UKSRN

Annual Conference 2022

7 and 8 July 2022

Durham University | Palatine Centre | PCL048
and via Zoom

Address:

Palatine Centre (Law School Entrance) | Stockton Road | Durham DH1 3LE

Location: PCL048 | Hogan Lovells Lecture Theatre

(First to the right after the Law School entrance)

Zoom link:

(Open each day from time of arrival of delegates)

https://durhamuniversity.zoom.us/j/6946699111?pwd=QzJPc2srK25QY2N3NWpIWDdINUtkUT09
Meeting ID: 694 669 9111
Code: 395774

All times in the programme are UK time.

7 July 2022

12.30	**Arrival of delegates – Tea/Coffee | Law School Atrium**
13.00	**Welcome – UKSRN Chair John Elliott**
13.10	***Extragalactic SETI* | Michael Garrett & Andrew Siemion**
13.40	***SETI using Interferometric Techniques* |Kelvin Wandia**
14.10	***Simulation of the Earth Radio-leakage from mobile towers as seen from selected nearby stellar systems* | Ramiro Caisse Saide, Nalini Heeralall-Issur, Michael Garrett, David C Cullen, Doobayparsad Baijnath**
14.45	**Tea/Coffee break | Law School Atrium**
15.00	***Behavioural Bio-signatures: some questions* | William Edmondson**
15.30	***Could real time simultaneous multiwavelength observations of UAP determine a technosignature?* | Eamonn Ansbro**
16.00	***METI by Design* | John Elliott**
18.30	**UKSRN Conference Dinner**

8 July 2022

10.00	**Arrival of delegates – Tea/Coffee | Law School Atrium**
10.30	***Entropy, the Drake equation, and the Fermi paradox*** **| Bart Wlodarczyk-Sroka**
11.00	***Whose SETI? – Values, Praxis and Critical Zones in an age of terrestrial crisis*** **| M.L.C. Colborn**
11.30	***Remembering the Conversation? - Discussions about the challenges and next steps in establishing a long-term METI archive*** **| Paul Quast**
12.00	**Lunch buffet | Law School Common Room**
13.00	***Law after contact*** **| Michael Bohlander**
13.30	***"The readiness is all." - Post-Detection through practice-based research*** **(pre-recorded) | Kate Genevieve**
14.00	***The UKSRN Post-Detection Hub*** **| John Elliott**
14.30	**Tea/Coffee break – Law School Atrium**
14.45	**UKSRN AGM – Members only**
15.30	**End of Conference**

Abstracts in alphabetical order by presenter

Could real time simultaneous multiwavelength observations of UAP determine a technosignature?

Eamonn Ansbro

Two hypotheses are proposed regarding the possible ETI responsible for Unidentified Aerial Phenomena (UAP) are the Zoo Hypothesis (ZH) and the Laboratory Hypothesis (LH).
According to the ZH, UAP may reflect the existence of an intelligence that has been monitoring the Earth for some time. UAP may be the first evidence of an ETI technosignature around Earth. This class of technosignatures are presented as exogenous intelligent probes that may go beyond the ZH. The LH fits this framework and suggests the importance of further scientific research in order to develop categorisation as a possible technosignature.
Observable outcomes may support the hypothesis that a techno signature manifests within the framework of UAP. We therefore explore the possibility that observations of UAP may reveal those characteristics.
Any candidate targets of this nature requires design of instrumentation that explores a wide range of simultaneous multiwavelengths. Real time observations are therefore required to determine these observable outcomes.

Law after contact

Michael Bohlander

Former NASA Chief Historian Steven Dick has said that "SETI is way behind the curve when it comes to legal implications of discovering intelligent life". This is true not only of the regulatory vacuum around METI or the post-signal-detection environment, but also of the wider ramifications of more direct forms of contact, including hostile contact. Much of the SETI community seems to be fixated on the former contact alternative and unwilling to discuss the latter, because of its proximity to areas of research that still fall under Shostak's "giggle factor". SETI Scientists still seem to demand for themselves the unfettered freedom to take risks that could impact all of humanity for many generations, because *"as scientists we always pursue further knowledge, pushing back the boundaries of the conventional to explore and understand what awaits over the next horizon*", as the authors of a 2022 NASA-sponsored paper "*A Beacon in the Galaxy: Updated Arecibo Message for Potential FAST and SETI Projects*" contend, and because they feel that humanity has *"a compelling story to share and the desire to know of others' – and now has the means to do so".* These are meaningless slogans that do not withstand critical scrutiny based on considerations of risk aversion, and they disintegrate in the face of their after all *intended* potential to lead to uncontrolled and unprepared direct contact, when existential risk regulation scenarios will arise. This paper will address some of these so far neglected risks, namely the conceptual challenges arising to our understanding of the human laws of war and human rights from direct contact with ETI, hostile or otherwise. Their discussion will show that the decision about rules as to whether and how to initiate contact and deal with its consequences is one for all of humanity, more specifically for its politically accountable leaders, and should be confronted sooner rather than later. Scientific curiosity provides no mandate to speak for humanity. Its representatives need to take control of the debate and guide it into developing a cosmic species consciousness with universally shared values that would form the baseline for Earth's response to any form of alien contact.

Whose SETI? – Values, Praxis and Critical Zones in an age of terrestrial crisis

M.L.C. Colborn

The arguments for pursuing SETI are significantly weaker than is often supposed (Kukla, 2010). This is because of (i) internal contradictions in the arguments and (ii) a reliance upon a particular interpretation of 'enlightenment' values to prop SETI up. (These questionable values specifically concern universal perspectives and the pursuit of knowledge for its own sake.) These weaknesses make SETI difficult to justify in an era of social, cultural and ecological crisis. A lack of pervasive justification is perhaps one reason why the funding of SETI has tended to be private. This reliance on private funding has problems because of significant conflicts of interest and because it masks the weaknesses of SETI as a scientific and social pursuit. It also means that SETI becomes reliant upon an individual's personal whims, and so ends up being of concern to private interests only, and not the broader body of humankind. However, alternative framings for SETI are available, which attempt to redress the currently existing weaknesses. Relevant here is Maxwell's (2007) suggestion that academic research in general needs to be redirected from a pursuit of knowledge to a pursuit of wisdom and also to proposals that the 'universal perspective,' which relies upon viewing the Earth at cosmic distances, is replaced with the idea of the 'critical zone,' where human beings are seen as part of a thin film of geochemical processes on the surface of the Earth (Latour & Weibel, 2020). This latter notion can be related to the concept of a 'biospace,' and is thus relevant in an astrobiological context (Cockell, 2015). My proposal is that SETI might be reframed in ways that are more relevant to current concerns, as well as congruent with the focus in astrobiology on life in the context of a broader, cosmic habitat. In this way, the search for intelligence can be shown usefully to contribute to a deeper understanding of our moment of existential crisis.

Cockell, C. (2015). Astrobiology. London: Wiley Blackwell |Kukla, A. (2010). Extraterrestrials: A philosophical perspective. New York: Lexington Books | Latour, B. & Weibel, P. (Eds.) (2020) Critical Zones: The Science and Politics of Landing on Earth. MIT Press/ZKM: London |Maxwell, N. (2007). From Knowledge to Wisdom: A Revolution for Science and the Humanities (2nd. Ed). London: Pentire Press

Behavioural Bio-signatures: some questions

William Edmondson

Definitional confusion is always confusing! Here we will assume, unlike some people, that Techno-signatures are not a subset of Bio-signatures. Techno-signatures are evidence of technological capabilities and thus indicative of technically skilled intelligent beings. They are not our concern here. In recent decades Bio-signatures have been assumed likely to show up in spectro-graphic data as (atmospheric) states, not events. A look at recent publications in the field [1;2] provides plenty of detail of what is measured, conjectured and proposed. The JWST is provoking new work on the topic.[3] My concern is to ask some questions: Can the (non-technological) behaviour of intelligent beings be discerned spectrographically? In particular, can instrumentation find evidence on exoplanets of the intentional use of fire (a uniquely human behaviour on this planet)? Are other behavioural Bio-signatures possible? In my talk I will assess the answerability of these questions. The overall aim is to provoke discussion.

[1] Frontiers of Astrobiology. Eds: Chris Impey, Jonathan Lunine, José Funes. CUP. Chapter 13 / [2] Issue 18 (6) of the journal Astrobiology – especially the paper by Y. Fujii /[3] https://www.stsci.edu/jwst/phase2-public/2589.pdf. See also the NASA blog on the JWST instrumentation: https://blogs.nasa.gov/webb/2022/05/12/seventeen-modes-to-discovery-webbs-final-commissioning-activities/

METI by Design

John Elliott

When we stare up at the stars and contemplate what might be out there, we do this using language, albeit via an internalised narrative. The point is that communication is essential for us to develop our thoughts and ideas, for whatever reason. And we are not alone in using communication. For many species, here on the planet Earth, it is necessary for their survival. For us, it is also an evolutionary imperative for our intelligence to thrive. It is the conduit by which we now dominate this planet.
Language is therefore the most important tool in the Homo Sapiens toolkit. Without it, no internal narrative, to imagine or plan; no complex exchange of information, with others; no ability to pass knowledge on, which remains as the original 'author' intended, across time and space.
It is therefore not a giant leap of faith that any evolved ET intelligence is highly likely (an almost certainty) to have the facility to communicate, themselves. If we receive a message, then we have this evidence and with it, their method and 'code book'. If not, we must compose our message, using our best guess on how we can say it, let alone, what we want to say.
In this paper, we look at some past transmissions, what we know about communication on this planet (our terrestrial corpus), probable variants that ET might use (beyond our normal capacity), and what we would like a message to contain, to facilitate understanding. By using such an approach (the flip side of the 'coin'), we can begin drafting a technologically neutral design blueprint, for format, structure, and content.

Extragalactic SETI

Mike Garrett & Andrew Siemion

The Breakthrough Listen Initiative has embarked on a comprehensive SETI survey of nearby stars in the Milky Way that is vastly superior to previous efforts as measured by a wide range of different metrics. SETI surveys traditionally ignore the fact that they are sensitive to many background objects, in addition to the foreground target star.
In order to better appreciate and exploit the presence of extragalactic objects in the field of view, the Aladin sky atlas and NED were employed to make a rudimentary census of extragalactic objects that were serendipitously observed by the 100-m Greenbank telescope observing at 1.1-1.9 GHz. For 469 target fields (assuming a FWHM radial field-of-view of 4.2 arcminutes), NED identified a grand total of 143024 extragalactic objects, including various astrophysical exotica e.g. AGN of various type, radio galaxies, interacting galaxies, and one confirmed gravitational lens system.
Several nearby galaxies, galaxy groups and galaxy clusters are identified, permitting the parameter space probed by SETI surveys to be significantly extended. New constraints are placed on the luminosity function of potential extraterrestrial transmitters and limits on the prevalence of very powerful extraterrestrial transmitters associated with these vast stellar systems are also determined. It is demonstrated that the recent Breakthrough Listen Initiative, and indeed many previous SETI radio surveys, place stronger limits on the prevalence of extraterrestrial intelligence in the distant Universe than is often fully appreciated.

“The readiness is all.” - Post-Detection through practice-based research

Kate Genevieve

I will share learnings from an array of creative practice-based projects that engage participating audiences to respond to current and emerging post-detection protocols.
Planning for post-detection scenarios has to involve a diverse mix of stakeholders from across human society, not simply scientists and politicians of the Global North. The onus is on SETI to ensure that research invites a diversity of peoples and perspectives.
The researchers of the Indigenous Studies Working Group highlight the importance of understanding that communication protocols are not fixed and eternal, but alive, emergent, relational and processual (Shorter & TallBear 2021). Creative techniques that dialogue with emerging scientific research through semi-structured story-telling, improvisation, art processes and relational play can open up possibilities for collaborating researchers to connect, extend research and learn together in an ongoing practice.
Interactive story-telling is excellent at integrating a diverse range of sources: from extraterrestrial signal detection, to xenolinguistics and the psychology of perception, imagined narratives in science fiction and contemporary zoological studies of the communication systems of More-than-Human earth-based life.
Participatory scenarios are unique in creating novel insights into potential community and societal impacts of a confirmed detection. Researchers can study the living responses and interactions of the audience in real-time. Through experiential and hybrid research techniques, and the opportunity to play and re-play art experiences, it is possible to create unusual and meaningful data about audience interaction for further analysis by post-detection researchers.
Creating spaces for trans-cultural and trans-disciplinary interplay and investigating the community dynamics that unfold in these crafted contact experiences could improve our research culture, deepen the questions we ask and significantly enhance our understanding and readiness for such an event.

Baxter, S. B. & J. Elliott. (2012). “A SETI metapolicy: New directions towards comprehensive policies concerning the detection of extraterrestrial intelligence.” Acta Astronautica 78: 31-36 /Charbonneau, R. (2021). American Indian Culture and Research Journal, 45.1: 71-94 / Dominik, M. et al. (2019). "A message from afar", 2019 Royal Society Summer Science Exhibition / Gibson, J. J. (1979). The Ecological Approach to Visual Perception. Boston: Houghton Mifflin / Guddemi, P. (2020). Gregory Bateson on Relational Communication: From Octopuses to Nations. Springer / Haraway, D. (2003) When Species Meet (Minneapolis: University of Minnesota Press / Kershenbaum, A., Bowles A.E., Freeberg T.M., Jin D.Z., Lameira A.R., Bohn K. (2014) Animal vocal sequences: not the Markov chains we thought they were. Proc Biol Sci. Oct 7;281(1792): 20141370 / Shorter, D. D., & TallBear, K. (2021). An Introduction to Settler Science and the Ethics of Contact. American Indian Culture and Research, 45.1: 1–8 / Whiten, A., Biro, D., Bredeche, N., Garland, E. C., & Kirby, S. (2022). The emergence of collective knowledge and cumulative culture in animals, humans and machines. Philosophical Transactions of the Royal Society B: Biological Sciences, 377.1843 / Wright, J., & Oman-Reagan, M. (2018). Visions of human futures in space and SETI. International Journal of Astrobiology, 17.2: 177-188

Remembering the Conversation? - Discussions about the challenges and next steps in establishing a long-term METI archive.

Paul Quast

On 9th October 2008, '*A Message from Earth*' was transmitted from RT-70 Yevpatoria; a signal containing an eclectic portrait of humanity, its hopes, dreams, stories, and scientific details about our homeworld *we deem to be accessible*. This 'message' is now over 14 light-years from Earth, arriving at Gliese 581 within the next 9 years. Aside from several descriptions and some promotional materials, we unfortunately *do not* possess a full inventory of these contents here on Earth, despite several CD archives being produced. The last known copy of this CD was placed into the custodianship of a nearby space museum in Crimea. As of 2014, this building no longer stands.

This brief account about one of Earth's strongest signals out into the cosmos draws into sharp focus a particularly concerning facet of the METI debate; an experimental practice which actively searches for ETI over expanses of decades and far longer. If ETI were to detect our 'Message from Earth', and choose to formulate a response, should *we* as the initial transmitting entity not take precautions to ensure materials we dispatch to *represent us*, are still available at home to consult, scrutinize, and reinterpret? After all, such materials will hold vital indicators when contemplating how an ETI may have chosen to orientate their own responses. If *we don't remember* how a conversation started, how can we expect to mount an intelligible re-response in the event of establishing contact from METI?

Taking the recent '*A Profile of Humanity*' catalogue of transmissions as a starting point, the purpose of this segment is to discuss what should be the next formal steps in establishing a permanent archive of METI activities – including additional fields to this catalogue, bringing METI into the fold of other long-term experimental practices, and searching for record custodians for the foreseeable future.

Simulation of the Earth Radio-leakage from mobile towers as seen from selected nearby stellar systems

Ramiro Caisse Saide (1) |Nalini Heeralall-Issur (2) | Michael Garrett (3) | David C Cullen (4) | Doobayparsad Baijnath (5)

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Mobile communication towers represent a relatively new but important contributor to the total radio leakage associated with planet Earth. We investigate the overall power contribution of mobile communication towers to the Earth's radio leakage, as seen from a selection of different habitable exo-planets. We made use of publicly available Geo-location data of mobile towers from the the world's largest Open Database of GPS Cell Towers (OpenCelliD). The free and open source Qgis software was also used to create, edit, visualize, and analyze the geo-spacial information. We created a model of the total mobile tower radio leakage by gridding the surface of the planet into small, computationally manageable regions, assuming a simple integrated transmission pattern for the mobile antennas. In this model, these mobile tower regions rise and set as the Earth rotates. In this way, a dynamic power spectrum of the Earth was determined, summed over all cellular frequency bands. We calculated this dynamic power spectrum from four different viewing points – Barnard's star, HD 95735 star and, Alpha Centauri A. Our preliminary results demonstrate that the peak power

leaking into space from mobile towers is ~ 4GW and this is associated with Western Europe. This leaks in the direction of HD 95735 star and corresponds to LTE mobile towers technology. The second most powerful leakage emission comes from West of Asia and Central Europe, following East of Africa and Australia, with power levels of 3.5 GW. We demonstrate that the mobile tower leakage is periodic, direction dependent, and that these could not be detected by a nearby civilisation located within 10 light years of the Earth, using instrumentation with a sensitivity similar to the Green Bank Telescope. With this model, we intend to expand our simulations to include anticipated 5G mobile systems, radar installations, ground based up-links (including the Deep Space Network), and various types of satellite services, including low-Earth orbit constellations such as the Starlink and OneWeb.

Key words: Search for extraterrestrial intelligent life. Mobile towers. Detectability. Stellar systems.

SETI using Interferometric Techniques

Kelvin Wandia

The search for extraterrestrial intelligence (SETI) and the astronomical technique of very long baseline interferometry (VLBI) emerged at around the same time, with the former driven by the need to answer the profound question of whether we are alone and the latter by to resolve radio sources of very small angular sizes. VLBI has matured and become the go-to technique for astrometry and localization in the radio regime. Radio SETI has however been restricted to single dish antennas like the Green Bank Telescope (GBT) and beam forming arrays like the Allen Array Telescope (ATA) and thus yet to exploit the full advantages of VLBI. Besides the obvious advantages of being able to localize a potential technosignature over short time frames, VLBI is more immune to radio frequency interference (RFI) which does not correlate and offers redundancy due to multiple baselines. To develop SETI techniques using VLBI we have made observations of J1926+4441, a very long baseline array (VLBA) calibrator using the European VLBI Network (EVN) which lies 1.88’ from Kepler-111, a G-type star that hosts Kepler111-b, an ”Earth-like” exoplanet where we will search for technosignatures aided by proper motion measurements from GAIA and distance measurements from the Bailer-Jones catalogue. To alleviate bandwidth and time average smearing due to the large angular offset from the phase centre. We have correlated the data at very high temporal and spectral resolution preserving a large field of view with hundreds of sources we can search for technosignatures. We map all the eight targets in the Kepler field and fail to make any detection. During the analysis of the high resolution dataset, we encountered a feature in the auto correlations and cross correlations and by querying existing surveys of galactic hydrogen we prove that the feature in the former is the emission of neutral galactic hydrogen. However, the feature in the cross correlations eludes explanation, as galactic hydrogen cannot correlate due to its low brightness temperatures. Nonetheless, through a follow-up observation using the e-MERLIN we judge the data adequate, flag the feature and proceed to search for technosignatures from the Kepler111b. We make image cubes and search for signals with a drift rate of 2 Hz/s that have signal-to-noise ratios exceeding 5. We also fail to detect any such signal, but constrain the power expected from a receiver on the surface of Kepler-111b to ~ 3.75 × 1015 watts.

"Entropy, the Drake equation, and the Fermi paradox"

Bart Wlodarczyk-Sroka

The physical limitations inherent in the processes underpinning life, intelligence and existence within our Universe imply that all physical processes occupy an environment (which is finite in range) and that all physical processes convert energy to higher entropy states (at a finite rate). Following the Drake equation, a significant proportion of any potentially discoverable ETI civilizations able to survive over cosmic timescales would be those with the highest longevity - a longevity proportional to the ratio between their environmental expansion rate and their rate of energy usage. We conclude that any such potential ETI would actively seek to avoid any form of interaction with our own civilization, explaining the disparity between the number of potentially contactable extant civilizations predicted by the Drake equation and the Fermi paradox.