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NEWS
NEW STUDY FINDS GIANT PREDATORY DINOSAURS COULD HUNT UNDERWATER

FEATURE
IDENTIFYING SUNKEN SLAVE SHIPS WITH INTEGRATED MARITIME ARCHAEOLOGY AND GEOSCIENCE

REPORT
UNDERGRADUATE FIELDWORK IN A PANDEMIC

WELCOME

TO THE OXFORD EARTH SCIENCES ALUMNI MAGAZINE

MIKE KENDALL

Dear Alumni,

I am the incoming Head of Department, taking over from Chris Ballentine. Chris has led the Department through exciting times of expansion and growth, with over 10 new Faculty members appointed in the last 2 years alone. It is a difficult job at the best of times, but Chris has also had to sail through the unchartered waters of a global pandemic. He has done this with great confidence and leadership. Our staff have responded with an amazing level of resourcefulness, delivering high standards of teaching, across online and hybrid formats. Our students, in turn, have shown a high level of resilience, but also patience and understanding. It cannot be understated how well the Department as a whole has handled this challenge, owing a great deal to Chris' steady hand and confident leadership.

The Department of Earth Sciences at Oxford is one of the very best in the world and it is indeed an honour to be appointed as its Head. I am still relatively new to Oxford - still learning what Hillary term means and what a DPhil is – but I have been struck by the collegiality of the Department and wider University, and the quality of our students. I am the new Chair of Geophysics and join Oxford from the University of Bristol. My research spans pure and applied geophysics, and I have worked in some of the hottest (the Horn of Africa) and the coldest (Antarctic) regions on Earth. I am particularly excited about a number of new initiatives in the Department, all of which will have an influence on our teaching curriculum. These include sustainably resourcing the materials needed for net zero, critical metals being a good example. The Department has also stepped up to lead in a number of areas of Equality, Equity, Inclusivity and Diversity. This includes participating in Oxford's Black Academic Futures scholarships, but also more focussed initiatives such as a fieldwork hardship fund. As alumni, you've helped shape the department in the past and I look forward to meeting and working with you on our future.

IN THIS ISSUE

CONTENTS

GETTING TO KNOW OUR NEW HEAD OF DEPARTMENT

Field work in Cape Dorset, Nunavut, Canada.

INTRODUCING...

Chair of Geophysics

Professor Mike Kendall FRS

Mike joined the department in 2019 from the University of Bristol. He has a PhD in Geophysics from Queen's University in Canada and was a NSERC postdoctoral fellow and Green's Scholar at the Scripps Institution of Oceanography in the USA. He has had faculty positions at the University of Toronto and the University of Leeds, and worked briefly for Chevron Canada Resources in Calgary, Canada. He was previously president of the British Geophysical Association (BGA) and vice-president (Geophysics) of the Royal Astronomical Society. In 2003 he was the BGA Bullerwell Lecturer, in 2011 he was elected fellow of the American Geophysical Union and in 2019 he was elected to the Royal Society.

Mike's research covers pure and applied seismology, with connections to mineral physics, geodynamics and engineering. His breakthroughs have come from an ability to translate discoveries and solve problems across disciplines, including volcanology and glaciology. Current research in global geophysics concentrates on the nature of the Earth's core-mantle interface and the boundaries of tectonic plates. For nearly 20 years he has worked in East Africa, revealing the role of the mantle in the breakup of continents. He has led seismic field experiments in a range of geologic settings varying from the Canadian Arctic to Ethiopia.

Techniques developed to study wave propagation in the deep Earth have also been applied to his research in exploration seismology. With a focus on wave propagation in anisotropic media, his interests in applied seismology lie in passive seismic monitoring and rock-fracture characterization. Early in his career he recognised the importance of human-induced seismicity, working closely with industry and regulators across a range of industrial applications. He has managed a number of large industry-funded consortia, and in 2010 he founded the Bristol University Microseismicity Projects (BUMPS).

Mike conducting field work on the island of Praslin in the Seychelles.

RESEARCH NEWS

For all the latest Oxford Earth Sciences Research News, visit www.earth.ox.ac.uk/news

NEW STUDY FINDS GIANT PREDATORY DINOSAURS COULD HUNT UNDERWATER

New research by a multi-institution team including prof. Roger Benson of Oxford Earth Sciences, the Field Museum of Natural History, Chicago and the University of Cambridge used X-ray imaging of fossilised bones to analyse bone density. By comparing the bone structure of living animals and birds that forage in the water, researchers found strong evidence that dinosaurs from the spinosaurid family swam underwater to search for prey.

Spinosaurid dinosaurs look like T. rex, but with a long, narrow snout and short legs. They include species like Spinosaurus from northern Africa, and Baryonyx from England, and were first discovered in 1915. Fossilised gut contents show that spinosaurids were amphibious hunters – eating both surf and turf – but it has been debated whether they caught fish in the water like a crocodile or hunted from the shallows like a heron.

Illustration of the Spinosaurus, Credit: Davide Bonadonna.

The new study used data on skeletal bone density to resolve whether spinosaurids swam underwater. Using CT scanning (a form of 3D x-ray imaging) the researchers showed that animals that submerge themselves underwater to find food have bones that are almost completely solid throughout, whereas cross-sections of land-dwellers' bones look more like doughnuts, with hollow centres. The Spinosaurus and Baryonyx both had the sort of dense bone associated with full submersion, whereas their close relative, Suchomimus, had hollower bones. It still lived by the water and ate fish, as evidenced by its crocodile-mimic snout and conical teeth, but based on its bone density, it was not swimming to hunt.

Read more:
bit.ly/BurmAmmTres

IRON INTEGRAL TO THE DEVELOPMENT OF LIFE ON EARTH

Iron is an essential nutrient that almost all life requires to grow and thrive. Iron's importance goes all the way back to the formation of the planet Earth and it went on to have major ramifications for how life developed. Now, a collaboration between Jon Wade at Oxford Earth Sciences and Prof. Hal Drakesmith, group leader of the Iron and Immunity Group in the MRC Human Immunology Unit and others, has uncovered the likely mechanisms by which iron influenced the development of complex life forms, which can also be used to understand how likely (or unlikely) advanced life forms might be on other planets.

The initial amount of iron in Earth's rocks is 'set' by the conditions of planetary accretion, during which the Earth's metallic core segregated from its rocky mantle. Too little iron in the rocky portion of the planet, like the planet Mercury, and life is unlikely. Too much, like Mars, and water may be difficult to keep on the surface for times relevant to the evolution of complex life.

Initially, iron conditions on Earth would have been optimal to ensure surface retention of water. Iron would have also been soluble in sea water, making it easily available to give simple life forms a jumpstart in development. However, oxygen levels on Earth began to rise and an increase in oxygen created a reaction with iron, which led to it becoming insoluble. Gigatons of iron dropped out of sea water, where it was much less available to developing life forms. Life had to find new ways to obtain the iron it needs adopting characteristics which propelled early life forms to become ever more complex.

Early Earth on the left, had seas infused with life-enhancing iron, whereas Earth today, seen on the right, does not. Credit: Image courtesy of Mark A. Garlick / markgarlick.com

Knowing about how important iron is in the development of life may aid in the search for suitable planets that could develop life forms. By assessing the amount of iron in the mantle of exo-planets, it may now be possible to narrow the search for exo-planets capable of supporting life.

GOLD HYDROGEN

As the world shifts towards clean energy, it's highly likely that hydrogen will play an important role. Naturally occurring 'Gold' hydrogen could sidestep the need for industrial processes currently required for manufacturing that hydrogen.

Hydrogen is generated naturally in the Earth's deep crust. Hydrogen gas fields can be formed by a range of internal Earth processes that bring the gas to shallower sedimentary rocks such as limestone and sandstone where there is also a 'cap'. If these reservoirs can be traced and the gold hydrogen extracted in a clean and safe way then it will be a highly sustainable and acceptable form of green energy.

A joint research initiative between Helios Aragon, a Spanish company, and Professor's. Chris Ballentine (University of Oxford) and Jon Gluyas (Durham University), is investigating hydrogen generation, migration and how it accumulates so that it can be extracted and used for commercial purposes. Natural hydrogen occurrences in Brazil have also been investigated by the Oxford team, in collaboration with Barbara Sherwood Lollar (University of Toronto) and funded by the Total Oil and Gas Company.

GREEN MINING COULD PAVE THE WAY TO NET ZERO

Magma beneath volcanoes releases gases that rise towards the surface and these gases are rich in metals. As the pressure drops, the gases separate into steam and brine. Most metals dissolved in the original magmatic gas become concentrated in the dense brine, which in turn gets trapped in porous rock. Extracting valuable metals from hot salty fluids ('brines') trapped in porous rocks at depths of around 2km below dormant volcanoes is a radical green-mining approach to provide essential metals for a net zero future – copper, gold, zinc, silver and lithium – in a sustainable way.

The brines potentially contain several million tonnes of copper and copper is a key metal for making the transition to net zero, due to its importance in electricity generation and transmission, and electric vehicles. In addition, geothermal power will be a significant by-product of a green-mining approach, meaning that operations at the well-head will be carbon-neutral.
This research is part of an international effort that uses volcanology, hydrodynamic modelling, geochemistry, geophysics and high temperature experiments that is led by Prof. Jon Blundy.

Soufrière Hills Volcano on the Caribbean Island on Montserrat. Photo courtesy of Steve Sparks, University of Bristol.

NEW SEISMOMETER TECHNOLOGY DEPLOYED IN ANTARCTICA AHEAD OF POTENTIAL USE ON DISTANT ICY MOONS

Twenty state-of-the-art seismic 'Nodes' built by STRYDE (the world's smallest and lightest land seismometers) have been deployed onto the ice shelf around the British Antarctic Survey (BAS) Halley VI Research Station, along with one 'short period' (SP) sensor built by Imperial College London and the University of Oxford and funded in development with the UK Space Agency. This is the first time that either of these instruments have been used in Antarctica, an environment which is the closest analogue of an icy moon found anywhere on Earth.

In addition to laying the groundwork for future space science missions, this exciting and novel experiment will also help to understand the floating ice shelf upon which the BAS Halley VI Research Station is located.

The project is a partnership between BAS, the UK Space Agency, University of Oxford, and STRYDE

Seismic 'Node' deployed onto the ice shelf around the British Antarctic Survey (BAS) Halley VI Research Station Credit: Thomas Barningham @ BAS.

EARTHQUAKE RUPTURES AND HAZARDS IN ASIA

RICHARD WALKER PROFESSOR OF TECTONICS

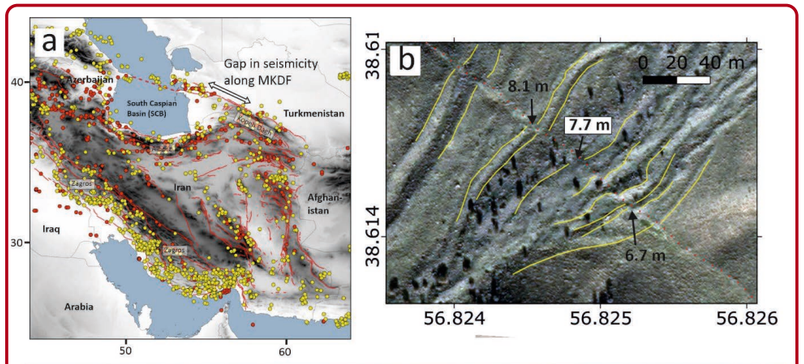
In contrast to plate boundaries, where earthquake hazard is usually confined to narrow zones around the edges of the oceans, active faulting within continental interiors is spread across very wide regions, and with intervals of hundreds, or even thousands of years between large earthquakes in any one area. The long recurrence intervals pose challenges for the assessment of earthquake hazards, and the small database of recent large earthquakes limits our understanding of fault rupture processes in such regions.

The problem is societal as well as scientific. Populations across much of the Asian interior are sustained in narrow fringes between desert and mountain, which provide opportunities for settlement, agriculture, and resources and offer pathways for migration and trade. Yet these areas are prone to earthquakes, and the rapid growth of population centres and infrastructure, often without detailed appreciation of the hazards, are leading to increased vulnerability.

The Active tectonics and earthquake geology group in Oxford, along with our collaborators in the UK and overseas, are undertaking a number of projects exploring the earthquakes, active faulting, and growth of mountain ranges in the Asian interior. We are expanding and enlarging the database of earthquake surface ruptures across the Asian continental interior, both to address the general issues of earthquake occurrence in the continental interiors, as well as to provide information that is useful to earthquake hazard assessment at a local scale. We are aided by the pristine landscape that can retain evidence for discrete surface ruptures for very long periods of time, and also by the available of modern sub-metre stereo optical satellite imagery and field-based drone survey techniques which have offered a revolution in our ability to interpret landscapes and make measurements.

Our work builds on programs and collaborations started within the 'Earthquakes without Frontiers' consortium that ran from 2011 to 2017, and we are currently supported by the NATO Science for Peace and Security Program, the Leverhulme Trust, and COMET, the Centre for the Observation and Modelling of Earthquakes, Volcanoes and Tectonics, and a wide range of partners. The NATO SPS program aims to deliver underpinning hazard science in the Tien Shan region that can be built into new risk assessments and risk reduction activities whereas the Leverhulme Trust supports geographically wide projects addressing the occurrence of damaging earthquakes in the continental interiors (EROICA – Earthquake Ruptures of Iran and Central Asia) and in marine settings in the Mediterranean, Indonesia, and the Caspian Sea (Neptune – Neotectonics, Palaeoseismology and Tsunami in the eastern Mediterranean).

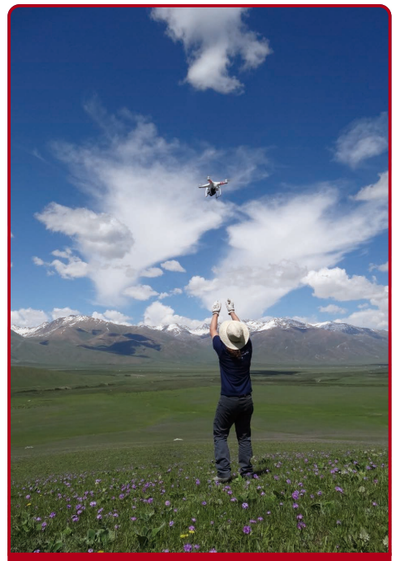
An important part of our work is in unravelling the sources of major destructive earthquakes, including a significant number through the late 19th and early to mid 20th centuries. For example, Almaty, Kazakhstan, with a population of 2 Million, was badly damaged by a magnitude 7.3 event in 1887, and two extremely large events of magnitude >8 that struck the city in 1889 and 1911. Ashgabat, the capital city of Turkmenistan, was destroyed with much loss of life in a poorly understood earthquake in 1948. The major 20th century earthquakes are of particular importance for us, as we are able to study them using seismology, to gain direct constraints on their magnitudes, as well as other important details of their sources such as depth extent, and using geomorphology, by mapping the extent of the surface ruptures and measuring the amount and variability of surface slip along those ruptures (e.g. Abdrakhmatov et al., 2016; Ou et al., 2020). These earthquakes help to calibrate our findings for historic and prehistoric events, for which we are limited to observations from the geomorphology.



(a) Instrumental (yellow) and historic (red) earthquakes within the Arabia-Eurasia collision. There is a gap in seismicity along the Main Kopetdag fault (MKDF) in Turkmenistan. (b) Sub-metre Worldview-3 imagery (obtained through the Digitalglobe foundation) shows evidence for multiple ~6-8 m right-lateral offsets which are likely to have bene caused by a single large earthquake. (c) Fieldwork allows observations to be validated, and trench investigations allow the earthquake to be dated to the Medieval period. This large magnitude earthquake is not present in any catalogue of earthquakes. All figures from Dodds et al., in revision.

We also go further back in time, to address the long-term patterns, distributions, and clustering of earthquakes that can be extracted from the historical records in regions such as Iran and China (e.g. Middleton et al., 2016; Feng et al., 2020). A number of prominent faults close to major population centres have no documented historical record of earthquakes near them, and yet display evidence in the landscape for rupture in the recent past. Forensic study of these faults, such as the example shown in the figure, is essential for determining the completeness of the historical record and the hazard posed to population centres across the region.

You can read more about our activities and keep up to date through our website (quakesincentralasia.org) and on twitter @ QuakesCentAsia

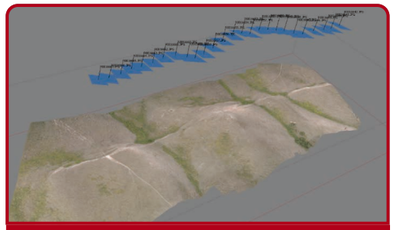


Surveying ruptures from the 1992 Suusamyr earthquake, Kyrgyzstan.

Russian language edition of the report 'Earthquake Science and Hazard in Central Asia', which was written following the 2016 EWF workshop in Almaty, Kazakhstan.

Trench exposing the Almaty fault, which passes close to the city of Almaty and which has no record of historical earthquakes upon it. We are dating the sediment layers in order to determine the timing of the last two earthquakes to have occurred on this fault, both of which occurred in the prehistoric era. The improved knowledge of earthquake hazard is of benefit to city planners in Almaty.

Photos from a recent workshop and dinner in Oxford, at which established experts and early career scientists in earthquake geology assembled from across central Asia and Europe. Experts came from Kyrgyzstan (Prof. Kanatbek Abdrakhmatov, Institute of seismology, National academy of sciences), from Mongolia (Prof. Amgalan Bayasgalan), from Russia (Dr. Alexander Strom), from Tajikistan (Dr. Anatoli Ishchuk, Institute of seismology, National academy of sciences) as well as France, Germany and the UK. The purpose of the meeting was to share knowledge about the major earthquakes that occurred during the 20th century within central Asia, and also to develop a program of work for the coming years in order to achieve our project aims.



3D model of ruptures from the 1889 Chilik earthquake, Kazakhstan, derived from low-altitude drone photography. Our team (including partners from IoS Kyrgyzstan and KNDC Kazakhstan) used these surveys to understand the source of this very large and destructive earthquake.

Ruptures from an undocumented earthquake from the medieval period along the Main Kopetdag Fault, Turkmenistan. Uncovered through our own remote sensing, fieldwork, and palaeoseismic trenching. This rupture passes close to a number of towns along the Kopetdag rangefront to the west of Ashgabat.

Our team along with colleagues from the Institute of Seismology and Atmospheric Physics, NAS, Turkmenistan outside the institute after I had given a workshop, which was reported on television and in the national press.

Selected Papers

Feng, X., Ma, J., Zhou, Y., England, P., Parsons, B., Rizza, M.A. and Walker, R.T., 2020. Geomorphology and Paleoseismology of the Weinan fault, Shaanxi, central China, and the source of the 1556 Huaxian earthquake. Journal of Geophysical Research: Solid Earth, 125(12), p.e2019JB017848.

Ou, Q., Kulikova, G., Yu, J., Elliott, A., Parsons, B. and Walker, R., 2020. Magnitude of the 1920 Haiyuan earthquake reestimated using seismological and geomorphological methods. Journal of Geophysical Research: Solid Earth, 125(8), p.e2019JB019244.

Abdrakhmatov, K.E., Walker, R.T., Campbell, G.E., Carr, A.S., Elliott, A., Hillemann, C., Hollingsworth, J., Landgraf, A., Mackenzie, D., Mukambayev, A. and Rizza, M., 2016. Multisegment rupture in the 11 July 1889 Chilik earthquake (Mw 8.0–8.3), Kazakh Tien Shan, interpreted from remote sensing, field survey, and paleoseismic trenching. Journal of Geophysical Research: Solid Earth, 121(6), pp.4615-4640.

Middleton, T.A., Walker, R.T., Parsons, B., Lei, Q., Zhou, Y. and Ren, Z., 2016. A major, intraplate, normal-faulting earthquake: The 1739 Yinchuan event in northern China. Journal of Geophysical Research: Solid Earth, 121(1), p p.293-320.

DIGGING THE DIRT ON THE PLANET'S OLDEST FOSSILS

ROSS P. ANDERSON POST-DOCTORAL RESEARCH FELLOW, ALL SOULS COLLEGE

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Today complex eukaryotic life, including all animals and plants, makes up the bulk of documented biodiversity and eukaryotes play a key role in modulating the Earth System. Yet it wasn't always this way; for most of geological history eukaryotes were either absent or minor players in the Earth's ecosystems. Their diversification to ecological prominence between 1,000 and 500 million years ago (Ma) marks a pivotal transition in our planet's history. Despite the importance of this geobiological revolution as the foundation of the modern biosphere, we still don't understand its underlying mechanisms or even the basic timing of key evolutionary milestones.

Since 2017, I have been a Post-Doctoral Research Fellow at All Souls College; the first earth scientist ever to be a fellow. There I have been investigating when, how, and why the first eukaryotes evolved and diversified. This builds on a rich heritage of palaeontological inquiry on the emergence of biological complexity at Oxford. For many years, Martin Brasier led work on some of the first macroscopic organisms from the Ediacaran Period, and Oxford currently has a strong group of early career researchers in this area. Frankie Dunn (1851 Fellow, University Museum of Natural History and Merton College) works on the Ediacara Biota like Martin, whereas Luke Parry (Junior Research Fellow, St Edmund Hall) works on exceptionally preserved fossils that tell us about the Cambrian Explosion of animals. The rise of complex life was also highlighted in the University Museum's recent First Animals exhibition.

The main challenge to researchers working in this area is the rarity of fossil evidence for early eukaryotes. While fossils have played a central role in our quest to chart the history of life from the Cambrian Explosion to the present, those in older Precambrian rocks are poorly documented. The first eukaryotes evolved before the advent of biomineralisation. They lacked the hard shells and skeletons that readily preserve; instead, their soft and often microscopic remains were only fossilised in specific circumstances. Put simply, we don't know where or why precious remains of these early eukaryotes were preserved.

A large proportion of my own work at Oxford has focussed on this key issue. I've applied novel analytical techniques to fossil material to uncover the processes controlling preservation. If looking for early fossils is like looking for needles in a haystack, my work is ridding us of the hay and allowing us to focus in on the needles for the first time.

One lithology from which early eukaryote fossils are commonly recovered is mudstone. Working with former Oxford faculty member Nick Tosca (now at the University of Cambridge), we investigated the role clay minerals play in soft-body fossilisation in this lithology. Work I had been involved in as a PhD student at Yale showed that the clays kaolinite and berthierine have antibacterial properties that may slow the decay of soft-body organisms allowing them to be preserved. In 2018, we employed X-ray diffraction to demonstrate that the abundance of these minerals can predict which fossiliferous Cambrian rocks preserve soft tissues with ~80% accuracy. More recently, we have shown that kaolinite can directly bind to organic matter, increasing its decay resistance, and have documented kaolinite-fossil associations for both Cambrian Burgess Shale fossils as well as organic-walled microfossils of Precambrian eukaryotes. Oxford is well-equipped for this technically challenging research. Earth Sciences has an advanced X-ray diffractometer that can rapidly analyse large stratigraphic sample suites. While the David Cockayne Centre in the Department of Materials and the nearby Diamond Light Source provide access to cutting-edge microanalytical tools such as synchrotron based infrared spectroscopy. These studies together argue that the early fossil record is biased to locations/times where clay production was favoured, typically tropical environments.

Can we apply this knowledge to search for key fossils that plug gaps in our understanding of early eukaryote evolution? In summer 2018, I began a field campaign funded by the Royal Society and the University's John Fell Fund in the Norwegian Arctic. Knowing the need for clay-rich strata, the target was a 950–800 Ma 4.5km-thick mudstone succession recording shallow-water environments in northern Svalbard. This succession includes the Oxfordbreen Formation—its name taken from a glacier traversed on a similar University expedition to Svalbard in the 1920s. Over the past year, two Earth Sciences undergraduates (Sanaa Mughal 3rd year and George Wedlake 4th year) have worked with me to process these samples. They have already uncovered exciting new microfossils, including only the fourth example of the oldest green alga Proterocladus and new multicellular forms. Their work is also telling us about the ecology of these early eukaryote ecosystems as we trace fossil occurrences across depositional environments, testing whether these ecosystems were nutrient limited. They recently presented their work as posters at the Palaeontological Association Annual Meeting.

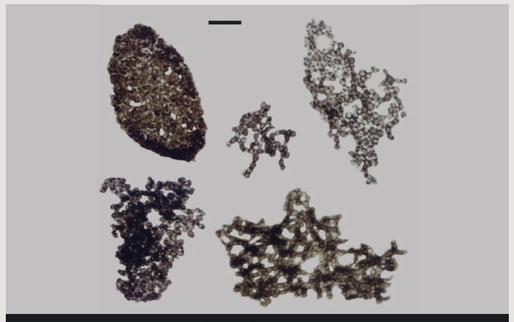
Not only have I been working in Svalbard but also Mongolia. There I reported new phosphatised Ediacaran microfossils like the iconic fossils of the Doushantuo Formation, China. What type of organism these Doushantuo fossils represent is controversial; they may even be the oldest animal embryos. The discovery of new examples in Mongolia is shifting the focus beyond the >20 years of work that has been undertaken in China with the exciting prospect of new discoveries.

There's much more to uncover about early eukaryote evolutionary history with fossils. The new dual approach I am taking in Oxford that applies insights from study of fossilisation processes to an ambitious field programme is systematising the search for key new fossils for the first time.

Emergence of complex life meeting held at All Souls College in 2018, bringing together 30 of the UK's foremost researchers in this area.

Fieldwork in northern Svalbard with collaborators from Yale University and Dartmouth College, 2018. Photo credit: Tim Gibson.

Polar bear encounter in northern Svalbard, 2018. Photo credit: Tim Gibson.



New early eukaryote fossils from Svalbard. Scale is 100 µm.

Anderson working in northern Svalbard, 2019. Photo credit: Alexie Millikin.

Sanaa Mughal (3rd year undergraduate) analysing new early eukaryote microfossils with Infrared spectroscopy to understand their organic composition.

IDENTIFYING SUNKEN SLAVE SHIPS WITH INTEGRATED MARITIME ARCHAEOLOGY AND GEOSCIENCE

ASSOCIATE PROFESSOR RICHARD PALIN

DEPARTMENT OF EARTH SCIENCES, UNIVERSITY OF OXFORD, OXFORD, UNITED KINGDOM

DR. DAVID CONLIN

NATIONAL PARK SERVICE, SUBMERGED RESOURCES CENTER, LAKEWOOD, COLORADO, USA

An international collaboration

On January 8, 1455 Pope Nicolas V signed a Papal Bull granting Portugal the right to enslave any and all people they encountered south of Cape Bojar, on the northwest coast of Africa. For the next 450 years, a vast transnational industry encompassing most of the major European powers engaged in the shameful practice of human kidnapping and trafficking on an industrial scale—it was an industry that shaped the modern world. Between 1514 and 1866, more than 36,000 maritime voyages dedicated to the kidnapping of Africans occurred worldwide, hundreds of these voyages ended in shipwreck and catastrophe[1] Little has been done to document these sites of painful history, and few have been excavated or documented to proper scientific standards.

Since 2015, a team of African professionals and a network of international researchers, underwritten by the Slave Wrecks Project[2], have been searching for shipwrecks associated with the global slave trade in the waters of Africa. While the popular media often depicts shipwrecks that are definitively identified by one or two key artefacts, in reality, the true process of identification may rest upon a larger accumulation of circumstantial evidence. To make a convincing argument regarding the date, cultural affiliation and purpose of a shipwreck is an often arduous and frustrating task that draws from many different fields. At the University of Oxford, UK the Department of Earth Sciences has joined the quest to bring these wrecks, and their history back into memory with the application of cutting-edge geological science applied in novel ways.

[1] https://www.slavevoyages.org/

[2] The Slave Wrecks Project is an ambitious international study of the impacts of the global slave trade via an examination of shipwrecks. The project is housed in, and supported by, the United States' Smithsonian Museum of African American History and Culture. For details of the project and its scope go to https://nmaahc.si.edu/explore/initiatives/slave-wrecks-project

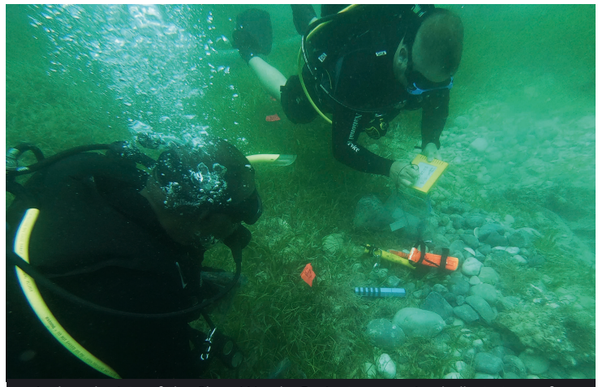
Over the past nine months, Dr Richard Palin and colleagues at the Department of Earth Sciences, conducted research on six ballast stones recovered by archaeologists from the Slave Wrecks Project from a shipwreck in Africa in order to determine their geological provenance. Ballast stones are added and removed as ships complete different legs of their voyages and, with proper historical background, it is sometimes possible to correlate these physical specimens with locations noted in historical accounts of ship's voyages. Deducing the geological history of the ballast stones recovered from the underwater wreck therefore offers a unique opportunity to determine where a ship had visited prior to sinking and is an important piece of circumstantial evidence regarding the potential identity of a shipwreck.

Richard Palin.

Analysing the ballast stones

The ballast stones collected by the team were made of basalt; a dark-coloured igneous rock that forms primarily on Earth today at mid-ocean ridges, where tectonic plates slowly spread apart, but also erupts from volcanoes that lie far away from plate boundaries, such as the Hawaiian Islands in the central Pacific Ocean. In the latter case, volcanism at the Earth's surface is driven by rising columns of extremely hot mantle impinging on the base of the crust - commonly referred to as mantle plumes, or 'hot spots'. Crucially, basalts that form in mid-ocean ridge and intraplate tectonic settings have distinctly different geological characteristics, especially in terms of their mineral contents, chemical compositions, and isotopic profiles.

"The critical step in working out whether the shipwreck discovered off the coast of Africa could be historically linked to a vessel involved in the trade of enslaved people was to determine whether the ballast stones had geological affinity to the island of Mauritius" says Richard. "Mauritius is part of the Mascarene Islands, which formed due to magmatism associated with the Réunion hotspot, which itself has been active for over 65 million years." The mineralogical, geochemical, and isotopic characteristics of basalts erupted on the islands of Mauritius, Réunion, and Rodrigues are well documented in the scientific literature, and so Richard and his team collected equivalent data from the ballast stones to make comparisons. "We looked at the mineral contents, the major, minor, and trace element concentrations, and strontium and neodymium stable isotope ratios. This involved a wide variety of laboratory analyses, including making very thin slices of the ballast stones and viewing them under a polarising microscope, and crushing portions of the samples to a powder that was then analysed via mass spectrometry. The data were collected mostly here at Oxford, although a collaborator in Germany performed some of the geochemical work. I also consulted some of my colleagues around the UK to help with the data analysis and interpretation - it was truly a team effort!"



Archaeologists of the Slave Wrecks Project recovering ballast stones for analysis at University of Oxford's Earth Sciences Laboratory.

Did the team identify the ship?

Following data collection and comparison with published reference values, can the team now confirm that this wreck is one sought by the Slave Wrecks Project? *"It's not absolutely certain"*, says Richard *"but, that's a common situation in geoscience - we often have to deal with incomplete datasets, and interpretations may be non-unique. Six ballast stones collected by the SWP were analysed, and three have strong petrological, geochemical, and isotopic similarities to basalt documented from Mauritius, so I would argue with confidence that they were collected there by a ship prior to its final voyage. However, two of the stones show characteristics that better match those found in basalts from Réunion, and one sample seems to be a complete wildcard, having isotopic characteristics that suggest formation above a subduction zone. This doesn't fit the geological profile of the Mascarene Islands at all, unfortunately!"* Even if all the ballast stones were from Mauritius, there still is the possibility that a ship currently under investigation that was not historically involved in the trade of enslaved people, but that followed a similar path, collected ballast from there as well. Barring an exceptional find from future archaeological excavations, the most likely result is the ship, and its history, will be identified from a preponderance of circumstantial evidence—in this, Oxford's contribution to identifying the provenance of the basalts will be key.

The team is very happy with these results. Independent research performed on wood and lead recovered from the wreck will bring in additional lines of evidence, and hopefully they will all converge on a positive identification. As Dr. David Conlin, one of the SWP archaeologists observed, *"Regardless of any final identification, Oxford University is contributing to exciting new developments in maritime archaeology and, if the wreck turns out to be the particular ship we are searching for, to profound questions of human history and decency that deserve the best science we can apply to them . We are very grateful and fortunate to have found highly talented and engaged partners like Dr. Palin and his team at the Earth Sciences Laboratory."*

A dark history and a brighter future

The story of the global trafficking in enslaved peoples is soberingly relevant to Black History Month. In the 241 years stretching from 1619 to 1860, an estimated 12.5 million people were abducted from their homes in Africa and taken to the New World; about 2 million of those souls perished during their voyage. The research performed at Oxford, effectively integrating geochemistry and geology with maritime archaeology will help to address a deeply important and meaningful piece of human history that has been largely ignored.

"Personally, I was honoured to have had the chance to contribute to this important work," says Richard. *"I'd love to take part in similar projects in the future.".*

The Slave Wrecks Project is an ambitious international study of the impacts of the global slave trade via an examination of shipwrecks. The project is housed in, and supported by, the United States' Smithsonian Museum of African American History and Culture. For details of the project and its scope go to https://nmaahc.si.edu/explore/initiatives/slave-wrecks-project

UNDERGRADUATE FIELDWORK DURING A PANDEMIC

Dr Stuart Robinson

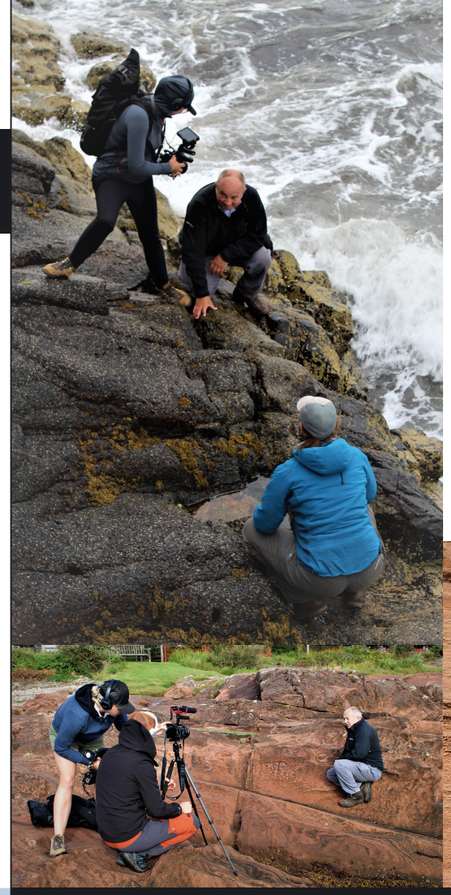
Associate Professor of Sedimentology and Stratigraphy

Field activity has remained an integral part of the undergraduate course. From the first year excursion to Pembroke to worldwide trips throughout the course, Oxford Earth Scientists are given opportunities from the beginning to develop the practical tools required for research. In turn, this ensures that tomorrow's experts are scientifically trained to break new ground in their studies.

As we all know the Covid-19 crisis has had a big impact on the past two years of field courses. The early stages of the pandemic in 2020 severely impacted our ability to deliver field teaching and all trips scheduled for the Easter vacation (Assynt, Arran, Spain), Trinity Term (Day-trips around Oxfordshire and the Cotswolds), the Long Vacation (Independent mapping, Dorset, Bermuda, Greece) and Michaelmas Term (Pembrokeshire) had to be cancelled.

From the earliest stages of lockdown we were aware that we needed to replace in-person field teaching with a high quality substitute that would still allow the students to make observations, to think across scales, and to explore Earth Science processes in a variety of contexts. Our solution was to develop a series of virtual field classes built around relatively short, high-quality professionally-made films featuring faculty on location in the field. The films provided the field observations and context for more focused exercises and activities that the students could complete remotely if required. In some cases, we were able to run the virtual field classes in Oxford, allowing us to also include real specimens in the mix. Our motivation in developing the films in the short-term was to deliver virtual field classes but we were very aware that by making films and collecting drone footage, we had an opportunity to develop a major resource for the future. This resource is now being used to enhance our traditional teaching and provides us with materials that can be used to enable all students, including those with disabilities or physical impairments, to experience

Credit Ronnie Guthrie. Back in the field in 2022 in Cornwall.



Credit Laurence Robb. Here are a few photos which reflect what had to be done to provide remote versions of the field courses.....in this case filming methods at Arran.....one shot of the drone that was very effective at capturing both panoramic and close-up views, and Conall and Claire being filmed on the outcrop.

Credit Ronnie Guthrie. 2022 in Cornwall.

the learning outcomes offered by our field destinations. The films were generally very well-received and one student was overhead enthusiastically commenting that they were 'like watching a Netflix wildlife documentary'!

Since restrictions eased in 2021, we set about ensuring that we got our students back into the field as much as possible, using the virtual materials alongside real experiences where possible. During Trinity Term 2021, the 1st and 2nd years went on a range of day-trips from Oxford to see Mesozoic sediments, the Pre-Cambrian basement of the Malverns and the oldest animal fossils in the Ediacaran at Charnwood Forest. After the summer exams, the 1st years went to Arran, the 2nd years to SW England (North Somerset and North Cornwall) and the 3rd years to Cornwall. Some of these were old established trips, some were new that we had developed as hybrid trips with components of virtual teaching and in-person. For 1st years they got to experience the traditional introduction to geology that Arran provides, whilst the 2nd years were immersed in practising field skills needed for mapping. The 3rd years were provided with a synthesis trip that looked at many aspects of Cornish geology including the tectonic history of the region, the economic geology and the environmental geochemistry and pollution associated with mining.

Independent undergraduate fieldwork was not possible in 2021, so in September we took the 2nd years for mapping training and an independent mapping exercise on the Isle of Skye - a very wet experience that I'm sure will live long in their memories! Similarly, overseas trips were not feasible so Bermuda and Greece ran as virtual field classes again, albeit with more activities in and around the department including a demonstration of how oceanographic equipment is used but in the Thames rather than Bermuda!

From the beginning of October 2021, normal service has resumed with both Dorset and Pembrokeshire running as normal. Looking ahead to the rest of 2022, we are not able to run overseas trips just yet but are hopeful that overseas trips will begin at the end of the Summer. Our 2nd years will conduct independent mapping projects as normal in the summer, albeit most likely in the UK. Looking further ahead, we are in the midst of a course review that will see some changes to the field program, most notably a diversification of field activities to include more geophysics and environmental geochemistry alongside traditional geology. This program will build upon our history of field teaching and the new courses and materials that we have developed during the pandemic - in this respect, at least, the pandemic has provided some benefits.

Should you like to support our field teaching please contact Sarah Hilton (alumni@earth.ox.ac.uk) or see our website. Donations to the Field Teaching Fund go into our endowment and as such, they will have a lasting impact, training the next generation of Earth scientists.

Credit Claire Nichols. Independent mapping on the Isle of Skye in summer 2021.

FOR THE RECORD

RECENT AWARDS

Congratulations to Helen Johnson who has been promoted to Professor of Ocean and Climate Science by the University's Recognition of Distinction panel. Helen has been a member of Oxford Earth Sciences since 2007 and her current research uses fluid dynamics, simple and state-of-the-art numerical models and ocean observations to improve our understanding of ocean circulation and the role it plays in the climate system. She addresses a wide range of questions, with a focus on the Atlantic and Arctic Oceans. Helen continues to supervise postgraduate students as well as teach the Physical Climate System and Oceanography undergraduate courses and to co-lead our Oceanography 4th year undergraduate field trip to Bermuda.

Associate Professor of Palaeobiology, Erin Saupe, is one of 9 UK recipients of the 2022 Blavatnik Awards for Young Scientists, in recognition of her work using the fossil record to understand how species respond to environmental changes over both long and short timescales. The awards issued by the Blavatnik Family Foundation and the New York Academy of Sciences are the largest unrestricted prize available to UK scientists aged 42 or younger. They are fast becoming internationally recognised among the scientific community as instrumental in expanding the engagement and recognition of young scientists, and providing a strong foundation on which science can prosper.

A second congratulations to Erin who has also been awarded a 2021 Philip Leverhulme Prize in recognition of her outstanding research. The Leverhulme Trust awards £3 million to 30 outstanding researchers across the UK annually, each prize is worth £100,000 which can be used over two or three years to advance their research.

The Geochemical Society and the European Association of Geochemistry have announced that three Oxford Earth Scientists have been honoured with the title of Geochemistry Fellow in the 2022 cohort. Professor Chris Ballentine, Professor Tamsin Mather and Professor Gideon Henderson join 13 other geochemists receiving the fellowship this year. The award was established in 1996 to honour outstanding scientists who have, over some years, made a major contribution to the field. The awards will be presented at the society's Goldschmidt Conference this summer.

Anthony Watts was awarded the 2020 Maurice Ewing Medal at the virtual AGU Fall Meeting in December. The medal is for "significant original contributions to the ocean sciences." The Ewing Medal is a Union Medal of the American Geophysical Union that is sponsored by the US Navy and is one of its highest awards.

Congratulations to postgraduate students Roberta Wilkinson and Matthew Kemp who together make up Geologise Theatre (@ wearegeologise). They have been awarded a 2021 EGU Public Engagement Grant which are awarded each year to Union members interested in developing an outreach project to raise awareness of the geosciences outside the scientific community. Roberta and Matthew take a different approach to communicating, they write, produce and perform songs and musical theatre shows about geosciences as Geologise Theatre and this funded project will be tackling the issue of climate change in 'Geologise Theatre presents: A Climate Change Musical'.

Tamsin Mather and Tarje Nissen-Meyer have both been named within this year's cohort of Turing Fellows. The 400 fellows announced by the Alan Turing Institute are drawn from across its 13 partner universities and are established scholars with proven research excellence in data science, artificial intelligence, or a related field. They contribute to new ideas, drive collaborative projects that deliver impact, and help to grow the institute's research capacity and its diverse network of partner organisations.

OTHER AWARDS & PRIZES

Student Edward Clennett has been awarded both the second prize in the Halliburton Landmark Earth Model Award and the Geologists' Association UKOGL (UK Onshore Geophysical Library) Prize, a UK MSci competition.

Dr Kate Kiseeva, NERC Indendent Research Fellow was awarded the Max Hey Medal of the Mineralogical Society for 2020.

Tom Kettlety has been awarded the 2020 Keith Runcorn Prize of the Royal Astronomical Society.

Victor Vescue has won the prestigious award for Best Romanian Undergraduate Student in Europe of 2021.

Erin Saupe was awarded The Hodson Award from the Palaeontological Association and has also received an MPLS impact commendation in the Social Impact Award category.

Luke Parry has been awarded the Lyell Fund by the Geological Society.

Professor Tamsin Mather has been elected to the Academia Europaea.

Gwen Antell has been conferred the Winifred Goldring Award by the Association for Women Geoscientists and the Paleontological Society.

Exeter student Josh Fallows was announced winner of the 94th President's Putter following the annual meeting in January of the Oxford and Cambridge Golfing Society at Rye Golf Club in East Sussex.

Many Congratulations to all!

NEW KIDS ON THE ROCK

INTRODUCING THE NEW APPOINTMENTS IN OXFORD EARTH SCIENCES

Professor Bob Hilton
Tutorial fellow at St Peter's College

Bob joins us from Durham University, where he spent 12 years as a Lecturer, Reader and Professor in Geography. Prior to Durham, Bob held a postdoctoral research position at L'Institut de Physique du Globe, Paris and received a PhD and undergraduate degree in Earth Sciences from Cambridge University. He is a geochemist who thinks an awful lot about geomorphology and hydrology, using a wide range of elements and isotope ratios to track carbon cycle processes. So far, he has focused on how erosion and weathering result in drawdown and release of carbon dioxide, and the tectonic and climatic variables that may drive these carbon transfers. These themes will continue, and he's looking forward to building new collaborations in research and teaching in the department and wider University.

Dr Sarah Hilton
Outreach and Communications Officer

Sarah is the new Outreach and Communications Officer (also covering all things alumni). She is an Earth Scientist at heart with an MSci degree from Imperial College, a PhD from Cambridge and finally a Post Doc in Durham. After that she spent 8 years in the North East working in science outreach, knowledge exchange and business development with science. Sarah will be managing the website, social media accounts, outreach and engagement events as well as our alumni events and communications (including this edition of the magazine).

Dr Julie Cosmidis
Associate Professor of Geobiology

Julie obtained her PhD from the Institut de Physique du Globe de Paris. After working as a research associate at the University of Colorado in Boulder, she became an Assistant Professor at Penn State University in 2017. Her research focuses on microbe-mineral and organic-mineral interactions. She is particularly interested in deciphering the molecular mechanisms involved in microbial biomineralization, understanding its impact on past and present environments, and using it as a tracer of microbial activity in the geological record. She also works on developing industrial applications for biomaterials and microbial processes.

Dr Claire Nichols
Associate Professor of the Geology of Planetary Processes and Tutorial Fellow at St Edmund Hall

Claire joins us from the Massachusetts Institute of Technology in the United States and she completed her PhD with the NanoPaleo Magnetism Group in the Department of Earth Sciences, University of Cambridge. Claire's research interests focus on magnetic minerals, from their nanoscale properties, to what they can tell us about planetary surface processes, and the ancient magnetic fields they record on the Earth, the Moon and elsewhere in the solar system.

Jon Blundy, FRS
Royal Society Research Professor

Jon is an igneous petrologist. He studied for a Bachelor's degree in Geology at the University of Oxford and for a PhD at the University of Cambridge. Since 1989 Jon has been in the School of Earth Sciences at the University of Bristol, initially as a research fellow and since 2004 as Professor of Petrology. He has spent time as a visiting scientist at University of Oregon, Nagoya University, California Institute of Technology, and University of Western Australia. He was elected Fellow of the Royal Society in 2008. Jon is interested in all things magmatic, from magma generation in the crust and mantle to active volcanoes and hydrothermal mineralisation. His Royal Society Research Professorship explores further the link between magmatic processes and ore formation.

Dr Laura Stevens
Associate Professor of Climate and Earth Surface Processes

Laura joins Oxford Earth Sciences from the Lamont-Doherty Earth Observatory of Columbia University, where she was a Postdoctoral Fellow. Prior to that, Laura spent a decade in Massachusetts while earning a PhD in Geophysics from the MIT/WHOI Joint Program and a BA in Geosciences from Wellesley College. Their research is focused on determining the physical processes driving ice and water flow in, around, and beneath Earth's ice sheets and glaciers, using a combination of field observations, computational modelling, and inverse methods.

Matthew Beverley-Smith
Sample Preparation Lab Manager

Matt has come to us from Southampton University, where he prepared thin sections and other geological samples for four years, after completing an apprenticeship. He is very excited to be working here and seeing what kind of project materials he will be lucky enough to work with.

David Beer
Workshop Technician

David spent eleven years working for Honda engineering Europe in Swindon as a CNC machinist, in the manufacture of automotive press tooling. He is a qualified patternmaker by trade and has wood working, plastics and manual machining experience.

James King
Workshop Manager

James joined the department as a Workshop Apprentice in 2015, on a 3 year course under the training of Jamie Long. After completing his apprenticeship, he worked as a technician for four years, gaining experience particularly in CAD/CAD machining. He was employed as the new Workshop Manager in 2021.

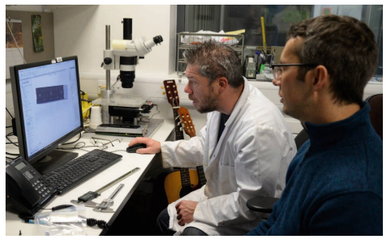
Louisa Bailey
Head of Administration and Finance

Louisa comes to us from the University of Cambridge, her last role there being the Department Administrator in the Department of Politics and International Studies, where she was responsible for the operations of the Department covering both research and teaching.

OBITUARY: JAMIE LONG 1971–2021

The department announces with great sadness the passing of Jamie Long in September after a long illness. Jamie ran the department workshop facilities with huge energy and enthusiasm and he will be greatly missed by all in the department.

Jamie's love of engineering began in secondary school where he had a natural talent and interest in metal work and excelled at mechanical engineering. His meticulous attention to detail and desire to do things properly and to the best of his ability served him well in his future career. His working life started as an apprentice engineer at JD Krouse, but later he joined the University of Oxford as the workshop manager. As an outstanding engineer and machinist, Jamie would always find a solution to solving a technical problem or an improvement on designs brought to him. Seeing a project through from design to completion and working collaboratively with faculty gave Jamie much satisfaction and Instrumentation that he has made over many years is used both here and by leading laboratories around the world. Jamie always provided great support to his colleagues both as an engineer and as a friend.



Jamie also had interests in cycling, using his skills in engineering to improve a range of vehicles and also playing bass with his band – Dead Section. He enjoyed playing a range of instruments at all of the local festivals and music venues and his band will be sorely missed at our Christmas parties. His charity fundraising gave him the opportunity to pursue his great joys such as cycling whilst giving back to the community.

Jamie is husband to Su and step father to Tia and Zac and our thoughts are with his family and friends.

TAKING EARTH SCIENCES OUT AND ABOUT: OUTREACH AND ENGAGEMENT

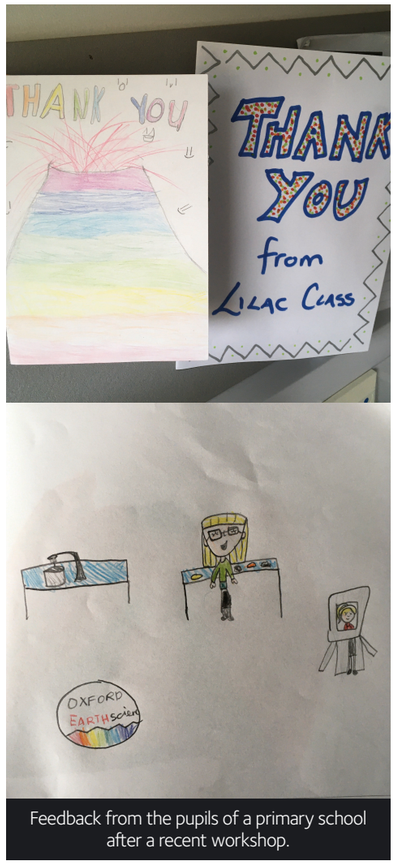
The Covid-19 pandemic has restricted our capacity for outreach and engagement over the past two years but we are pleased to say that we are getting back out and about as a department. You can help support our efforts with either your time or by donation please contact Sarah Hilton if you are interested in discussing more about how you can help inspire a new generation of Earth Scientists.

IN SCHOOL WORKSHOPS

A year 4 pupil from Botley Primary School learning about the unpredictability of volcanoes using party poppers to experiment.

We have been visiting local primary schools, to give workshops on rocks, fossils and volcanoes, largely to year 3 and 4 who cover rocks in their science curriculum. Our faculty and D.Phil students also visit secondary schools to give talks about Earth Sciences as a subject. Feedback from one school about Jon Wade's talks said 'the students were captivated by the talk and by Jon's delivery, so much so that many of them stayed behind to speak to him and ask more questions. Some of these were

Owen Green visited a secondary to work with their science club.



Feedback from the pupils of a primary school after a recent workshop.

students that are not entirely engaged in school life but they were fascinated by what Jon had to offer..

COMMUNITY ENGAGEMENT

The Barton coLAB group have been building a team of Young Producers to design, create and co-ordinate an immersive community event exploring the impact of a volcanic winter on Barton. Mike Cassidy and Alice Paine went to the Barton Community Centre where they provided some scientific context of volcanic winters.

Barton coLAB Young Producers

BARTON coLAB

CHRISTMAS LECTURES

The popular Christmas lectures have re-started at the Oxford museum of Natural History, Professor David Pyle did a lecture this Christmas which we followed up with a number of table top activities associated with volcanoes in the museum. These activities were supported by undergraduate and D. Phil students and post-doctoral researchers.

OXFORD SPARKS

Oxford Sparks from the University of Oxford connects you with researchers and takes you on the journey of discovery to hear about the latest, cutting-edge science to spark your curiosity! Many of our Earth Scientists have short

James Bryson ready for filming his short research video with Oxford Sparks.

videos and podcasts that explains their research. Learn more at OxfordSparks.ox.ac.uk.

OXFORD SPARKS

SCHOOLS VISITING THE DEPARTMENT

We also have many schools visiting the department via our many colleges. The students get a taster session on the Earth Sciences and a peek into our world leading laboratories.

EDI NEWS

ATHENA SWAN BRONZE AWARD

Athena Swan Bronze Award

We are pleased to announce that we have once again received the Bronze Athena Swan award (now held since 2016) in recognition of our commitment to advancing women's careers in Earth Sciences in higher education and research.

The Equality Challenge Unit's Athena SWAN Charter acknowledges the efforts of organisations to ensure a positive environment for women working in science; that they are represented at all levels, their contribution, skills and experience are recognised, and that they are retained and promoted appropriately.

The Athena Swan application process involves a critical self-assessment, highlighting both positive and negative issues. The negative issues have been addressed in an action plan that you can read on the EDI pages of our website and with the support of all members of the department we will strive to make further improvements going forwards.

LGBTQ+ AFFINITY GROUP

We have staff and students who identify as LGBTQ+ and this has led to a departmental network group – The affinity group which provides an opportunity for LGBTQIA+ members of the department to find community and solidarity in a relaxed space. The group have organised relaxed coffee and ice cream catch ups, attend events together and now run a monthly book club. In addition, they organise talks and events for the department as a whole including a talk about being LGBTQ+ in the geoscience industry and a talk about making fieldwork more inclusive.

The group would love to build up generational knowledge, connections, and networking opportunities between the current LGBTQ+ members of the department and our alumni who also identify as LGBTQ+. If you are interested please email lgbtq.affinity@earth.ox.ac.uk to request to be added to their mailing list.

Oxford Earth Sciences
LGBTQIA+ Affinity Group
lgbtq.affinity@earth.ox.ac.uk

ALUMNI NEWS & EVENTS

OUR ALUMNI ATTENDING EVENTS

OUGS Geosciences Careers Fair March 2022

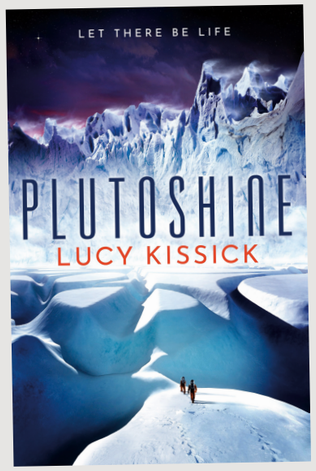
Alumni representing a number of different companies and industries were on hand to talk to students and postdocs about careers outside of academia. This year we were delighted to welcome representatives from Fugro, the world's leading Geo-data specialist, RES - Renewable Energy Systems, Verisk - Insurance Solutions, Gavin & Doherty Geosolutions -specialist geotechnical engineering, RMS - Risk Management Solutions, Güralp - World leading seismic monitoring instrumentation, HR Wallingford - solving complex water-related challenges, McKenzie Intelligence Services Ltd -informed decision making, the Met office - Weather and Climate Change and Schlumberger New Energy - CCS. Shell also delivered a popular CV clinic throughout the day. A number of talks in the seminar rooms were given by our alumni, who have gone on to work in these companies from their own Earth Science degrees with titles such as 'Geospatial Intelligence in the Insurance Industry' and 'Soil, Rocks and Rainbows' it was a great and varied afternoon.

Oxford and Cambridge Earth Sciences Panel Discussion March 2022

After many forced Covid-19 related delays and despite a full London tube strike causing disruption on the day, we were finally able to join forces with our Cambridge colleagues and alumni to co-host a London Panel Discussion held at the Geological Society's Burlington House. The Panel discussed 'uncovering the habitability of other planetary bodies' and we hope to make the recording available at a later date.

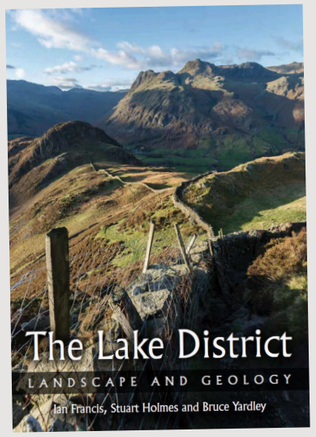
Our Alumni Publishing books:

Two of our alumni have published books this year.



Dr Lucy Kissick, a recently graduated DPhil student has published her first novel, Plutoshine. Lucy say's that the department itself was a sort of blueprint for what the base on Pluto might be like as a self-contained community of colleagues and friends. Lucy wrote Plutoshine while completing her doctorate, where she recreated Martian lakes in the laboratory to understand the planet's atmosphere. She now works as a scientist in the nuclear industry between the mountains and the sea of the English Lake District, and can usually be found in either.

Dr Ian Francis, Oxford Earth Science graduate (1977) and DPhil student (1982) published a book on Lake District geology, published by The Crowood Press. With over 230 illustrations including maps and superb photographs with unique aerial views and panoramas, it includes: easy-to-understand explanations of how the rocks formed; how the geology affects the landscape and an exploration of the long human story of Lakeland landscapes. There are guided excursions to seven easily accessible geological locations and a dedicated website, with a Google Earth photographic guide to all the main localities mentioned in the book. See bit.ly/34JLibK



Our Alumni Winning awards:

The Geological Society London have announced their 2022 awardees, which includes a number of Oxford alumni among the junior awards; as well as Mike Bickle (DPhil, 1973).

Daniel Collins (Lyell Fund), (MEarthSci 2012)

Anna Bidgood (President's award) (MEarthSci 2015, DPhil 2020)

James Preston (President's award) (MEarthSci 2015)

Fred Richards (William Smith Fund) (MEarthSci 2014)

Our Alumni Breaking barriers:

Israa Abu-Mahfouz, an alumnus of the Earth Sciences Dep & St. Peters College from Jordan did a DPhil in Petroleum/Structural Geology with Professor Joe Cartwright in the period between 2014-2018. After finishing her research in Oxford, Israa was employed as a Postdoctoral Fellow at King Abdullah University of Science and Technology (KAUST) and after two years she was promoted to a Research Scientist. In Dec 2021, she was appointed as the first female faculty member in the College of Petroleum Engineering & Geosciences (CPG), King Fahd University of Petroleum & Minerals (KFUPM), Saudi Arabia. Since there was no female undergraduate geology program in Saudi Arabia, her appointment at KFUPM makes her the first female faculty teaching both undergraduate and postgraduate students in the whole kingdom of Saudi Arabia.

Israa says 'I am very happy that I am contributing to this change in the kingdom of Saudi Arabia which comes in line with the ambitious vision of the country 2030.'

If you have any news you would like to be shared via our social media channels, newsletters or magazine we would love to hear from you. Just email alumni@earth.ox.ac.uk

DATES FOR YOUR DIARY

Alumni Dinner Autumn 2022

The 2022 dinner will be held in the autumn this year. The dinner will be preceded by activities in or around the current Department of Earth Sciences and an informal drinks reception. More details about the event and how to register will be circulated shortly.

As always, we welcome Earth Sciences graduates from any and all years, but if you are planning to mark a specific year anniversary of matriculation and would like help organising a year group reunion to attend, please get in touch with the Alumni Relations Officer (Sarah Hilton) at alumni@earth.ox.ac.uk.

Department Alumni Field Trip to the Pyrenees September 2022

Prof Bruce Levell and Dr Arie Speksnijder are leading a Geotraverse of the Pyrenees from Barcelona to Toulouse in September 4-11 2022. This trip marks the 50th year since matriculation of Bruce's year group (1972-1975). It is the follow-up to a successful trip of the same year group to the spectacular Early Cretaceous carbonate platforms of the Vercors and Jurassic Tethyan rift basins of the Western Alps (Alp d'Huez) in September 2017, (The 45th anniversary). To date 27 people, including partners are signed-up for the trip, which also includes several alumni from the class of 1973. Maybe this is a tradition that other year groups might like to emulate?

Geosciences Careers Fair Michaelmas Term 2022

Whether your company is recruiting, you're looking for a new job yourself, or you would like to talk to our students about your career, our annual OUGS Careers Fair offers an afternoon of various industry insights, followed by Happy Hour.

To make sure you receive updates and notifications about these and other events, please make sure we have your email address and permission to email you! Drop Sarah a line on alumni@earth.ox.ac.uk.

Oxbridge Alumni Field Trip to Oman January 2023

Profs. Mike Searle and Bruce Levell are leading a geological field excursion to Oman for alumni in 2023. The trip from 14-26 January 2023 will loosely take the form of a North to South geotraverse through Northern Oman featuring the obducted oceanic crust including the MOHO itself, the exhumed subduction complex, thrust slices of Tethyan oceanic sediments and the underlying autocthonous carbonate platform of the Arabian plate. In age the rocks range from the Snowball Earth glaciations of the Neoproterozoic to Miocene reef limestones. The rocks are superbly exposed and abundantly fossiliferous, the mountainous scenery spectacular, and the Omani people simply enchanting. This is the second time the excursion has been run. The first trip being in January 2020 when it was enjoyed by participants whose level of geological knowledge ranged from zero to professional.

https://www.indusexperiences.co.uk/tours/a-geology-field-trip-to-oman/

Searlefest - a celebration of the work of Professor Mike Searle 1st July 2022

A day conference, in the Oxford University Natural History Museum to mark the geological lifetimes and retirement of Professor Mike Searle. Mike has been in the department since 1990, first as a long-term Post-doc (18 years), then as a Lecturer. He has worked extensively in mountain belts all over the World, but predominantly in Oman and along the Himalaya, Karakoram and Tibet, but also notably in Burma (Myanmar), SE Asia, the Aegean-Cyclades Islands, NW Scotland and Cornwall. He has supervised over 20 DPhil students and numerous 4th year Masters student projects in Oxford.

The day's conference will be followed by a drinks reception in the department RCR, and an optional dinner in Worcester College at £57.60. If you would like to attend, booking is essesntial, please contact Sarah at alumni@earth.ox.ac.uk.

A SUBJECT AS OLD AS TIME, EARTH SCIENCES ENDURES...

...AND EVOLVES...

LEGACY GIFTS HELP ENSURE OUR DEPARTMENT DOES BOTH

Find out more here: https://www.mpls.ox.ac.uk/our-team/development-office/legacies-to-mpls

To learn more about the impact a gift in your will could have, or to find out how to remember the Department's work in your bequest, please contact:

The Alumni Relations Officer ▪ Department of Earth Sciences ▪ South Parks Road ▪ Oxford ▪ OX1 3AN
Email: alumni@earth.ox.ac.uk ▪ Call: +44 (01865) 272031