporary British Novel* (Cambridge University Press, 2019) and has co-edited two books on living writers, *Maggie Gee: Critical Essays* (Gylphi, 2015) and *China Miéville: Critical Essays* (Gylphi, 2015). Caroline is currently working on her second monograph, tentatively titled *Science Fiction in the Era of Ecocatastrophe*, which considers how fictions of extreme environments (such as Mars, Antarctica, the deep sea, and the centre of the Earth) have allowed writers to imagine creative responses to real and perceived disasters about climate change, from the late 19th century to the present day.

Rachel Hill (Goldsmith's College, University of London)

“Unfathomable. Bottomless. Very Deep”: Astrobiology, water-worlds and Earth's oceans

Our solar system is predicated to harbour multiple water-worlds, with subsurface oceans thought to flow on the moons Enceladus, Europa, Ganymede and Callisto. A recent paper by Li Zeng (2019) hypothesises that sub-Neptunian exoplanets, found in abundance across the milky way and commonly thought to be gaseous, are more likely to be vast water-worlds. The preponderance of anticipated planetary oceans are the locus of immense focus for astrobiology, with terrestrial oceans becoming a blueprint for how extraterrestrial ecospheres and alien life are conceptualised. Conversely, Earth's oceans, with sea level rises, pollution and deep-sea desertifications, are rendered increasingly alien.

As dominant imaginaries of the planetary shift from arid and d(r)ying horizons (of Mars et al) to aquatic depths, so to are representations of alien alterity recalibrated. The gradual ubiquity of predicted water-world habitats are thus reflected in a popular culture increasingly frequented by cephalopodic intelligence and aliens. Popular science books such as Peter Godfrey-Smith's 'Other Minds' (2018) and Sy Montgomery's 'The Soul of an Octopus' (2015), are testaments to the wide-spread and escalating interest in cephalopods and their ilk.

Similarly, science fiction (SF) such as Denis Villeneuve's *Arrival* (2016), Adrian Tchaikovsky's 'Children of Ruin' (2019) and Sayuri Ueda's 'The Cage of Zeus' (2004) interrogate humankind's responsibility for species protection, environmental conservation and the potential for communication with cephalopodic kin. In this context SF becomes a means of metamodelling how ethical encounters with both alien and terrestrial life could manifest.

As our planetary imaginaries are increasingly freighted with the multiple valences of heterotopic watery space, so to are more unbounded, oceanic worldviews necessitated. Hence, rather than privileging the apparent fixity of land, the term 'tidalectics,' coined by Barbadian poet Kamau Braithwait, instead proposes an ontology based on navigating flux and flow. This paper will therefore use a tidalectical approach to put astrobiological hypotheses,

terrestrial oceans and SF into conversation; demonstrating not only how oceanic resonances are increasingly established across space, but also that such resonances can only be properly apprehended through the integration of a more cosmic perspective within our thought processes.

Bio: Rachel Hill is on the Cultural Studies MA at Goldsmiths, University of London and is currently writing her dissertation on the contemporary imaginaries of outer space. She has previously spoken in various conferences and workshops about the intersection of astronomy, spaceflight, science fiction and ethics. Hill also regularly reviews speculative fiction for publications such as *Foundation: The International Review of Science Fiction*, *The Quietus*, *Strange Horizons* and *The Women's Review of Books*.

Daniela De Paulis (Space artist)

The Dream of Scipio: From classical literature to early aviation experiments in film

'The Dream of Scipio' (Somnium Scipionis) is a chapter of 'On the Republic', a literary dialogue on Roman politics, written in six volumes by Cicero. "The work was rightly seen as a condensation of important ideas from ancient philosophy and cosmology by scholars in the middle ages. Scholars now recognize it as a superb example of a popular meditation technique widely practiced in different schools of classical philosophy, and known today as the 'View from Above'. In Cicero's account, the Roman tribune Scipio Aemilianus describes how, exhausted from feasting, he fell into a deeper sleep than usual. As he sleeps, he dreams, and in his dreams he experiences a mystical revelation, a vision of his mighty forebear. In the dream, Aemilianus encounters his grandfather's spirit in the outer rim of the heavens, where the ancients supposed pure souls to dwell, near to the gods. Hence, together they look down upon the stars, the earth, and the many different lands and nations dispersed across the surface of the globe", realizing how small and fragile the Earth is, in comparison with the overwhelming size of the cosmos. 'The Dream of Scipio' has been an influential work for my artistic research on the "View from Above" and "The Overview Effect".

In the presentation for 'Cosmic Perspectives', I will be introducing my work at the archeological park of Centocelle in Rome, where I am recreating the first

flight over ancient Rome in April 1909. One of the test flights demonstrated by the Wright Brothers on 24 April 1909 at the archeological sites of Centocelle was documented as part of the first footage in history taken from a plane in flight, showing the ancient ruins as a backdrop for the wings of the Flyer, through a poetic association between past and future.