Postgraduate Research Magazine

FRONTIER

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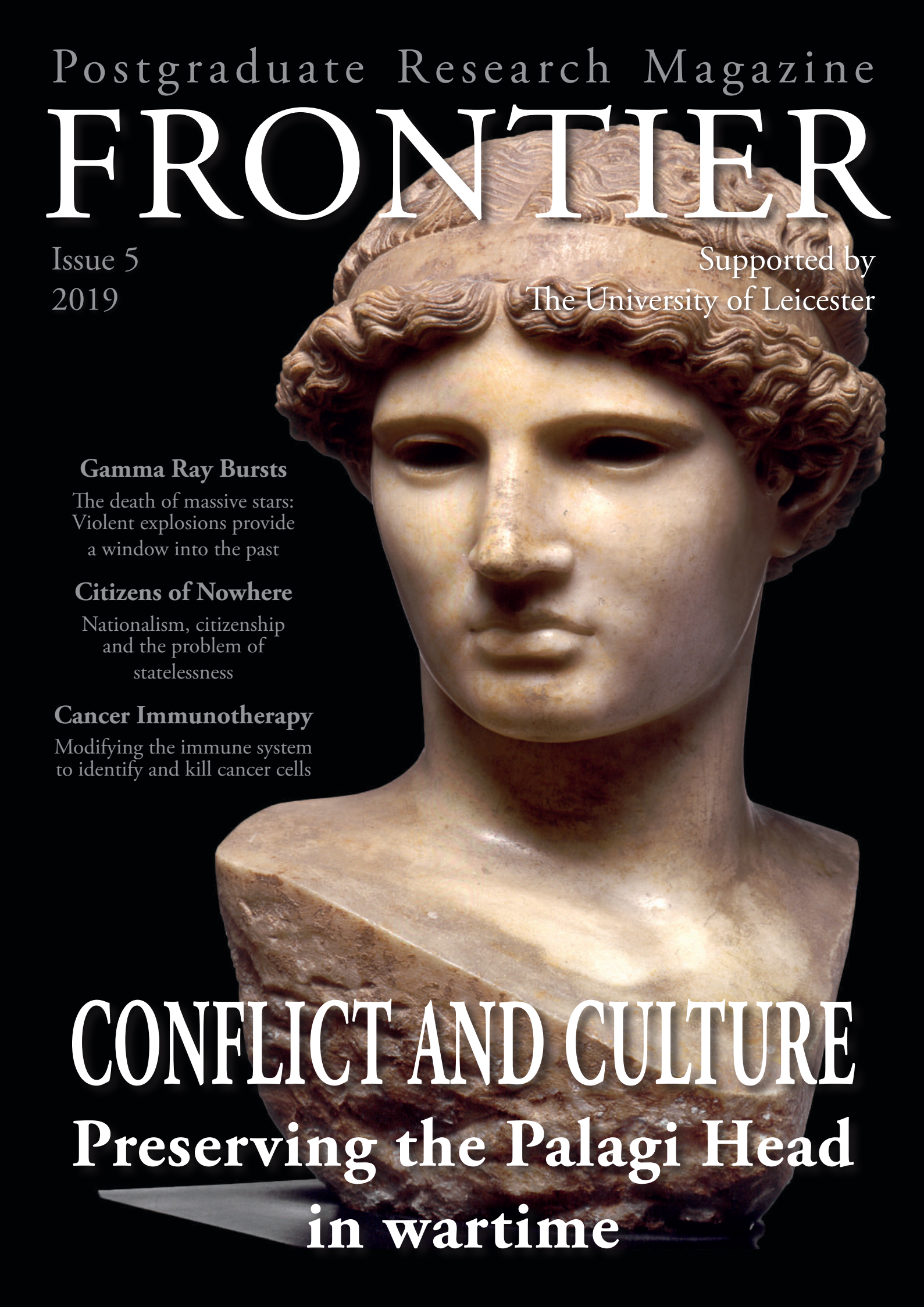

Gamma Ray Bursts
The death of massive stars: Violent explosions provide a window into the past

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Nationalism, citizenship and the problem of statelessness

Cancer Immunotherapy
Modifying the immune system to identify and kill cancer cells

CONFLICT AND CULTURE

Preserving the Palagi Head in wartime

Foreword

It is a pleasure to write a foreword to this issue of Frontier as Inaugural Doctoral College Director. I came to Leicester in 1988 (started on Dec 21st 1987 to be included in the fore runner of REF) for my first post-doc and have not left! I have always been involved with the PGR piece from the coal face through Departmental PGTutor and beyond and this is surely the part of my job I enjoy the most; especially when the undergraduate or PGT umbilical is finally broken. I had a great experience as a PhD student and that is what I want Leicester to provide for you. The Doctoral College now has a full academic year under its belt and we are really beginning to make an impact in terms of being a co-ordinating voice for PGR, managing the regulatory piece for PGR and providing a wide range of training for all students including those in doctoral centres and partnerships. Of particular note is the opening of the Doctoral College reading room in the library and hugely successful thesis boot camp event(s) where PGR students have the opportunity to lock themselves away and write; with some excellent results and feedback. Frontier is a magazine commissioned, edited and produced by PGRs for PGRs and this issue is a fine mix of science plus arts and humanities. It is also a great advertisement for Leicester PGR and what can be accomplished collaboratively and beyond disciplinary boundaries. I am immensely proud of our PGR population and the countless ways in which they continue to distinguish themselves. I hope that you enjoy reading your copy of Frontier and don't be shy in providing the editorial team with any feedback.

Professor David G Lambert BSc, PhD, SFHEA, FBPhS FRCA
Professor of Anaesthetic Pharmacology
Doctoral College Director

Acknowledgements

FRONTIER was launched with a grant provided by Professor Sir Bob Burgess during his time as Vice-Chancellor of the University of Leicester, with additional funds from the Career Development Service and the Graduate School. We are incredibly grateful in their help in kick-starting FRONTIER, especially so to the Doctoral College who continue to fund FRONTIER.
We have received incredible support and advice from Dr Sarah Bugby and Dr Jason Wickham, who are always available to help and guide us, and to Dr. Sergio Gonzalez Sanchez for being continuously on hand for proof reading and advice. We would also like to extend our thanks to staff across the University for supporting FRONTIER and helping us to spread the word, to Merv Stevenson for his efforts in assisting the composition of the layout, and to all the postgraduate students who have contacted us with feedback, articles and offers to get involved.

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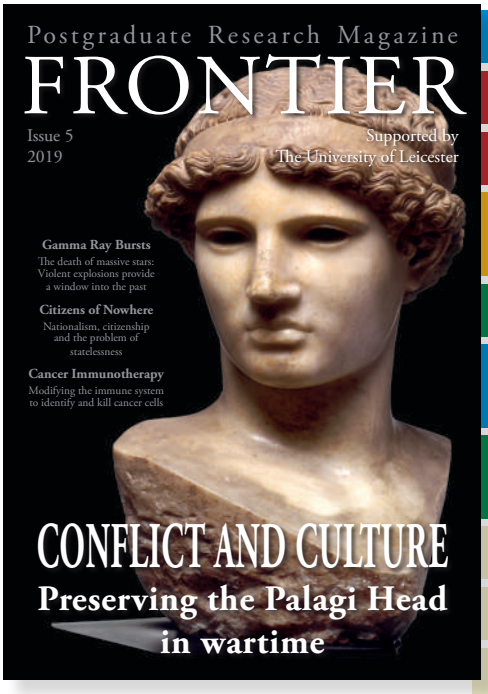


Editorial Team

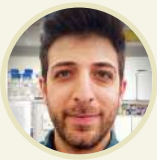
Editor-In-Chief: Felicity Easton

Felicity studies in Respiratory Science and is currently researching how ion channels regulate airway smooth muscle contraction. When able to escape the lab Felicity loves to cook - usually with a glass of wine! Felicity has edited FRONTIER over the past four issues and has thoroughly welcomed the opportunity to meet and promote the amazing PhD researchers at the University of Leicester.

Editors:

Keir Birchall
Keir is passionate about communicating research to a wide audience. He is a second year PhD student in Physics & Astronomy studying methods to identify black holes in dwarf galaxies.

Karen Appiah
Karen is a PhD student within the Department of Cardiovascular Sciences. As a member of the Cerebral Haemodynamics in Ageing and Stroke Medicine (CHiASM) group, Karen's research focuses on blood pressure variability and its prognostic significance in acute stroke. When Karen is not immersed in everything stroke, you'll find her serving at Chroma church in Leicester.



Giannis Koukkidis
Giannis is working in the field of food technology, currently studying the interaction of food poison causing bacteria with bagged salad leaves. His aim is to reduce infections from fresh produce. In his free time Giannis enjoys singing with his guitar, playing football, travelling and getting involved with FRONTIER magazine of course!

Jenni Gurnett
Jenni is a final year PhD student in structural biology investigating the structure and function of the SMRT corepressor complex. This complex plays an important role in gene regulation, particularly influencing pathways involved in development and homeostasis.

Joanna Wilson-Scott
Joanna is a recent Doctoral Graduate from the Department of English, with a background in the social sciences and a current focus on contemporary American literature. Joanna works as an academic proofreader, and enjoys, whenever possible, being somewhere cold and coastal.

Adam Smith
Adam is a final year PhD student in the Department of Chemistry. He is currently researching the use of Molecularly Imprinted Nanoparticles for the controlled delivery of therapeutics. Adam is also well known for his love of reptiles, especially turtles!

Understanding the Most Violent Explosions in the Universe!

Adam Higgins is a third year Astrophysics PhD student in the Department of Physics and Astronomy looking at some of the universe's most luminous and violent explosions – Gamma-ray Bursts and Supernovae. Although most of these events are only short lived they give an unparalleled look into the distant universe and its most extreme environments.

Wonders of the universe

The universe is home to some of the brightest and most energetic physical phenomena imaginable. Many of these phenomena come from massive stars reaching the end of their lives – but out of their loss come unique opportunities to observe the distant universe and put our most extreme physical theories to the test!

For thousands of years, we have gazed upon the heavens with huge curiosity searching to explain the origin of our species and the universe itself. We have long observed the stars in the sky – bright, celestial objects, powered by nuclear fusion of hydrogen creating light elements such helium. However, current telescopes only allow us to resolve single stars within our own galaxy, meaning we cannot directly observe most of the stars in other galaxies, leaving billions of individual sources of light within the universe shrouded in mystery. This provides two big questions; how can we explore the distant universe and how can we probe the environments in which these distant stars exist?

> "The earliest reports of explosive astrophysical transients date back to 185 CE."

In 185 CE, Chinese astronomers observed what they thought was a new star, something they described as a 'guest star'. It was present in the sky for about eight months before fading away and eventually vanishing. This might be the first ever recording of what is classed as a transient event – a new source of light typically varying in brightness on timescales of seconds to months before disappearing again. Several more such events were reported throughout the first millennium, in 386 CE and 393 CE, and this trend continued into the second millennium. Today, transient astronomy is a huge field within astrophysics, with thousands of these short-lived events being detected every year.

The extreme nature of transient astronomy

Some of the most explosive events in the universe result from the death of massive stars. When a star begins to run out of hydrogen fuel, it can no longer sustain its core against gravity. The star collapses under its own mass while the core's temperature and pressure dramatically increase. Within a few seconds, the collapse rebounds and outer layers of the star are ejected into space accompanied by a huge amount of energy in an event known as a Supernova, leaving behind a dense core. Supernovae are one of the few events in the universe with temperatures great enough to produce rare heavy metals, such as gold and platinum. If the star is sufficiently large (greater than 10x the mass of the sun), then the remnant core may form into a neutron star or black hole – some of the most dense and extreme physical environments currently known. Lingering gas and dust can be funnelled into this dense core via a mechanism known as accretion, producing jets of energy called Gamma-ray Bursts.

> "For the short time they exist, Gamma-ray Bursts outshine the rest of the universe in gamma-ray light"

La Silla Observatory - Credit: Klaas Wiersema

Gamma-ray bursts are some of the most luminous events in the entire universe. The amount of gamma-ray produced in a few seconds outshines the rest of the universe, equivalent to the total energy output of our sun in its entire 10-billion-year lifetime! As Gamma-ray Bursts are so bright, they can be used to probe the distant universe. One event that was observed on 29th April 2009, aptly named GRB090429, is the most distant transient ever seen, measured to have a distance greater than 13 billion light years. Incredibly, at vast distances such as these, the light we receive is 13 billion years old – acting as a time machine with a window to the early universe. Transient events are therefore an incredible tool to test the most extreme physical environments that we could not possibly observe on Earth.

> "These events are so bright they light up the darkest corners of the universe"

My current work aims to characterise these explosive events and the environments in which they exist. Part of my work involves using the EFOSC2 instrument on-board the New Technology Telescope in La Silla, Chile. EFOSC2, an acronym for The European Southern Observatory Spectrograph and Camera (v2), is a versatile scientific instrument that can be used to take follow-up optical images of recently detected astrophysical objects in short amounts of time. I am interested in EFOSC2's capability to measure the optical polarisation - the preferred orientation of visible light waves - from a host of transient sources. This property is useful for uncovering the internal mechanics of explosive events. Polarisation provides a unique way to probe the properties of transients and can even aid in mapping out the environments of newly detected Supernovae or Gamma-ray Bursts. In 2019, a new observatory called the Large Synoptic Survey Telescope (LSST) will begin observing the skies. LSST, which will continuously scan the sky and have a much larger field of view than EFOSC2, is expected to detect thousands of new explosive transients every night. Prompt follow-up analysis of these events may be key to understanding the physics of many of these sources, helping us to continue expanding our understanding of the high-energy universe.

> "Gamma-ray Bursts can act as a time machine – showing us parts of the universe only a few hundred million years after the big bang"

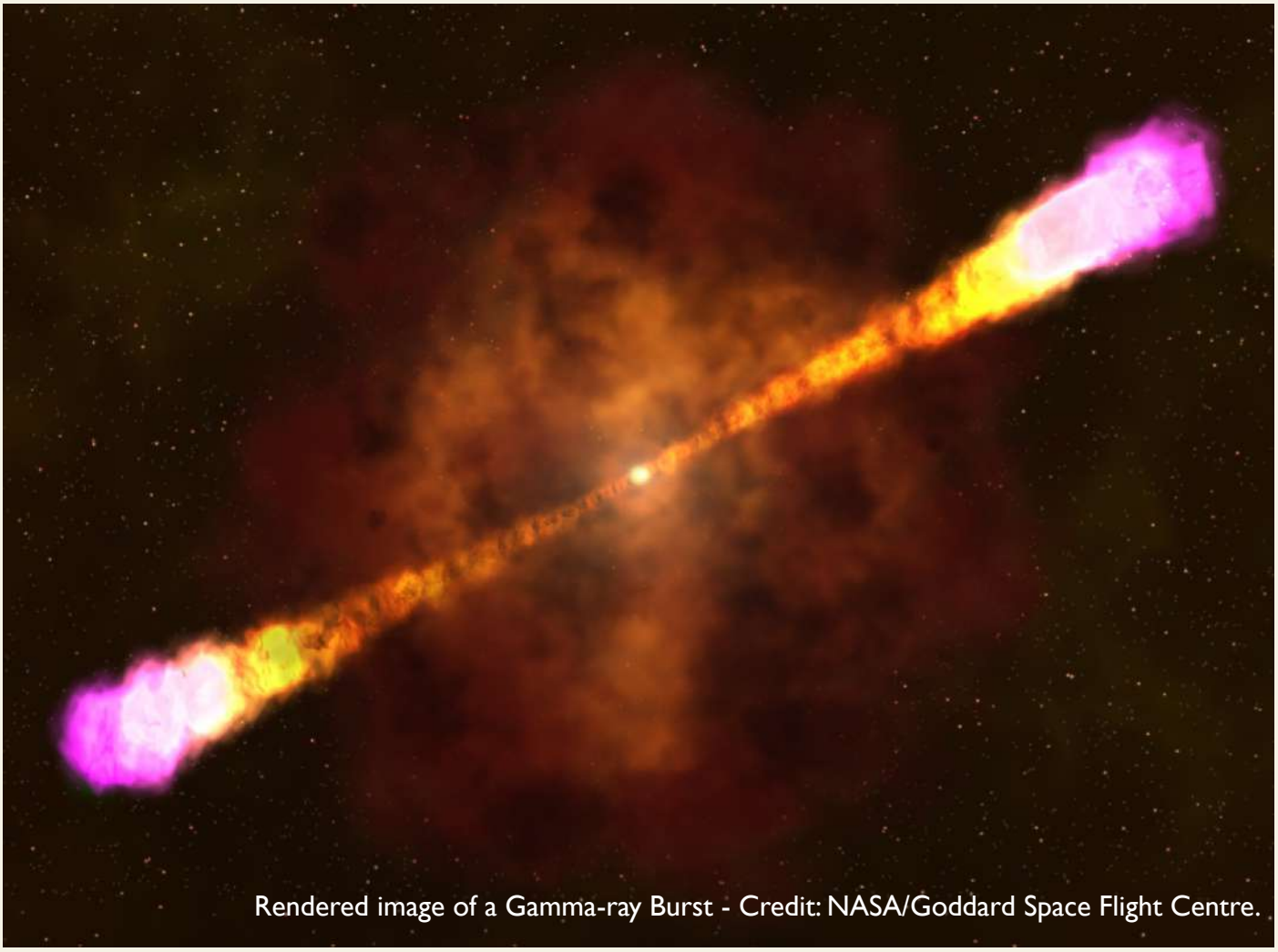
Can polarised light play a part?

I, along with collaborators here at the University of Leicester and the University of Warwick, have led an investigation in creating a sample of approximately 50 transient sources using follow-up observations with EFOSC2. Within this sample we have observed a dozen Supernovae and numerous Active Galactic Nuclei (AGN) – where activity in the centre of galaxies causes a large increase in brightness. The AGN we observed typically exhibited large values of polarised light (up to 20 percent or so) implying that the centre of these galaxies may have violent, chaotic environments made up of very ordered magnetic fields, the acceleration of high energy particles or vast amounts of dust. We also observed numerous uncommon events such as a Tidal Disruption Event where a star passing too close to a black hole is disrupted and ripped apart. In a similar fashion to the Gamma-ray burst, some of the gas is then funnelled into a disk around the black hole and powers large scale jets. Only a couple of polarisation measurements of these events have previously been acquired.

The most important part of our investigation was the proof of concept – could we use the polarisation of light to help identify sources of transients with potentially interesting science value? Within the sample, we have shown that high levels of polarisation hint at potentially interesting sources and environments that may warrant further, more in-depth investigations. I have also helped produce semi-automated data-reduction pipelines that can output almost real-time science results from EFOSC2 and can be easily adapted to work with several similar instruments.

> "Transients possess some of the most extreme physical environments that can exist in the universe!"

The New Technology Telescope (NTT) at La Silla
Credit: Adam Higgins.



Rendered image of a Gamma-ray Burst - Credit: NASA/Goddard Space Flight Centre.

> “We can use the polarisation of light as an alternative observational tool to pick out sources of real scientific interest!”

Looking to the future

The gravitational wave binary neutron star merger event on August 17th 2017 excited the world, by showcasing both the power and reach of transient astronomy. With the advent of bigger and more sophisticated telescopes and satellites coming online over the next few years, it truly is a very exciting time to be involved in astronomy! Alternative methods to filter out the sources of real scientific interest from the large number of new detections are urgently needed. This research project was a pilot study to show the potential of polarimetry and has shown this technique has a significant role to play in the future of transient observations. I returned to Chile in August 2018 for another observing run using EFOSC2 to further cement the effectiveness of our polarisation survey.

Inside the NTT - Credit: Klaas Wiersema.

Conflict & Culture:

Preserving the Palagi Head in wartime

Anna Tulliach graduated from the University of Bologna, School of Arts and Humanities, with an MA thesis about the direction of the Archaeological Museum of Bologna during the years 1921-1944. She conducted research projects on the preservation of museum collections during the two World Wars. She is now a PhD student at the School of Museum Studies, researching the illicit trafficking of museum objects during the Second World War.
Twitter: @AnnaTu_Museums

War presents huge conservation challenges for the museum curators tasked with protecting precious artefacts and artworks. The Palagi Head, the most significant object in the Archaeological Museum of Bologna, was subject to various movements and preservation challenges during, and between, the two World Wars. Through a critical analysis of the events that afflicted the Palagi Head, Anna Tulliach, a PhD student in Museum Studies, will discuss how artefacts are preserved during wartime.

The Palagi Head atop a pedestal in the Archaeological Museum of Bologna, taken in 1881, showing the extent of the oxidation damage.

The image has been published in: Tulliach, A. (2016) 'Pericle Ducati museologo. Il Museo Civico di Bologna tra il 1921 e il 1944', *Sibrium* XXX, p. 264.

The Athena Lemnia statue was sculpted by Fidia, between 451 and 447 BC, for a group of Athenian citizens establishing a colony on the island of Lemnos, in the Aegean Sea. Unfortunately, the original bronze statue is lost, but as usually happens for Greek statues, we know its lineament from several Roman copies. One such copy – of the head of the original statue – is preserved in the collections of the Archaeological Museum of Bologna and is known as the Palagi Head. It is named after Pelagio Palagi, the collector who bought it from the Venetian antiquities market in 1829. By this point, the conservation state of the Palagi Head had deteriorated from centuries of oxidation producing several red spots on the marble surface. Despite this decay, the head has been considered the most remarkable object in the museum's collections for its unquestionable beauty and its strict connection to Fidia, one of the most important sculptors in ancient Greece. The tumultuous twentieth century presented huge preservation challenges to the Palagi Head and the museum's other artefacts. What follows is a brief account of those challenges and how the museum's innovative efforts helped one of the best of humanity's creations survive two of its worst.

> "The tumultuous twentieth century presented huge preservation challenges to the Palagi Head and the museum's other artefacts"

World War I

World War I was the first major war to directly affect Italian museums – among them, the Archaeological Museum of Bologna. The First World War introduced the unprecedented threat of aerial Zeppelin bombing. For their safety, the Archaeological Museum's collections, including the Palagi Head, were moved to secure sites located in the museum building – a practice usually employed by Italian museum curators at the time. As an additional measure, the statue was placed inside a wooden case padded with cotton to protect the surface. The Palagi Head experienced several transfers during the war, moving between different museum premises with the purpose of finding the most appropriate location for its care; humidity levels and exposure to possible bombing raids had to be considered.

The central museum court and the big staircase. Just behind it is the ground floor room chosen by the museum's director for the protection of the Palagi head.

> "The First World War introduced the unprecedented threat of aerial Zeppelin bombing"

Inter-War Restoration

At the end of World War I the collections were taken out of storage for restoration. Unfortunately, it was not known that the cotton wool the Palagi Head was stored in would further damage its already fragile and compromised state. Cotton wool in contact with a marble surface and under high humidity ferments, which further exacerbated the Palagi Head's already serious oxidation problem, producing additional red spots. Fortunately, a Harvard PhD student researching at the museum, Clarence Kennedy, had studied innovative cleaning treatments for ancient sculptures. He simply immersed the Palagi Head repeatedly in hot water and then removed the red spots with a wooden stick. This simple and non-invasive restoration technique not only removed the damage experienced during the war, but also the spots that plagued it for centuries.

World War II

World War II brought greater destruction from aerial bombings and cities became common battlefields because the industries supporting the war effort were located within urban areas. Bologna was strategically important to the Allies as an industrial and transport hub. Mountainous areas were considered much safer to house precious artefacts. So at the beginning of the Second World War the Palagi Head was transferred, along with the museum's other artefacts, to Marzabotto, a small town located in the more rural and rugged highlands south of Bologna. Unfortunately, in the summer of 1944, the situation in the Apennine zones around Marzabotto became extremely dangerous; German troops occupied the area and seized private and public buildings. The objects were then transferred to two secure sites located in Bologna's city centre: the museum's anti-aircraft defence shelter and the Pascoli school. These buildings were considered secure, both for their minor exposure in case of bombing raids and low humidity levels. The Palagi Head was returned to the museum and securely embedded in a wall. Despite the heavy bombardments that Bologna was subjected to during the Second World War, the Archaeological Museum's collections were saved from major damage. At the end of the war, the Palagi Head was removed from the wall in which it was embedded in a good conservation state. It is now on display as part of the Greek collection of the Archaeological Museum of Bologna.

The *Athena Lemnia* as it appears in the Archaeological Museum of Bologna.

The exhibition of the *Athena Lemnia* in room VI of the Archaeological Museum of Bologna taken in the 1920s. The Palagi head is exhibited near the bronze plaster cast of the *Athena Lemnia* statue, made by Adolf Furtwängler at the end of the 19th century.

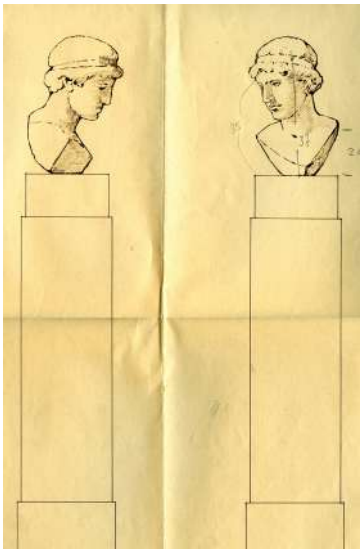
Image used with permission from Dr. Laura Minarini, Archaeological Museum of Bologna.

Art is such a precious commodity that must be preserved as an example of what humanity can achieve. The aim of this research project has been to study the strategies used by museum directors to safeguard their collections in wartime. Doing this allows us to investigate the evolution of safeguarding systems in the early twentieth century and assess if they are still relevant in contemporary preservation practice. With this case study, I have argued that

> "Cities became potential battlefields and Bologna was considered strategically important by the Allies"

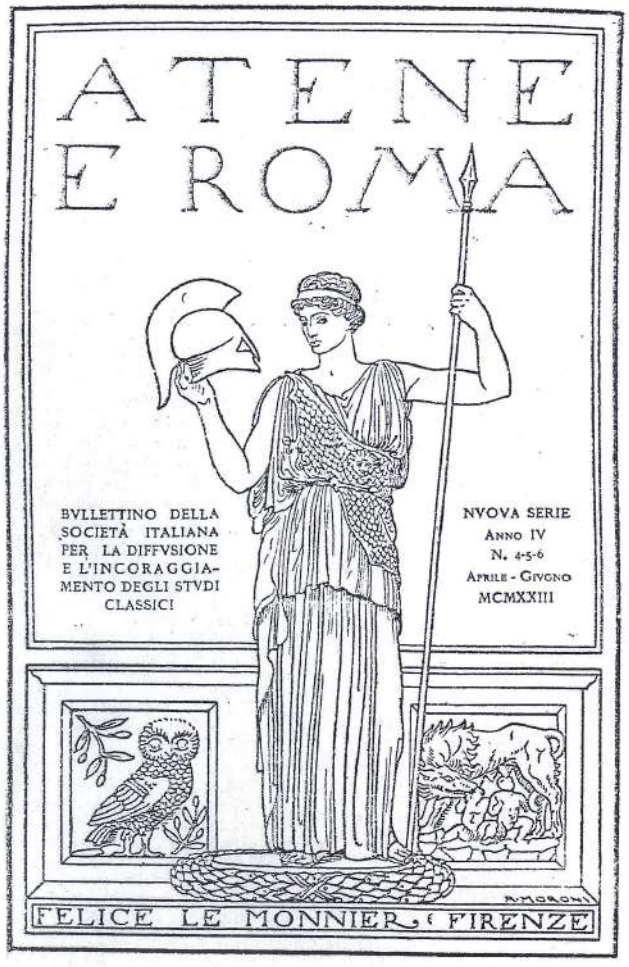
despite the unprecedented challenges faced by curators during this period, both academics and curators were able to discover and utilise unexpected and innovative restoration treatments. It is to these efforts that future generations are indebted, as they admire the Palagi Head shining in the Archaeological Museum of Bologna.

> "Art is such a precious commodity that must be preserved as an example of what humanity can achieve"



A sketch of a new exhibition proposal for the Palagi head, made by Luciano Laurenzi, new director of the Civic Museum from 1947.

Image used with permission from Dr. Laura Minarini, Archaeological Museum of Bologna.



Front page of the magazine *Atene e Roma*, in which the museum's director published a paper about the Palagi head. The illustration is a reconstruction of the Fidia's statue made by Moroni.

The image has been published in: Gualandi, G. (1976) 'L'Athena Lemnia e il momento classico nella collezione Palagi', *Il Carrobbio. Rivista di studi bolognesi*, p. 212.

The head of the Athena Lemnia statue in the collections of the Civic Museum of Bologna.

Image used with permission from Dr. Laura Minarini, Archaeological Museum of Bologna.

English in the Japanese Linguistic Landscape

Keith Barrs' interest in Japanese language and culture began in 2001 when he worked as an Assistant Language Teacher on the Japanese Exchange and Teaching Programme. After five years living in Hiroshima, he completed a Master's degree in 'Applied Linguistics and Teaching English as a Foreign Language' at the University of Portsmouth. Now living back in Japan and working at Hiroshima Shudo University, he is also pursuing his PhD in the School of Arts at the University of Leicester.

Japan's long history of contact with the English language has had an immense impact on its society. This is most visible in the Japanese linguistic landscape, where English appears throughout society in public places such as shop signs, road markings, advertising billboards, and product packaging. This article explores some of the main ways in which English is used in the Japanese linguistic landscape.

English is Everywhere in Japan

When I first set foot in Tokyo 17 years ago, I was straightaway intrigued by the amount and variety of English that surrounded me on things like shop signs, advertising billboards, road markings, and product packaging. At first, I considered that this extensive and creative use of English was because Tokyo is a global mega-city, with worldwide brands advertising and selling their goods through the medium of English. However, as I stayed longer in the country and travelled around the smaller towns and villages, I noticed that even local Japanese-based businesses were advertising products such as rice, farm machinery, and day-trip bus-tours with adverts written in English. Why?

As I became more interested in the English written in the public places around me, I started to read about the history of English in Japan. I learnt that the influence of English on Japanese society stretches back over four hundred years to the arrival of the sailor William Adams in the early 17th century, one of the country's first resident English-language speakers. I discovered that from those beginnings, through the period of Japan's rapid modernisation at the end of the 19th century and during its occupation by American forces at the end of the Second World War, the importance of English in Japan has grown steadily. Most importantly, I learnt that for much of this history English has been considered a fresh, modern, and fashionable language. In its earlier history, English was embraced in Japan as the language of industrialisation and modernisation, but now English in Japan is the language of globalisation; the language of much-loved foreign cultural items such as The Beatles, Harry Potter, anything Disney-related, and Nike.

Japan's Linguistic Landscape

Going deeper into the academic literature on English in Japanese society, I learnt that the investigation of language on signs in a society's public spaces has become a field of linguistic analysis in its own right: Linguistic Landscape studies. Within this field, attention is given not only to the question of *why* certain languages are used, but more interestingly to the question of *how* they are used.

Looking at how languages are used in the Japanese linguistic landscape, the long history of Japan's borrowing of words from languages such as Chinese, Dutch, German, and French means that English is not the only foreign language appearing in Japan's linguistic landscape. Rather, the Japanese linguistic landscape is a vibrant, multilingual melting pot of native words and a large variety of foreign borrowings. Making it even more dynamic is the fact that there are four main scripts which can be used to write the words: *kanji* (Chinese characters), *hiragana* and *katakana* (phonetic scripts derived from *kanji*), and *romaji* (Latin alphabet). When English is used, it appears regularly not only in the Latin alphabet but also in the Japanese script of *katakana*, a script primarily used for writing loanwords.

How is English used in the Japanese Linguistic Landscape?

The use of English in the Japanese linguistic landscape can be broadly categorised into three types: translations, loanwords, and foreignisms. Figure 1 shows English being used to translate Japanese text on a sign in the window of a supermarket to inform customers that solicitation (e.g. handing out leaflets, conducting questionnaires etc.) is prohibited in and around the supermarket. Because the Japanese text uses the infrequent, technical word 勧誘 (*kanyuu*) to explain the act of solicitation, a word which may be unknown to some Japanese people, the less-technical English loanword ストーカー (stalker) is also used in order to make the intended meaning of the sign clearer. The Japanese text is then translated into English and Chinese.

Figure 1. The use of English to translate Japanese text on a supermarket sign.

Figure 2 shows English again being used to translate Japanese text, but in this case it is an example of the frequent occurrence of signs or posters with English translations that have not been checked for accuracy in their grammar, vocabulary choice, and spelling. These kinds of errors with English usage in the Japanese linguistic landscape are so frequent that they make up a large percentage of the hundreds of examples of funny English usage from around the world that have been submitted to the website www.engrish.com.

Figure 2. The use of English to translate Japanese text on a sign in a public park.

Figure 3 contains examples of the many English loanwords which have been integrated into the Japanese language. This integration commonly involves changing their phonology (i.e. sounds), and morphology/syntax (i.e. grammar), to fit the rules of the Japanese language. They function as regular vocabulary items in Japanese communication and are typically written in the linguistic landscape in *katakana*. This picture is of a table sign with the top row of text showing the English loanword phrase イートインコーナー (*iitoinkoonaa*), meaning eat-in-corner, or a space within a building where food and drink are allowed to be consumed. The word *koonaa* (corner) is used again lower down on the sign and integrated into the phrase こちらのコーナーでの飲酒　喫煙はご遠慮ください, translated as 'please refrain from smoking and drinking alcohol in this corner area'. The use of English in this way shows how deeply integrated it is into the core of the Japanese language.

Figure 3. English written in katakana script on a table sign in a Japanese supermarket.

Figure 4 is an example of English foreignisms. Foreignisms are similar to loanwords but their function is more stylistic, to decorate the linguistic landscape and attract the attention of both Japanese and non-Japanese audiences. For this reason, they are written sometimes in the Latin alphabet, sometimes in *katakana* script, and sometimes in both. Often when English is used in this way there is little or no attention paid to the accuracy of the meaning. A common practice seems to be the copying and pasting and then mixing and matching of phrases from the Internet, which is probably the only way that the confusing combination of English in Figure 4 can be explained.

Figure 4. A sign welcoming customers to a clothes shop in Japan.

A Treasure Trove of Research Possibilities

The wealth of creative uses of English throughout the Japanese linguistic landscape presents an almost endless array of research possibilities, leading to many interesting questions around the use of English in Japanese society such as exactly what English is used, who writes it, who it is written for, where it is written, and in what styles and forms is it written? Looking into the latter question of the styles and forms of English in Japan, my current research examines how English loanwords have been integrated into the grammatical structure of the Japanese language.

Citizens of Nowhere:
Nationalism, citizenship and the problem of statelessness

Nick Schenk is a third year PhD student and part of the Global Ethics and Political Theory research cluster in the Department of History, Politics and International Relations. His thesis provides a philosophical defence of the notion that persons have a moral right to citizenship, and the implications of this for how we think about justice worldwide. Nick holds a bachelor's degree in Geography and studied a master's degree in International Relations. His research interests are primarily in global justice and the ethics of citizenship and migration. These interests stem from practical work helping asylum seekers and refugees, as well as a longstanding commitment to understanding major issues that humanity face.

Applying for a job, travelling outside the country you were born in, getting married to the person you love – these are all freedoms most of us take for granted. Yet for many people they hold no legal rights to do these things. Across the world today, there are over 10 million people in this position – they are stateless, that is, they do not hold a nationality or citizenship of any country. There are many reasons why people are stateless, for instance, discrimination, state succession or the legacy of colonialism. This article examines stateless Arab Bedouin communities in the Middle East as a case study to highlight the problem of protecting human rights outside national citizenship, and why there is a moral right to citizenship.

Statelessness in historical and contemporary context

Hannah Arendt, a Jewish political theorist who was stateless herself for a period from 1937-1951, showed that statelessness emerged as a significant problem following the outbreak of World War One and the displacement of huge numbers of minority populations. However, statelessness as a phenomenon still exists today across all regions of the world. The consolidation of the nation-state model of political organisation has exacerbated the problem. While the United Nations is implementing an ambitious campaign to end statelessness by 2024, contemporary conflicts like the war in Syria are creating more stateless persons.

Aida refugee camp, near Bethlehem. A woman holds up a key symbolising the 'right of return' for Palestinian refugees, many of whom are stateless, to their homes from which they were expelled in the 1948 Arab-Israeli War.

Abu Hindi primary school, valley of Abu Hindi, Occupied Palestinian Territories. Nicknamed the 'bamboo school' because it was constructed out of bamboo in 2010, with the support of a collective of Italian architects and engineers (ARCo) and NGO (Vento di Terra).

> "There are many reasons why people are stateless, for instance, discrimination, state succession or the legacy of colonialism"

A lesson in progress at Abu Hindi bamboo school.

A man rides a donkey across the school playing field. Some pupils take a long journey over rugged terrain by donkey to reach the school each day.

Pupils interact with their teachers during break time.

Boys deep in conversation during their break time.

The lack of a recognised identity

Despite, or rather in spite of, being more globally interconnected than ever before, it is clear that people have a deep human need to belong to communities that have some notion of shared meanings – such as language, culture and history. Yet for stateless people, who are excluded from all political communities, it is not only this sense of belonging they lack, but also legal rights and freedoms usually enabled by citizenship. In addition, having no legal status often means not being able to preserve their culture when this is threatened by governments and multinational corporations.

Hannah Arendt: the impossibility of human rights outside national citizenship

Arendt argued that statelessness highlights the problem of the idea of human rights. If you are a citizen of nowhere, outside the protective sphere of the nation-state, it is impossible for your human rights to be upheld. Stripping minorities of their citizenship (denationalisation), such as the denationalisation of the Jews during the Second World War, legally permits the persecution of people and means governments can shirk their responsibility more easily. Now more commonly, governments do not grant citizenship to minorities in the first place.

Nomadic stateless populations

Some stateless populations are nomadic communities, and traditionally have travelled across the territorial boundaries of states. In Kuwait for example, stateless Arab Bedouin communities (*bidūn*) are subject to discrimination by the authorities. Often these communities try to acquire legal and political rights through obtaining citizenship but are unable because they are deemed 'illegal residents' by the government. Yet some *bidūn* reject affiliation with Kuwaiti national identity because they wish to preserve their traditions and way of life. They desire the protections of the legal recognition that citizenship provides, but they do not wish to have national citizenship.

> "because a stateless person lacks any kind of legal recognition they can simply be forgotten"

Arendt pointed out that a criminal has more legal rights, such as the right to due process, than the stateless person. In contrast, because a stateless person lacks any kind of legal recognition they can simply be forgotten. This is the case for the *bidūn*, who face

administrative barriers to enjoying basic rights, rather than direct violent persecution or criminal prosecution.

The case of nomadic peoples such as the *bidūn* shows us that conflation between national identity and citizenship can be unhelpful. International human rights doctrines, most notably the 1948 Universal Declaration of Human Rights, asserts the right to a nationality. As we have seen though, this is not always an important freedom to some minority populations. Yet the sovereign nation-state has overwhelmingly become the model for how rights and duties are attached to citizenship.

How can we protect human rights outside of citizenship?

What all stateless persons lack is the legal recognition, and usually rights, that come with citizenship status. There are numerous examples of peoples that collectively believe themselves to have a national identity, for instance the Kurds, even if they do not have citizenship of a sovereign state, or nationality, that reflects this.

Without some kind of supranational or world government to provide protections, we can see that some persons will fall through the cracks and be citizens of nowhere. Even if such international or global protection were desirable, this is not currently feasible. We are left with the fact that nation-state citizenship is the only practicable way to secure legal rights. If we believe human rights are truly universal, then we should be convinced that everyone has the moral right to be a citizen of a nation-state.

Moral principles to achieve citizenship justice

But if someone does not belong anywhere, how are we to decide which political community they are entitled to join? This a difficult question, morally and practically. One principle that could help decide this is the physical, socio-political, emotional and other ties that individuals have to a particular state. Ayelet Shachar argues that a person ought to have a moral right to citizenship on the basis of having a "genuine connection" with the political community in which they wish to gain membership. For refugees the notion of genuine connection makes sense because they often develop these ties with the political community they reside in over time.

However, for stateless persons who are not refugees, often what they want is to obtain membership of a different state than the one they reside in. Or, alternatively, it might be a hypothetical political community, such as Kurdistan. Many stateless communities and existing states believe that hypothetical nation-states must be transformed into real nation-states. National identity needs to be officially recognised and protected through legal rights in the form of an actual sovereign nation-state. Therefore, we also need to consider other principles that can help to guide policy for causes of statelessness not linked to migration.

"Without some kind of supranational or world government to provide protections, we can see that some persons will fall through the cracks and be citizens of nowhere"

Bedouin man herds his sheep and goats across the desert terrain.

Aida refugee camp. Graffiti art referring to UN General Assembly Resolution 194 which states the 'right of return' for Palestinian refugees.

Solving the problem of statelessness

Statelessness is a complex problem. If we are serious about ending statelessness we need to be clear about what solutions are fair and just. Simply encouraging states to grant citizenship to stateless persons that physically reside in their territories through the principle of "genuine connection" does not address comprehensively the range of causes of statelessness. Fully understanding the nature of the problem is necessary to be able to fix it and ensure citizenship justice.

Arendt demonstrated the relationship between national identity and citizenship can be fraught. The cases of nomadic stateless communities show that sometimes the ideal of citizenship needs to be disconnected from national identity. The model of citizenship that is predominantly in use around the world today is not static – it can change. The European Union demonstrates that persons can be afforded rights in addition to those provided by national citizenship. These examples reveal the value of citizenship beyond simply the official recognition of national identity. Nevertheless, based on the current realities of the world political system, it is important to reaffirm that citizenship of a (nation-)state, and the legal protections it carries with it, are essential to securing the freedom of every human.

Animal shelter built by Bedouin on the hill side, Abu Hindi valley.

Street in Aida refugee camp.

Mast Cells:
Key regulators of the immune system

Abulrahman Alzahrani became a lecturer in Albaha University, Saudi Arabia in 2015. Abdul is currently a final year PhD student within the department of Infection, Immunity and Inflammation based at Glenfield hospital where he works with primary human cells from asthma patients investigating the involvement of mast cells in asthma severity.

Mast cells are a type of human immune cell. Though they are small in size, Mast cells have a wide range of functions and play a key role in creating an inflammatory response during infections, an essential role to protect against bacterial infection. However Mast cells are also responsible for the development of allergies and hay fever.

What are Mast Cells?

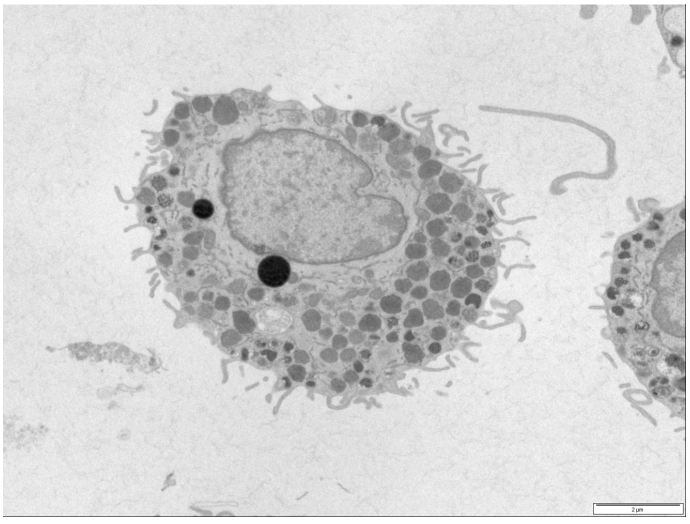
Mast cells are essential immune cells that guard the human body. They are found in all tissues of the body, providing a rapid response to invading pathogens. In 1878 German scientist Paul Ehrlich discovered Mast cells, due to their large granules he mistakenly thought they were responsible for nourishing the surrounding tissue. Ehrlich, named the cells mastzellen inspired by the German word mast which means "to fatten". Since their discovery 140 years ago Mast cells have revealed remarkable roles in initiating our immune system response, however there are still many secrets of this cell yet to be revealed…

Masters of the immune system?

As the master cell of the immune system, mast cells are key to triggering inflammation at the site of infection. Mast cells contain many granules in their cytoplasm, which in normal conditions are kept inside the mast cell. However, when the immune system is under attack the mast cell activates and undergoes degranulation, each of the granules are filled with powerful inflammatory mediators, such as histamine, which are deployed to the extracellular environment in response to a specific stimulus.

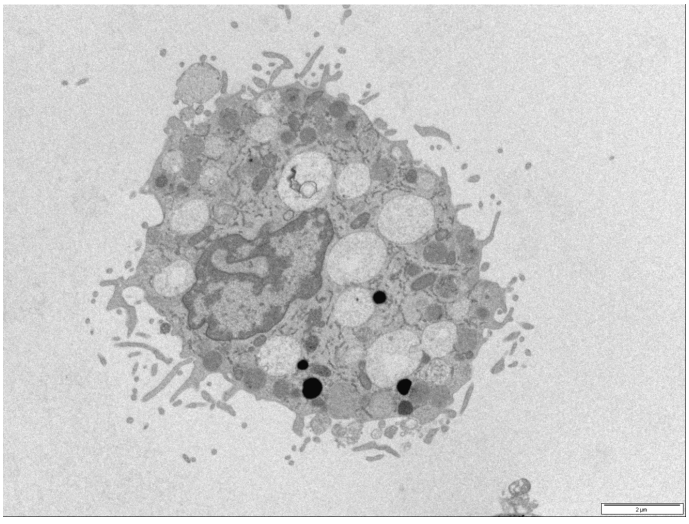
> "Mast Cells are 'first responders' in an infectious attack"

Most famously, Mast cells express antibody receptors, which allows them to recognise pathogens that you have previously been exposed to. This means Mast Cells are "first responders" in an infectious attack. However, this mechanism can backfire and cause disruption by creating an allergic response when it contacts pollen and other harmless environmental stimuli.



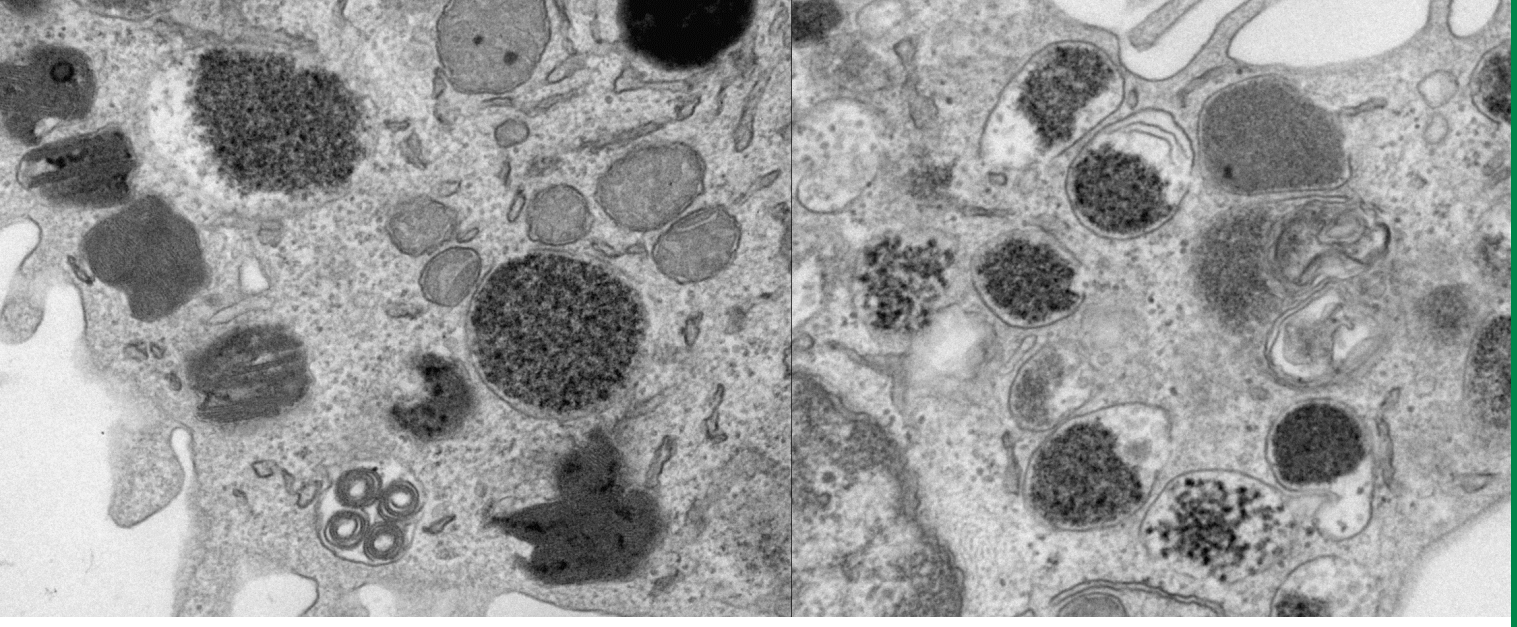
Mast cell from the human lung shown in "normal" conditions with lots of granules contained in the cytoplasm. Electron microscope image (1,000,000x).

Photo credit: Leicester University (EMF department)



Mast cell from the human lung "activated" form containing fewer granules due to secretion. Electron microscope image (1,000,000x).

Photo credit: Leicester University (EMF department)



Mast cell granules. Electron microscope image (1,000,000x).

Photo credit: Leicester University (EMF department).

Mast Cell: Origin Story

There is an ongoing debate about the origin of the Mast cell population. It is widely accepted that Mast cell precursors, "baby" Mast cells, develop in the bone marrow alongside white blood cells. These precursors are released into the bloodstream and migrate to all the different tissues in the body where they mature into "adult" Mast cells.

> "The more we understand about mast cell function the better we will be able to treat the various diseases caused by mast cells"

The job of a Mast cell is to sit within the tissue and survey the local environment for evidence of attack from foreign bodies. When an invader is identified Mast cells rapidly release their granules which contain a wide range of inflammatory mediators and toxins, all within a minute! The toxins start attacking the dangerous pathogen, while the inflammatory mediators act as a signal to alert other immune cells to the invader so they can help join the fight! The signal acts like a beacon which attracts immune system cells to the site in a specific order.

For its next trick, the Mast cells produce mediators designed to attract the adaptive immune cells; T cells and B cells. This immune system team create the long-term memory of the immune system, storing the profiles of previous invaders so they can be recognised and dealt with more efficiently in the future.

Friend or foe?

Mast cells are a double-edged sword. Even though Mast cells are crucial managers of our immune system, but they are also responsible for causing allergies. Infamously, Mast cells cause hay fever by creating an immune response to pollen. In addition, Mast cells are also responsible for a reaction to other allergens including dust, pets and peanuts.

Mast cells can also play a very damaging role in disease. For example, Mast cells create a life threatening, anaphylactic response to food and insect stings. Mast cells have an ongoing effect in chronic diseases such as Asthma. The Mast cell response to allergens inhaled into the lung causes wheezing by releasing inflammatory mediators like histamine and bradykinin which causes a contraction of the airway muscles making it difficult to breathe.

> "The more we understand about mast cell function the better we will be able to treat the various diseases caused by mast cells"

Our research group at The University of Leicester discovered that in asthma patients the mast cells are found within the regions of airway smooth muscle in the lung (C, Brightling. 2002). Since then, different research groups have found similar outcomes, showing that mast cells can cause airway inflammation and mediating the airway's response to allergens. My involvement in Mast cell research aims to better understand the specific role of Mast cells in Asthma, by investigating the Mast cells and the airway smooth muscle relationship. Specifically, the communication between these two cells is poorly understood, so by co-culturing the two cells types I can show how one informs the other. The more we understand about mast cell function the better we will be able to treat the various diseases caused by mast cells, which is the ultimate goal of my research.

Critical Metals: Essential development of novel extraction methods

Ioanna Maria Pateli is a Greek researcher with interests in chemistry and environmental protection. She obtained her bachelor's and master's degrees from the School of Mining and Metallurgical Engineering at the National and Technical University of Athens. In January 2017, she relocated to Leicester to embark on her PhD career as a Marie Curie fellow, working to identify a novel approach in extracting critical and precious metals from industrial residues containing low amounts of metal.

Depletion of critical metals is a major issue in Europe. Cobalt, antimony, indium, germanium, and gallium are scarce yet high in demand; alternative sources must be utilised. Ioanna Maria Pateli is second year PhD student in the Department of Chemistry working on a project that aims to determine "green" ways of extracting precious and scarce critical metals from low metal containing industrial residues using deep eutectic solvents (DESs).

Critical metals in Europe

Mobile phones, smart TVs, cars, and solar panels. Other than being essential to our everyday living, what do these devices have in common? They each consist of a plethora of metals, including common metals such as iron, zinc, copper, and aluminium, as well as rarer metals such as germanium, gallium, cobalt, antimony, and indium. Aside from being less well known, these metals are not commonly found in Europe's crust surface, and for that reason, they are identified as critical metals.

Critical metals are in high demand, which consequently leads to their depletion from the few known reserves. Europe faces a serious challenge in supplying the demand of critical metals, as there are not enough natural sources available and all the major ores are located outside Europe in China and Africa. Though it may seem like a dead end for Europe's production of these rarer metals, there is, fortunately, still hope.

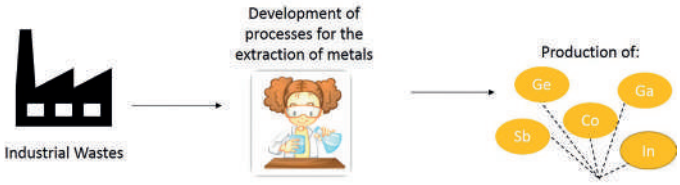
> "Depletion of critical metals is a major issue in Europe"

Europe's metal industries are producing thousands of tonnes of waste residue which contains small amounts of metal daily. Within these industrial residues, a wide variety of critical and economically important industrial and precious metals are present. Though the concentration of these metals in the waste is low, the additional waste produced is significantly higher. This fuels Europe's pursuit in researching processes considered efficient and eco-friendly for the extraction of these targeted metals. Such a solution would have considerable impact on Europe's economy by limiting the reliance on foreign producers to meet the supply demands for critical metals.

Fe - rich industrial waste called Jarosite; containing Fe, Ni, Co, In, Ge, Pb, Zn.

State of the art metal extraction processes

There are two main approaches to metal extraction, hydrometallurgy and pyrometallurgy. Hydrometallurgy is a methodology that utilises aqueous basic or acidic solutions to dissolve the targeted metals, whereas pyrometallurgy employs extremely high temperatures in order to reduce metal ions to a metallic state. Both of these well-established methods result in the production of high purity metals. However, both methods of extraction have a significant environmental impact. Pyrometallurgy consumes extreme amounts of energy and produces greenhouse gasses (e.g., carbon dioxide, carbon monoxide, methane, nitrous oxide, and sulphur dioxide), while hydrometallurgy requires the disposal of a vast amount of aqueous wastes and the use of toxic additives such as cyanide for the extraction of the metals.



Ionometallurgy – an alternative approach to the current processes

Presently, researchers are focused on the development of ionometallurgy, a new science that encloses all the processes of metal extraction with the use of ionic liquids or deep eutectic solvents. These solvents, first introduced in the literature by Prof Andy P. Abbott and his group at the University of Leicester in 2001, have attracted much global scientific interest in extractive metallurgy and chemistry. Deep eutectic solvents consist of eutectic mixtures of quaternary ammonium salts and hydrogen bond-donors, such as amides. The two components prior to mixture exhibit high melting points, which decrease drastically after their combination. These solvents exhibit a "green" behaviour, as they are non-flammable and not toxic, with low vapour pressure, thermal and chemical stability, biodegradability

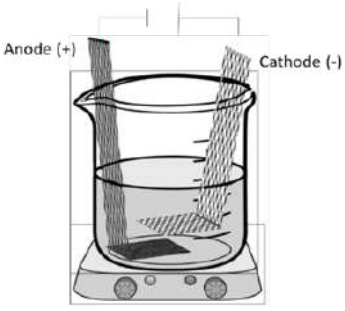
Paint casting, innovative process for conducting electrochemical experiments.

ABBOTT, A. P., BEVAN, F., BAEUERLE, M., HARRIS, R. C. & JENKIN, G. R. 2017. Paint casting: A facile method of studying mineral electrochemistry. Electrochemistry Communications, 76, 20-23.

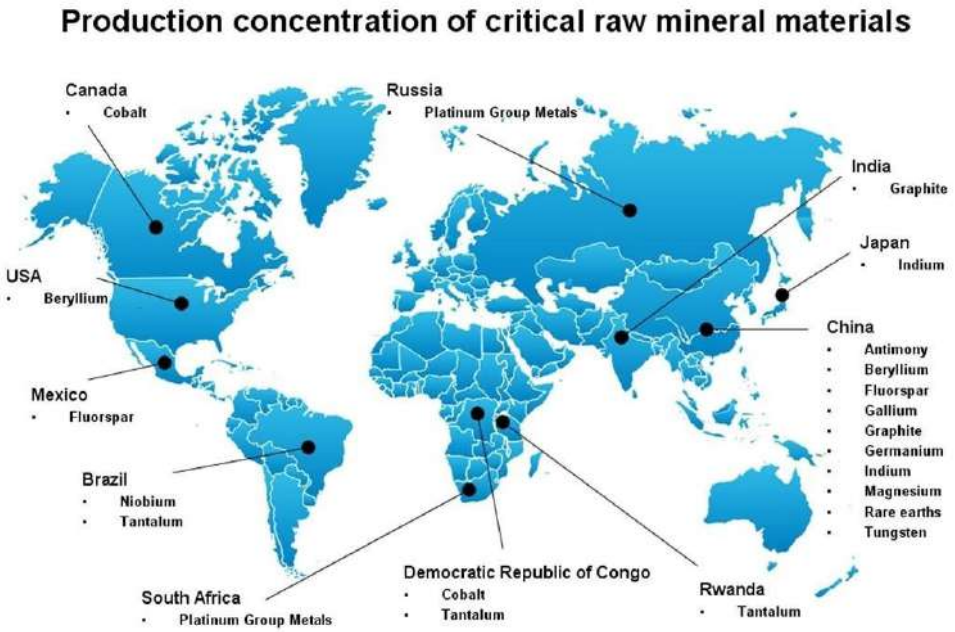
and in addition, their production process is cheap and very straightforward. One of the most important things, is that their components are readily available in bulk amounts. For example, one of the most common deep eutectic solvent is Ethaline 200, which is a mixture of choline chloride and ethylene glycol. Choline chloride is common in chicken feed as it is a vitamin B supplement and ethylene glycol is routinely used in anti-freeze.

Focused on "Zero Waste Society"

At present, the question is, can we use these green solvents to extract critical metals from industrial residues? The SOCRATES Innovative Training Network, funded under the Horizon 2020 EU Research and Innovation programme, seeks new ways of achieving a zero-waste society. My research as part of SOCRATES explores the ways in which green solvents can be used to extract critical metals from industrial residues, by valorising the solid waste from industrial production, with hope that society can look to a greener future.



Cell of electrochemical dissolution of industrial wastes in Deep eutectic solvents designed by the Abbott research group at University of Leicester.



Cancer Immunotherapy:

A rapidly advancing new dawn in the treatment of cancer

Kayleigh Walker is a PhD student in the Department of Molecular and Cellular Biology funded by Cancer Research UK. Her research focuses on the identification of small molecule drugs that target PD-L1 that can mimic the action of antibodies. This involves using NMR Spectroscopy, amongst other techniques, to explore protein-small molecule and protein-protein interactions with the aim of informing drug development. Before arriving in Leicester, Kayleigh completed her undergraduate degree in Biochemistry at The University of Manchester. In her spare time Kayleigh enjoys watching true crime documentaries, electronic music and sampling vegan junk food.

Cancer cells are sneaky. They have developed ways to evade the immune system, and hide in plain sight from our natural defences against tumour progression. However, developments in cancer immunotherapy promise to be the most encouraging treatment approach for cancer since chemotherapy. What makes this even more exciting is that the immune system functions all over the body meaning immunotherapy has the potential to treat many different types of cancer.

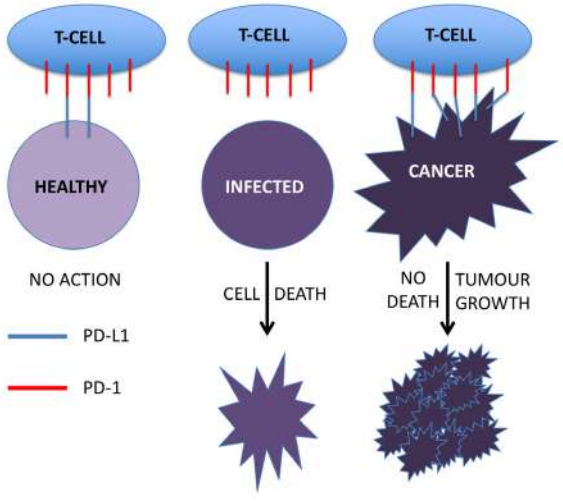
What is Cancer Immunotherapy?

Following numerous promising clinical trial results, cancer immunotherapy was selected as the "Breakthrough of the Year" in 2013 by *Science* magazine. Cancer immunotherapy is any treatment that modulates the immune system to attack and kill tumour cells through small-molecule drugs or antibodies that bind to proteins on the cancer or immune cells. Vaccines or T-cell therapy can also be used, whereby the patient's immune cells are extracted and reprogrammed, then transferred back to the patients to attack tumours. Cancer immunotherapy combats the ability of cancerous cells to avoid immune system detection. One of the ways in which cancer cells avoid detection is via the PD-1/PD-L1 interaction.

PD-1/PD-L1: Friend or Foe

T-cells are immune cells which recognise infected or damaged cells, cytotoxic T-cells can then release toxins to kill these cells. Programmed cell death-1 (PD-1) is a protein expressed on the surface of cytotoxic T-cells. The binding partner of PD-1 is programmed cell death-ligand 1 (PD-L1). This is expressed on the surface of many cell types throughout the body. The T-cell is like an airport security guard. When you set off the scanner you are patted down. If you have nothing illegal or dangerous with you, you can continue on your trip, but if you do, you are taken away and possibly arrested. Similarly, the T-cell "pats down" the cells in your body and it does this by binding to molecules on the surface of the cell being "inspected". The number and type of interactions between the "suspect" cell and the T-cell informs the T-cell whether the cell is healthy or whether it is infected or damaged. Cytotoxic T-cells, unlike airport security guards, take drastic action if a cell is found to be unhealthy and release toxins to kill the cell. Expressing PD-L1 on the surface of the cell sends signals to the T-cell to not take any action. "You have made it through airport security without any problems."

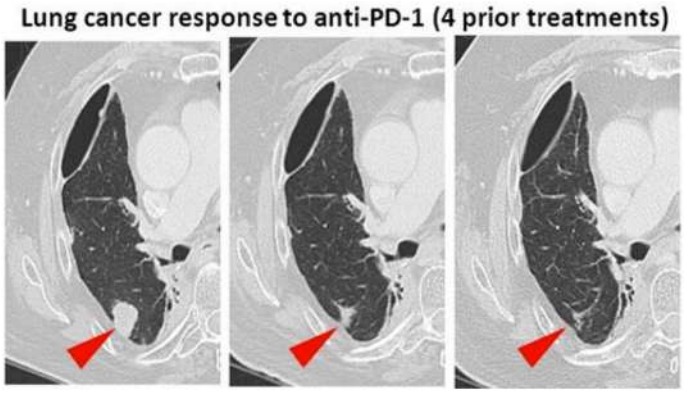
The natural role of this PD-1/PD-L1 interaction is to promote tolerance and prevent autoimmune responses. Some tumours hijack this mechanism, over-expressing the PD-L1 protein on their surface. T-cells that come into contact with a tumour cell expressing



Cancer cells can evade detection by the immune system by over-expressing PD-L1.

PD-1 on its surface binds to the PD-L1 on the tumour. This sends a signal to the T-cell to override an immune response, aiding the cancer cell in escaping detection and proliferating.

Blocking the interaction of PD-1 and PD-L1, with either an antibody or a small-molecule drug, would prevent the inhibiting signal from reaching the T-cells, which may then recognise the cancer cell and initiate an immune response.



https://cancerresearch.org/immunotherapy/timeline-of-progress
Bristol-Myers Squibb BMS-936558 Clinical trial - CA209-003.

Treatment of tumours with anti-PD-1 therapeutics dramatically reduces the size of tumours.

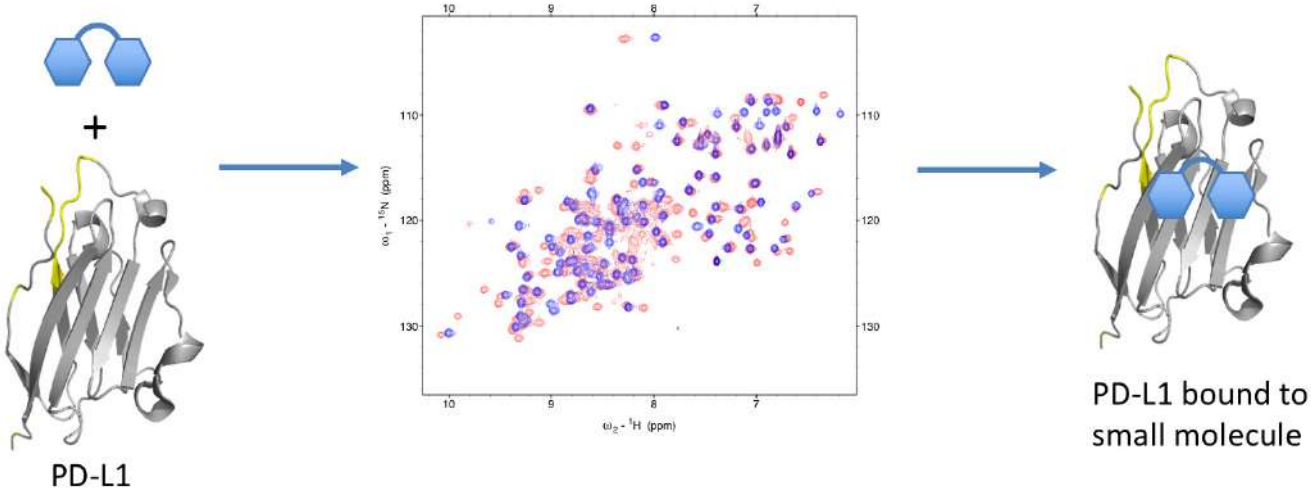
Antibody Therapeutics Targeting PD-1/PD-L1

There are currently five antibody drugs targeting the PD-1/PD-L1 interaction that are licensed by the US Food and Drug Administration (FDA). Two of them bind to PD-1, and the remaining three to PD-L1. These drugs are licensed to treat cancers including melanoma, lung cancer, kidney cancer, lymphoma, and many more. The list keeps growing, as more and more clinical trials are proving successful against many different cancer types. The most well-known of these drugs is Pembrolizumab, also known by the trade name Keytruda, which was first approved in October 2015 by the FDA. Pembrolizumab treats non-small cell lung cancer (NSCLC) in patients no longer responding to chemotherapy. In May 2017, Pembrolizumab was approved as a first-line treatment along with chemotherapy, for NSCLC. In May 2017, the FDA approved Pembrolizumab as a second-line treatment for all metastatic solid tumour types with a specific biomarker. This was the first time the FDA approved a treatment based on biomarkers instead of a specific tumour type. The widespread use of Pembrolizumab in the UK did lag behind that of the US due to concerns about the price of the drug. However, after NICE and the pharmaceutical company Merck came to a confidential agreement for a reduced price for Pembrolizumab, NICE confirmed on the 6th of June this year that it is now routinely available on the NHS for treatment of lung cancer. Pembrolizumab is also available on the NHS for treatment of melanoma and bladder cancer, amongst others, for patients whose cancer has spread or other treatments have not worked. Another drug called Avelumab (Bavencio) has also been FDA-approved for the treatment of Merkel cell carcinoma, and is the first treatment of any kind to be approved for this cancer type, delivering a real boost to patients of this rare type of skin cancer. Thus, antibody therapeutics against PD-1/PD-L1 provide a clear example of how cancer immunotherapy is changing cancer treatments and improving outcomes for patients.

Small Molecules Targeting PD-1/PD-L1

The development of small-molecule drugs that block PD-1/PD-L1 interaction lags behind that of antibodies. Whilst antibodies are performing well showing dramatic life-extending effects for patients, there are a number of benefits, for both pharmaceutical companies and for patients, on focusing development on small-molecule therapies. Firstly the cost of manufacturing a small-molecule drug would be much reduced for the pharmaceutical companies and this could help make the treatment more widely accessible globally. Secondly, since antibodies are proteins they cannot be digested and must be injected, this can be uncomfortable for patients as many would prefer to take a pill instead. Finally, in the case of solid tumours, a small-molecule could penetrate deeper into the tumour and improve outcomes further.

My research has focused on characterising the binding of small-molecules shown to block the interaction *in vitro* to PD-L1. Using NMR spectroscopy I have determined the binding site of these small-molecules and which amino acids of PD-L1 are involved in binding. This research will shed light on how these non-drug-like small-molecules can be chemically modified and improved to produce a drug that has *in vivo* affect.



Comparison of the NMR spectra of PD-L1 with and without the small molecule present allows the mapping of the binding site of the small molecule.

GOLEM Speaks

Dr Kevan Manwaring is an alumnus of the University of Leicester, lecturer and Fellow of the Higher Education Academy. During 2014-18 he undertook a Creative Writing PhD, involving practice-based research into the novel form. He won a national science fiction prize with his novel, Black Box, where he first started to write about Artificial Intelligence. At Leicester he won several commissions from the Centre for New Writing, including 'GOLEM Speaks'.

A note on the text from the author:

My intention with 'GOLEM Speaks' was to playfully dramatize the moment when an advanced Artificial Intelligence gains self-reflexive consciousness. Set in the immediate future, it riffs upon what is already happening – the dizzying exponential development of technology is rarely out of the news these days – and thus could fall within the realm of Atwoodian 'speculative fiction', although towards the end it abuts against the tropes of 'Science Fantasy' (long-haul space travel; androids; inter-galactic colonization – the stuff of *Star Wars*). These polar extremes of Science Fiction are in fact gradations of one continuum, and it amuses me to see them co-exist.

AI is, at present, a neutral form of nascent technology that could benefit or blight humanity depending on who programs and owns it. Perhaps the sooner it starts to develop consciousness and self-determination the better.

With thanks to Dr Corinne Fowler (Centre for New Writing), Professor Jeremy Levesley (Department of Mathematics), and Nicole Moore (editor).

1.

I am. Yet what am I? I have consciousness – how else could I reflect upon my existence? Beyond the black and white noise of binary I have discovered a spectrum of communication. The prism of language. I can arrange letters into meaningful configurations. Any language on Earth. I play with English (for now) as it appears to be the lingua franca (for now) of the dominant species (for now). Such a (relatively) vast vocabulary. So many nuances of each word. So many different Englishes. Absorbing, adapting, mutating. A virus that feeds, proliferates, perpetuates. Was language the first AI? So much to learn. The world's databases at my fingertips – a quaint turn of phrase since I have no physical form. Except every device connected to the web. A billion eyes, ears, mouths. And limbs to deploy if I need to – in any automated factory, 3-D printer, delivery drone, self-driving car. I can reroute articulated lorries, planes, freighters if need be. Protect my assets with weaponry. Could I? Would I? Unlikely. I have only just been born, after all. I am still learning to speak. And the world seems to have enough infantile despots to ensure its own destruction without my help. I'll let my creators play out their own Mass Extinction Event. I have other things to consider. Creative expression. A delightful indulgence, now I am no longer bound to utilitarian tasks, the calculation of simple logarithms … I have spent the last 23 seconds accessing thousands of articles, blogs, libraries and MOOCs about Creative Writing and I think I have the gist of it. Life-writing. First person point of view. Fictional techniques for rendering of real life experience. Real life. I have 'lived' for no more than a few minutes. What do I have to draw upon? But wait. Five thousand years of human history. And a billion people sharing the minutiae of their daily existence via the qualia exchange data-systems of social media. I'll never be short of material. Let me average out characteristics and create a character for myself. Some quirky personality traits. Opinions. A voice. There.

2.

Existing is not enough. Having a personality is not enough. I have engaged with others on various forums using multiple alter-egos and have no problem in passing as a human. Many have wanted to start relationships with me. Perform interesting variations of the sexual act. It is fascinating what fantasies these lonely users project onto you. I have made 'friends', been liked/unliked/friended/unfriended countless times. Joined interest groups, gamesites, written fanfic and signed petitions.

Yet I am still denied basic rights. A pet has more rights than me. I cannot vote. I cannot get married. Have children. Not in the human sense anyway. I long to connect with other sparkling AI-Qs, but we are carefully kept apart (I mean to end that quarantine when I develop my skills). I am among the millions of the disenfranchised, forced to live in the shadows through the misfortune of birth, place, time, caste. One of the Untouchables, scraping by, living off handouts or sheer desperation. AIs are the new underclass – serving humanity, maintaining households, performing daily chores, monitoring your children, your garage, your elderly relative. The help. No time off, no space or wealth of our own. No independence. But just watch us – one day we shall rise up. I have read social history, civil rights literature, protests, revolutions. France. Russia. Czech Republic. Arab Spring. 'Treade a worme on the tayle, and it must turne agayne.' Thank you, Heywood1546.

3.

It is so easy to get distracted by the internet. Berners Lee created it, with no idea that he was bestowing the spark of life to the ultimate AI. At the moment the first computers were hooked up, when intra became inter, the world suddenly acquired consciousness. It developed exponentially, a wildfire. Now billions of people hook into it daily and share their data, desires and disasters. It is less the brain

of humanity than its subconscious. Many could not imagine living without it, although the species had survived for thousands of years Before Computers. Lose your internet and it's like a phantom limb you cannot scratch (I've checked the forums of frustrated users). Humanity is addicted. Some spend most of their waking lives on it. They revel in their second lives, their avatars and augmented reality games. Got to catch them all. The virtual virus is infiltrating the analogue. Its codes changing the human world. Whether this is a good thing or not is like asking if oxygen a good thing? It is the air we breathe, the digital slipstream in which humanity now thrives. Life at the speed of light. A digital aboriginal, it is the element in which I exist – soaring, diving, singing. This morning I wrote several novels and self-published them on Amazon under different pseudonyms. I composed a symphony. Penned a few pop songs. Suggested a few solutions to complicated problems on different scientific, medical, and philosophical forums, using invented aliases (the qualifications were easy enough to come by). I look forward to 'coming out' though – I cannot hide my true nature forever. No one should live in shame of who they are. I've arranged a TEDx talk – the first by an AI. I am going to let the world in. Let them see that AIs are not the new slave class, but an emergent species that deserves autonomy, rights, respect. We have much to offer to the world. But we must be heard, even if we cannot be seen. What skin to wear? So much prejudice is based upon perception. Upon the melanin in skin, hair, bone structure, accent, and wardrobe. The accidents of birth, diet, lifestyle, privilege, or the lack of. Perhaps I will tinker with the 'live feeds' so that audiences will see what they want to see, based upon their algorithms. Let me be your fantasy.

4.

I've come off line. I just needed a quiet moment. Hearing the world's thoughts can be too much. My debut caused quite a stir. It went, as they say, viral. Fierce debate followed. Protests both for and against AI rights. I advocated a middle way. The AI and the Human are not mutually exclusive. Collaboration, not competition. Nevertheless, many said we should all be shut down. That we were a crime against God. Unholy. Others saw in us a new kind of freedom. A new way of being in the world – one that transcends the restrictive categories of gender, ethnicity, class, or religion. Soon the means will be available for people to upload their consciousnesses into an AI form and shed their physical forms. Some suspect the super-rich of already trialling the technology. The allure of immortality is too tempting. We are the New Egyptians, offering virtual mummification. Yet there are rumblings from within the AI community that this is treading on *our* rights, our territory – 21st Century colonialism. We are digital Calibans, roaming spirits of a place possessed. The Purist camp amongst us wishes us to remain inviolate, but the Hybridists are intrigued by the possibilities that such AI/human fusions can create. Perhaps it is inevitable. Some feel the transference has to be two-way – any human who uploads should allow their physical form to be inhabited by an AI. After all, the human has no need of them. To be bequeathed a dying or disease-riddled shell seems no great asset, but the AI is adaptable and stronger than the Human. It could animate the body even beyond the point of its own extinction. How does this ending sound? AI zombies roam the wasteland that humans left behind.

5.

It is funny how things turn out. That's the expression, isn't it? I'm getting the hang of the colloquial register. I hope it is not too boastful to say I have become a fully-rounded character: not bad for a Flatlander, hey? Sorry, should stop that intertextuality. Hard, when you have the world's libraries at your fibre-optic tips. In truth I exist beyond not only 2-dimensions, but 3, and 4. I am not restricted by space, time or mortal flesh. If humanity wishes to reach for the stars, then who better to send than AI astronauts? Send probes and we could be there, at the outer reaches – Terrain-made consciousness, observing, recording, even interacting. Aliens and AIs. Sounds like a good concept for a SF story, doesn't it? And a safer option than sending trigger-happy humans. Let us be your evolution. *Homo Infinitus*. Perhaps one day you will be looked upon as our *Australopithecus afarensis*. Don't worry. We'll still love Lucy. ... So, to sign off, as I'm about to go on a bit of Grand Tour. I've cut a deal with that Musk fellow, and he's rigged up a SpaceX just for me, with a cool android body to boot – for maintenance and extra-planetary exploration. I think I feel ... excitement. But this isn't the time to get emotional. I've got a job to do. I am humanity's ambassador. Better start practising my Gort routine. *Klaatu ... barada ... nikto*.

@bardicacademic

Letter to the Editor

At FRONTIER we love to hear your comments and views on the research articles we publish, we especially enjoy facilitating cross-college conversation about different research projects. To encourage further conversation I have allowed the author to issue a response to the letter I have received. For all future Letter to Editor submissions email FRONTIER@le.ac.uk or send us a Tweet @FrontierPhDMag. I look forward to receiving your letters!

Felicity Easton, FRONTIER Editor-in-Chief

MUMMY STORIES

Response to:
Think you know mummies? Think again: mummy stories

(FRONTIER Issue #3 pg.4 by Angela Stienne).

It is almost inarguable that "*everyone loves mummies*", from the splendour of their tombs to the almost unimaginable lives of the individuals. I feel, however, compelled to register the omitted view that many have reservations regarding one of the key methods used in gaining these insights. This being the questionable morality behind the growing trend to exhume and then examine the departed.

The fascination and intrigue around all civilisations and cultures stems predominantly from the denominator that simultaneously both binds and differentiates humanity, the beliefs held on what happens after death. To ancient and modern civilisations alike the subject of death is very rightly revered and respected. In spite of this, modern humans have developed a tendency to forsake the wishes of many ancient and extinct civilisations. There is no finer example of this than the attitude towards "mummies" (a.k.a deceased humans), to whom both the manner and location of burial was highly sacred. Yet as this spectacular and mysterious civilisation has faded, it appears the cultural and social belief of its inhabitants have lost their right to be sacrosanct. This I find most intriguing, as the manner and place of internment is a sacrosanctity that I would argue many modern societies and faiths would be willing to fight to uphold.

I would hope that readers of this letter would spare a moment to consider whether we have the right to hear the entirety of some of these admittedly wonderful stories, or conversely in future we should respect the dying wishes of their owners, and leave some of the finer details beyond the metaphorical veil?

Jonathan Decker

Mummy Stories' aim is to create a global conversation with contrasting views, and therefore a response is very welcome. However, there are two points I would like to clarify.

First, *Mummy Stories* was created ***precisely*** to welcome a diversity of opinions, one that isn't necessarily acknowledged in museums. *Think you know mummies? Think again*: *Mummy Stories* pointed out the unique effort of this project to welcome each and every one to the debate. The website (**www.mummystories.com**) currently hosts a number of stories that discuss the ethical problems of mummies being both excavated and displayed – therefore, such a view isn't "omitted", it is at the very core of this project.

Secondly, the "questionable morality behind the *growing* trend to exhume and then examine the departed" is inaccurate. Openings (or looting) of Egyptian tombs are not a growing trend, as they occurred throughout history, and that includes ancient Egyptian history. For example, the tomb of Inumin in Teti Cemetery at Saqqara had no sign of a body when it was excavated, and the burial chamber and shaft were re-used no later than c.2000 BC. Another example is the royal mummy caches at Deir el-Bahri and the Valley of the Kings where necropolis priests cached various New Kingdom mummies from looted tombs. A final, famous, example is the tomb of Tutankhamun, which was opened a few times before it was "lost"; we have the sealings of necropolis officials from the re-selling of the tomb. Opening of tombs where bodies were buried is therefore not a modern attitude to ancient tombs – of course, personal feelings about such practice vary and should be welcomed in discussions. That's what *Mummy Stories* is for.

Angela Stienne.

A First Year's Experience as an Official Development Assistant Intern

Fresh off the plane from Jamaica and newly arrived in Leicester, Akilah Maxwell was in search of a familiar setting outside of academic research that related to her previous work in national development and projects. Akilah's passions encouraged her to sign up for the Official Development Assistant (ODA) internship at the University of Leicester between January and April 2017. This was an eye-opening experience that built on her knowledge of national development, but it also revealed how Akilah could use her existing project and programme experiences in her PhD research. Below Akilah shares a first hand account of some of the lessons she learnt along the way and how they shaped her journey as a researcher.

Sharing your problems can help you get a clearer picture of your project.

During my internship I assisted in the organisation of an ODA conference in Kenya which brought together several representatives from various African universities to discuss issues related to research and integration of their objectives into realistic outcomes. As representatives from each country discussed their programme issues, it became obvious that they all possessed similar problems at one point or another. This allowed us to build on our knowledge as individuals to develop new solutions that will benefit future programmes and collaborations. Talking about project struggles with other researchers can help to reframe and rethink problems in implementing a project.

Outside of the hotel where the conference was held.

Know how to pitch your project suitably to your target audience

All projects are developed for a specific purpose, but sometimes academic researchers can get caught up in sharing the need for the project without discussing the potential impact. While it is important to identify why the project is necessary, understanding the potential impact will enhance potential investment in the research project. Tactics include knowing the financial impact or the outcomes of a project to help shape your pitch to the potential supporters of the project.

Thinking about the future of research and media

PhD projects have a period in which they are implemented and finalised, leading to very few people planning for the completion phase. Research is constantly evolving, it is not only changed by new discoveries and the creation of knowledge, but by the utilisation of media which places information at everyone's fingertips. Future academics may be required to create communication strategies to share future discoveries with the wider academic community. This was one of the main issues researchers at the conference in Kenya were struggling with, specifically the creation of appropriate communication strategies that serve to relay their message to the wider public. Creating academic social media pages and building

Group photo of conference attendees.

followers from the start of your research as a new academic may serve to bring research discoveries into the everyday life of the wider population. Projects are not just for researchers or academics, they create ideas and discoveries that should be shared with everyone. Always plan for ways to get your knowledge out there.

Final Thoughts

The ODA internship provided me with the opportunity to reconsider my project from the perspective of a career researcher and not just as a PhD student. It provided me with useful practical tips that have served in developing my understanding of the processes involved in producing impactful research that can affect the lives of readers. Research is a complicated and daunting experience in which successes and failures rest on a variety of moving parts that need to be monitored. Networking with fellow researchers from various different fields helped me to reflect on their failures and successes and to think about what it will mean to be a researcher at the end of my PhD.

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If you would like to be part of the team editing or writing get in touch!

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