Geological Society of Africa

Newsletter

Cape Point
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the issue

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Editor of the GSAf Newsletter

In the issue

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GSAf MATTERS

27th Colloquium of African Geology (CAG27) and 17th Conference of the Geological Society of Africa (GSAf17)

From 21 to 28 of July, 2018, more than 250 scientists from Africa and all over the world attended the27th Colloquium of African Geology (CAG27) and 17th Conference of the Geological Society of Africa (GSAf17) which were held at the University of Aveiro, Aveiro, Portugal.

This event was sponsored by the Universidade de Aveiro and the GeoBioTec Research Centre, under the auspices of the Geological Society of Africa. The event was an opportunity to continue the scientific exchanges between researchers from all over the world in the field of Geosciences, and to demonstrate the high scientific research standards that are being carried out over the world. The participants in the conference had the opportunity to share their expertise in a range of scientific fields, such as geology, geological resources, environmental risks, environment and human health, sustainable development, education, and tourism in Africa.

A group photo of the participation during the CAG27

The CAG27 has received considerable international attention from around the world. More than 250 researchers from 38 countries (Algeria, Australia. Austria, Belgium, Brazil, Cameroon, Czech Republic, Dem. Republic. Congo, Dem. Republic of Korea, Egypt, Ethiopia, France, Gambia, Germany, Ghana, Italy, Kenya, Madagascar, Mali, Morocco, Mozambique, Namibia, Nigeria, Malawi, Norway, Portugal, Republic of Korea, Rwanda, Senegal, South Africa, Sudan. Tanzania, Togo, Tunisia, Uganda, United Kingdom, Zambia, and Zimbabwe) joined the conference, highlighting the importance of this event.

The conference has been organized into 5 days sessions that included a wide range of topics, such as: S01 – Crustal Evolution of Africa value; S02 – Igneous and Metamorphic Petrology; S03 – Tectonics and structural geology; S04 – Stratigraphy, Sedimentology & Paleontology; S05 – Isotope Geology; S06 – Earth's mineral resources and sustainable development; S07 – Weathering, Climate and Surface Processes; S08 – Geophysics; S09 – Ocean Sciences; S10 – Geoparks, Geotourism and Geoethics for Promoting Earth Heritage in Africa; S11 – Geohazards, Natural and human-

induced environmental hazards and disasters; S12 – Geosciences Education in Africa; S13 – Integrated approaches in Geology (Medical Geology, Geophysics and Geochemistry).

The Scientific Committee compiled an interesting program of oral and poster presentations. The CAG27 local committee together with the Scientific Committee have compiled the accepted abstracts in the "*Book of Abstracts*" which was edited by Eduardo Ferreira da Silva, Carla A. Figueiredo Patinha, Nuno Durães, Carla Candeias; and published by UA Editora, Universidade de Aveiro, with ISBN 978-972-789-557-1.

The conference included 5 relevant Plenary Lectures (S. Felix Toteo, Luis Filipe de Menezes Pinheiro, Rui Manuel Soares Dias, Lahcen Daoudi e K'tso Nghargbu), 5 Keynotes (João Mata, Rui Castanhinha, Fernando Tavares Rocha, José Feliciando da Silva Rodrigues e João F.B.D. Fonseca), 2 workshops, as well as 165 oral presentations, organized in 3 parallel sessions and also 83 poster communications. To complement the conference's academic program, the Local Committee has also organized two post-conference technical field trip to visit the (a) Thermal/SPA Complex of S. Pedro do Sul and regional geology and (b) the Lourinhã Formation, the paleobiodiversity of Portuguese Upper Jurassic dinosaurs.

In additional to the scientific program, the CAG27 hosted two days' workshop under the title of "Kick-off workshop for the AU-AMREC working group". The workshop was facilitated by the African Union Commission.

The Geological Society of Africa General Assembly was held on the Thursday of 25 July, 2018 as a part of the activities during the CAG27 and the GSAf17.

The Geological Society of Africa acknowledges the Scientific Committee for their reviewing of the conference papers, and the Local Committee for their hard work in the organization which made another great event.

GSAf MATTERS: Homage of Prof. Serrano Pinto

From Africa, he started his career and he kept Africa all the time in his heart - "Prof. Serrano Pinto"

Prof. Serrano Pinto was born in Portugal, on 5 March 1936 and passed away suddenly after returning from his participation in CAG21 in Johannesburg on 15 January 2011. Prof. Serrano Pinto was the Goodwill Ambassador of the Geological Society of Africa to Portugal. During the opening ceremony of the CAG27, both the Geological Society of Africa and the local organizing committee paid a tribute to Prof. Serrano Pinto for his role in both the Geological Society of Africa and the University of Aveiro.

Prof. Serrano Pinto to the right with colleagues from Mozambique during one of the Colloquiums of African Geology.

Prof. Serrano Pinto studied his first geology classes at the University of Coimbra and the University of Oporto. Later during his military service, he left to Mozambique where he received an invitation to integrate the Geology and Mines Services. At the time, Mozambique was developing an ambitious cartographic and prospecting programme that required highly qualified professionals. Then, he went to Leicester, UK, to focus on his Master degree in Geochemistry. He published during this period many works that mark a turning point towards systematic mineral prospecting based on sediments of Mozambique. After a brief stay in Angola (1974) he pursued his activities at the recently created University of Aveiro (1973). After a meeting on Plate Tectonics that was held at the University in 1976, he started his PhD degree on the geochemistry and geochronology at Leeds University. After concluding his PhD program, he and other colleagues lead to the creation of Isotopic Geology Laboratory at the University of Aveiro.

In 1996, he was one of the founders of the Group of History of Science and Technology at the University of Aveiro, later established as Centre for the Studies of History and Philosophy of Science and Technology of the University of Aveiro. Prof. Serrano Pinto was in charge of the Centre Secretary Board serving as its Secretary and persistently stayed leading it. From 1997 until 2000 the Centre published a Newsletter with articles on the history of science by many of the active Portuguese historians of science, always with an article signed by Prof. Serrano Pinto (the Secretary Board).

He co-organized around 12 conferences on the Geochemistry domain and 4 international on the History of Science. He published around 12 books or book chapters; 6 geological maps of Mozambique and Portugal; 8 papers in journals from the SCI or as selected papers, more than 80 peer-reviewed as well as several proceedings in international meetings.

GSAf MATTERS: Sincere condolences

Prof. Driss Fadli from Mohamed V University (Rabat, Morocco) Passed away on Monday, 25th of August, 2018. He was a famous militant geologist. His activities was focused last years on how to highlight the geologic, cultural and touristic assets of Jbel Bani Geopark (https://www.facebook.com/BaniGeopark/). On behalf of the GSAf staff as well as of his Moroccan and African friends and colleagues, we present here our sincere condolences to Prof. Fadli family. The Geology is mourning in Morocco. Rest in peace our dear Driss.

Prof. Driss Fadli

GSAf MATTERS: New Newsletter editor

Since 2011, Prof. Lopo Vasconcelos acts as GSAf's newsletter editor and information officer for the society. During his service, Prof. Vasconcelos produced 118 issue of the newsletter. In 2018, Prof. Vasconcelos decided to retire from the editor position. The GSAf thanks Prof. Vasconcelos for his time that was given to serve the society.

The GSAf council nominated Dr. Tamer Abu-Alam (the Councillor for Northern Africa) to replace Prof Lopo Vasconcelos as the new GSAf's newsletter editor and information officer. The GSAf General Assembly unanimously agreed to the nomination.

GSAf acknowledges Prof. Lopo Vasconcelos for his service to the society. From left to right:

Prof. Gbenga Okunlola (President of GSAf), Prof. Lopo Vasconcelos and Prof. Aberra Mogessie (Past president of GSAf).

GSAf MATTERS: New Councillor for Northern Africa

By nominating and electing Dr. Tamer Abu-Alam as the new GSAf's newsletter editor and information officer, the position of Northern Africa councillor fell vacant. The GSAf council had received 5 applications for the position (3 from Morocco, 1 from Algeria and 1 from Egypt). Only the Egyptian candidate was present and she presented to the Assembly her perceived contribution if she is elected. The General Assembly elected Dr. Kholoud Abdelmaksoud as the new councillor for Northern Africa. The council thanks our colleagues from Morocco and Algeria who showed interest to serve the society and wish all the success to Dr. Kholoud Abdelmaksoud as the new councillor for Northern Africa.

GSAf MATTERS: A New frame of the GSAf's Newsletter

After a discussion of the Geological Society of Africa's council, the council decided to publish the newsletter regularly four times per year (March, June, September, and December). The society will communicate with its members weekly throughout automatic emails that contain important information. As a result, the council is working now to clean up the member database and design a new website. The council encourages the members to contribute to the newsletter and the weekly news emails.

GSAf MATTERS: CAG28

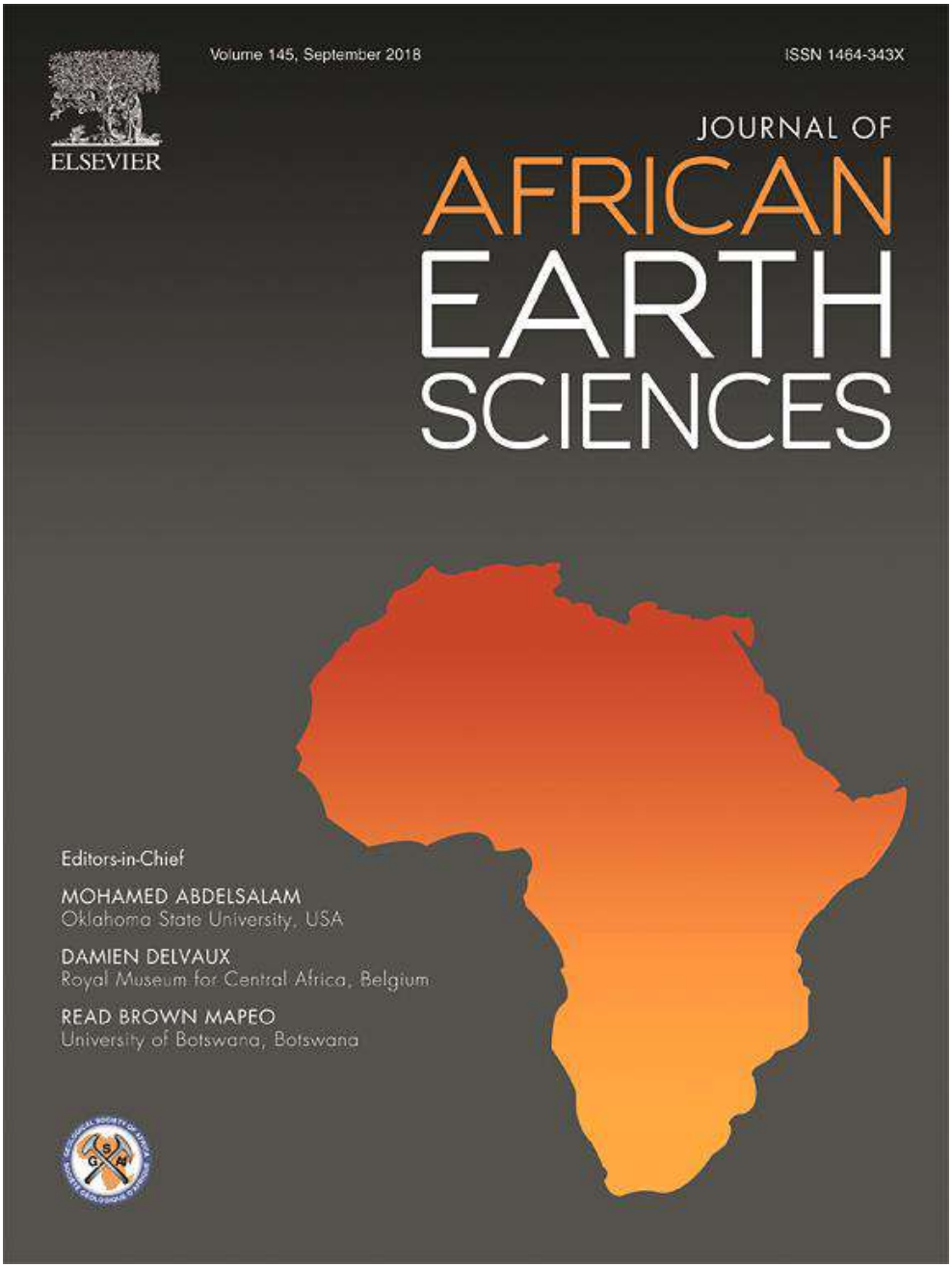
Two Bids for CAG28 were received by the GSAf council, one from Egypt and one from Morocco. However, the council had received no communication from Egypt after the submission of the bid and there was no one at CAG27 to present the Egyptian Bid. After the bid presentation by Prof. Youssef Driouch, The GSAf General Assembly voted to accept the Moroccan bid. The GSAf council congratulate Morocco's team who prepared the bid and wish them all the success during the next stages.

GSAf MATTERS: The Journal of African Earth Sciences

The Journal of African Earth Sciences has recently updated the journal cover and scope. The *Journal of African Earth Sciences* sees itself as the prime geological journal for all aspects of the Earth Sciences about the African plate. Papers dealing with peripheral areas are welcome if they demonstrate a tight link with Africa.

The Journal publishes high quality, peer-reviewed scientific papers. It is devoted primarily to research papers but short communications relating to new developments of broad interest, reviews and book reviews will also be considered. Papers

must have international appeal and should present work of more regional than local significance and dealing with well identified and justified scientific questions. Specialised technical papers, analytical or exploration reports must be avoided. Papers on applied geology should preferably be linked to such core disciplines and must be addressed to a more general geoscientific audience.



GSAf MATTERS: GSAf Fellowship Award

The GSAf is pleased to announce that Prof. Felix Toteu, Prof. Aberra Mogessie and Prof. Lopo Vasconcelos received GSAf Fellowship Award for their contributions to the growth and activities of the GSAf. Since their contributions to the society cannot be covered in an issue, their contributions to Africa and Earth sciences will be in the focus of the next issues of the newsletter.

GSAf Fellowship Award. From left to right: Prof. Lopo Vasconcelos, Prof. Aberra Mogessie, Prof. Gbenga Okunlola (President of GSAf) and Prof. Felix Toteu.

KNOW AFRICA (COVER STORY)

Cape Point, South Africa

It may not be the southernmost point of Africa – that honour goes to Cape Agulhas – but Cape Point certainly makes you feel as if you are standing at the edge of the world. At the tip of the Cape Peninsula 60 km south-west of Cape Town, lies Cape Point, a nature reserve within the Table Mountain National Park, a declared Natural world Heritage Site. Encompassing 7 750 hectares of rich and varied flora and fauna; abounding with buck, baboons and Cape mountain zebra as well as over 250 species of birds, Cape Point is a Nature enthusiast's paradise.

Named the 'Cape of Storms' by Bartolomeu Dias in 1488; the 'Point' was treated with respect by sailors for centuries. By day, it was a navigational landmark and by night, and in fog, it was a menace beset by violent storms and dangerous rocks that over the centuries littered shipwrecks around the coastline.

In 1859 the first lighthouse was completed; it still stands at 238 metres above sea-level on the highest section of the peak and is now used as the centralised monitoring point for all the lighthouses on the coast of South Africa. Access to this historical building is by an exhilarating three-minute ride in the wheelchair-accessible Flying Dutchman funicular that transfers visitors from the lower station at 127 metres above sea-level, to the upper station.

Modified from: http://www.capetown.travel/visitors/see-do/top-attractions/cape-point/ and http://capepoint.co.za

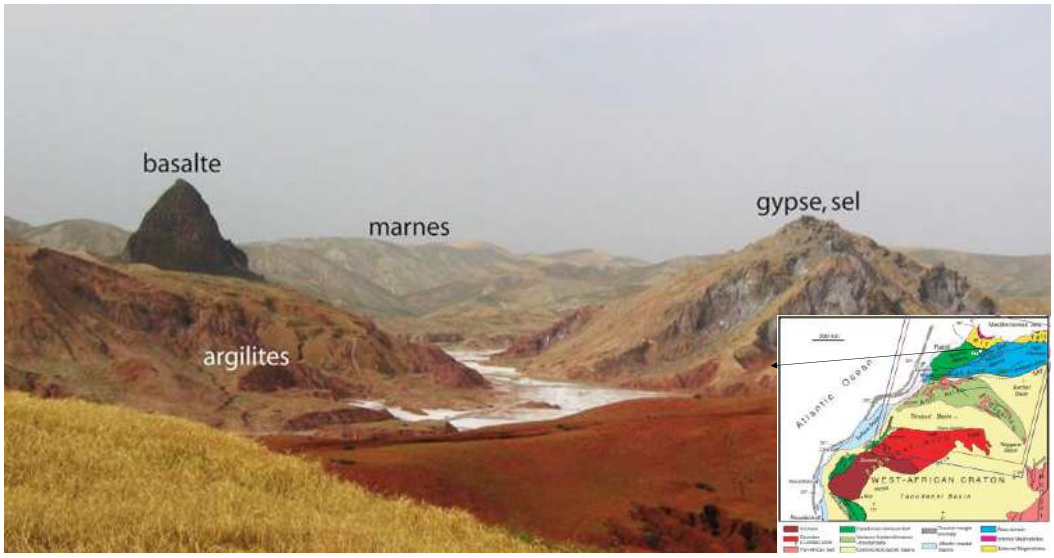
WELCOME TO FEZ, MOROCCO (CAG28)

In 2020, we have a great chance to visit and meet at the "geologist's paradise".

By Prof. Youssef Driouch

The next Colloquium of African Geology (CAG 28) will be held at Fez University (Morocco).

Morocco situated at the NW corner of African continent is close to Europe and Middle East. Morocco is called "Geologist's Paradise" (Géologues. SGF, n° 194. September 2017) because of: 1) the diversity of very well outcropping terranes spanning from Archean to Quaternary; 2) the location at a triple junction between Africa, Atlantic Ocean and the Alpine belt system; 3) the particular topography, Toubkal is the highest non-volcanic summit in Africa; 4) All rocks types are represented. Sedimentary, magmatic and metamorphic terranes in diverse tectonic systems from sedimentary basins to metamorphic fold belts; 5) Fossils, minerals and meteorites are famous, exposed in natural museums in many countries, they attract a large number of curious and specialists; and 6) natural resources are various and important. The main of them are: phosphates of late Cretaceous and early Cenozoic formations, Morocco has the largest resources and is the largest producer of phosphates and derivatives; Rare metals and REE Au, Ag, Co in Proterozoic Ore deposits (Anti-Atlas) with the famous world class Imiter and Bou Azzer mines, Au, Pb, Zn, Barite et Fluospar in Paleozoic terranes. Oil and gas on and off shore explorations are currently very active with many positive indicators.

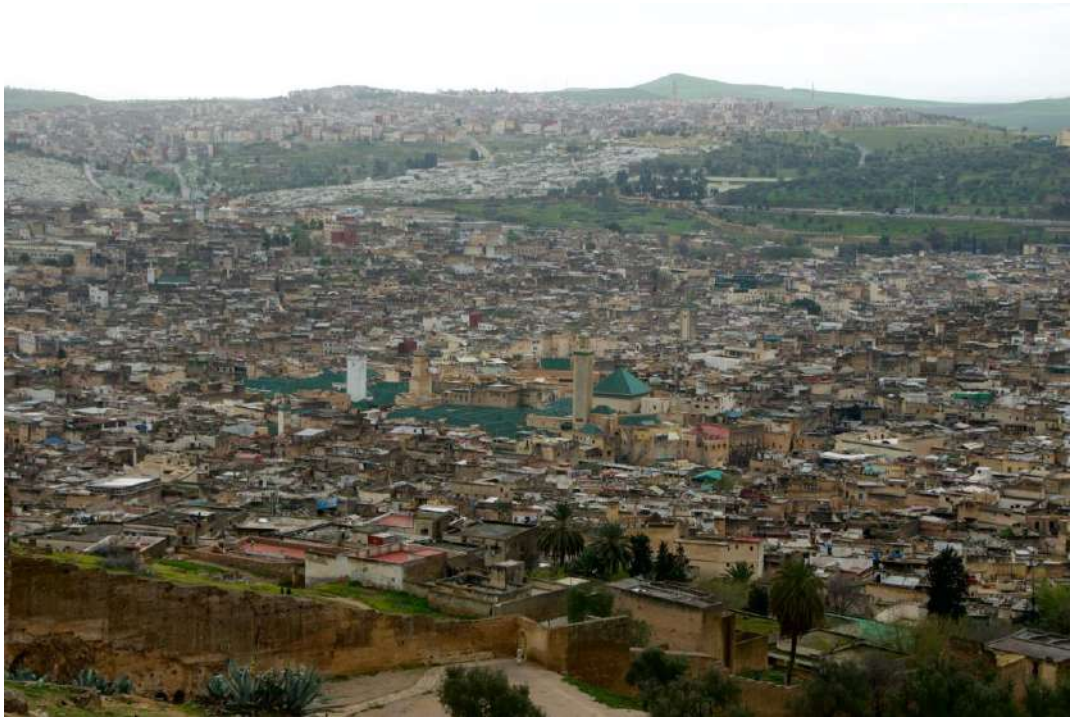


Upper Triassic diapir in the Oued Mellah valley (Northern Fez at the contact of Saiss basin and Rif Belt): red beds, basalt neck (CAMP) and salt diapir. The leached salt turns the oued Mellah white ("mellah"= salted, in Arabic). In the background, Cretaceous and Miocene marls (in. Michard et al. 2011. New Geological and Mining Guidebooks of Morocco. Notes et mémoires du service géologique du Maroc. N° 560)

Situated in central northern Morocco. Fez is the cultural and spiritual capital of Morocco. Fez hosts three universities: Al Quaraouiyine University founded in the 9th century and considered the oldest university in the world according to UNESCO and Guinness World Records. USMBA University was founded in 1975. It comprises many faculties: Medicine, Pharmacy, Law and Economics, Arts and Humanities, engineering schools and 2 faculties of sciences and their geology departments. The third University is the private Euro-Mediterranean University enclosing business, architecture, political and engineering high schools.

A strong Moroccan team is doing its best to provide a very rich and fruitful CAG28 session for all African and worldwide geologists, with friendly, professional and scientific exchanges as the main goals. More information will be available on GSAf communication platforms.

Warmest Greetings and Welcome to Fez



Labelled as “The Athens of Africa”, “The Queen of the Maghreb” or “The Baghdad of the Maghreb”, Fez is also described as “The most perfectly preserved and working Mediaeval city in the world” (Photo: José Brilha, 2018).

OPPINION

Climate Change Is Coming for Underwater Archaeological Sites

By Jessica Leigh Hester (31 July 2018)

On a choppy voyage to Antarctica in 1928, the crew of the ship that would eventually be rechristened as the Vamar bestowed upon their vessel an optimistic nickname: “Evermore Rolling.” It proved to be a bit of a misnomer. Far from slicing through cresting waves forever, the ship sank near Florida in 1942, 3.7 miles from the shore of Mexico Beach, possibly because it was loaded down with too much lumber.

It was wrecked, true, but its story didn’t end there. In 2004, the shipwreck was designated as one of Florida’s Underwater Archaeological Preserves; it was added to the National Register of Historic Places two years later. Now, the sepia, green, and gold waters around it are full of life. Fish dart through the ruins of the mangled iron broiler, and plants shoot up through the piecemeal hull and beams. Sea turtles scratch their shells against iron bars splayed out just above the sandy seabed, leaving burnt-orange rust behind them. Divers drop by to take it all in.

Wrecks stand to see a number of threats in a changing ocean. Here, NOAA diver John Brooks a ship off the coast of Hawaii.

Shipwrecks aren’t necessarily barren, static things, vanished and abandoned to the deep water and the recesses of someone’s foggy memory. They may be moldering, but, like the Vamar, they’re often active places—

part cultural heritage site, part dynamic ecosystem. They're constantly in flux, and they'll be impacted as climate change affects the water that holds them.

For years, archaeologists have mainly been concerned with what climate change might do to places where the land meets the water. They've examined ways to stave off rising tides by buffering sites that will be swamped, hauling things to higher ground, or documenting whatever they can in the water's path. For these sites that are not yet damp, water is a threat—sometimes a distant one, sometimes one that's gaining ground—but for the wrecks, it's a foregone conclusion. That ship has sailed—and sunk.

With climate change, "sea-level rise is the most obvious thing people are used to hearing about, and the most easily dismissed with submerged sites," says Jeneva Wright, an underwater archaeologist and research fellow at East Carolina University. Sea-level rise is far from the only climate-related threat facing submerged sites, though: Wright outlined a handful of others in a 2016 paper in the Journal of Maritime Archaeology, written when she was working as an archaeologist in the National Parks Services' Submerged Resources Center.

Across the field, there's admittedly little data about some of these risks, and Wright says that archaeologists would do well to collaborate with biologists, ecologists, oceanographers, and other scientists who have amassed much more information about what a changing climate will do to parts of these ecosystems. For now, Wright describes her reading of these risks as "theoretical, hypothetical, and logical," meaning that though there's fairly limited research within archaeology, these forecasts square with projections that researchers in other fields have arrived at, after starting to scrutinize the future effects of climate change on, for instance, ocean chemistry, reefs, and other marine life.

Storm surges and violent weather pose an immediate threat: Hurricanes tracking right over shipwrecks can splinter them into oblivion, or at least strip protective coverings and expose timbers, coral-covered cannonballs, and other features to battering currents and wind. This already happens. As a graduate student in 2014, Wright conducted research in Biscayne National Park, at the HMS Fowey. To cushion the wreck against a storm surge or hurricane event, the Parks Service had partially reburied it with sandbags and sediment. Then a storm swept through the following year. When it hit, "all of that sediment was dispersed and taken away," Wright says. "It was sort of a failure of the reburial effort, but was sort of a success, because if that sand hadn't been there, it would have been just this 18th-century British warship that had dispersed all over the place."

Some wrecks lay flush against the sand.

Other changes will be less physically brutal, and maybe less obvious to landlubbers, compared with pelting rain and wild winds. Wrecks are already deluged, of course, but rising sea levels could affect them, too, because depth changes—even relatively small ones—can trigger changes that cascade through the environment. Underwater, a change in depth can correlate to a change in temperature, and that in turn may change the species that can survive there. Take seagrass. In many wrecks around Florida, for instance, seagrass functions as an anchor, holding sediment in place and blanketing fragile timbers. Some of these species vanish below about 30 feet; anything deeper is too cold, too dark, and too devoid of oxygen. A sea-level rise of just a few meters could theoretically swamp these wrecks with enough water to threaten the survival of the species that lock them in place, Wright says. (In Florida, the National Parks Service manages parks around the estimate that waters will rise three feet by 2100.).

As the ocean absorbs more carbon dioxide, it is also becoming hotter and more acidic. The Smithsonian has referred to ocean acidification as "climate change's equally evil twin," and it could pose big problems for wrecks. Associated chemical changes will likely erode the cement-like coating that covers many historic wrecks. This protective layer, called concretion, appears most often on iron wrecks; it's a product of rust interacting with seawater and attracting organisms. "You've got this crusty stuff that's covering everything, and it can protect it for centuries," Wright says. But "because it's a calcium carbonate—just like Tums that you would eat if you had an upset stomach—it's really, really sensitive to acid." When the acid content increases, "all of that protective coating that's over these cultural materials can vanish—like, literally vanish," Wright says. Research in this vein tends to focus on the similar threats faced by calcifying marine life such as corals, clams, oysters, and sea urchins. When researchers extrapolate that to shipwrecks, Wright says, "You go, 'Ooh, that's bad.'"

Many wrecks are coated in concretions, which look like cement and can help hold everything together.

Chemical changes can also be quite dangerous in light of what might still be stashed inside a ship's hull. Sunken World War II naval vessels might still hold a smattering of "big, bad things," Wright adds, from armaments to biohazards such as vast quantities of oil. Most of these ships are made of rusting metals. "The more temperature you add, and the more acidic that environment is, the faster those shipwrecks can deteriorate," Wright says. "And suddenly you're looking at the loss of cultural heritage, but you're also looking at the release of whatever those wrecks are holding." In many cases, it's not realistic to extract the potential pollutants from these sites, or to raise them from the sea. They may be war graves, holding soldiers' remains, or else submerged in very deep water.'

One way to get a handle on all of these dangers is to track them. That can be tricky, because archaeologists and rangers don't always stop by to regularly check in on watery wrecks as easily as they do terrestrial sites, says Sara Ayers-Rigsby, director of the southwest and southeast branches of the Florida Public Archaeology Network (FPAN), a project based out of the division of archaeology and anthropology at the University of West Florida and Florida Atlantic University.

Divers study the SS City Washington in the Florida Keys National Marine Sanctuary.

"These sights are very much out of sight, out of mind for everyone who doesn't dive," says Della Scott-Ireton, the associate director of the FPAN program. But in Florida, a lot of people do dive. Tourists often come to Florida to explore the 12 underwater archaeological preserves scattered all around the state's perimeter, or the nine wrecks that dot the reefs and sandy floor of the Florida Keys National Marine Sanctuary, managed by the National Oceanic & Atmospheric Administration. NOAA has devised a "Shipwreck Trail," which divers are welcome to visit, and the Department of State has documented the sunken bows, sterns, and other portions of the wrecks that comprise what it calls "Museums in the Sea." Scott-Ireton describes places like these as "low-hanging fruit": Since divers will already be there, FPAN stands to benefit from persuading them to jot down some observations while they swim around.

Tapping into the citizen science brain trust is logical, because tourist divers already have their goggled eyes on the seabed. FPAN runs trainings in archaeological stewardship for sport divers, and earlier this summer, began adapting its Heritage Monitoring Scouts program—a self-guided citizen science effort—to include observations of underwater sites. Participants will descend with a waterproof mylar form for recording their observations, and look around for evidence of climate impacts (say, sediment buildup or disappearance), as well as other changes, like traces of looting or vandalism. So far, FPAN has received ten forms, Ayers-Rigsby says, including some that document sites that the archaeologists didn't yet have on file. Eventually, Scott-Ireton hopes to be able to loan out salinity meters so that divers can take measurements and report back, but that will depend on future funding.

In the past, there have been occasional skirmishes between archaeologists, who want to preserve the past, and some divers, who want to plunder it. Wright says it certainly doesn't have to be that way. "As a diver and

someone who gets excited about shipwrecks, you can direct that enthusiasm in two ways," she says. One option is pilfering a porthole for your mantlepiece, as a souvenir. The alternative, she says, is marveling at things where they landed, and thinking, "I experienced this amazing dive, and I want to protect it, and I want to be a part of telling its story."

This story originally appeared on https://www.wired.com/story/climate-change-is-coming-for-underwater-archaeological-sites/ and Atlas Obscura; and is part of the Climate Desk collaboration.

A GEOLOGICAL FEATURE

Grand-Canyon, USA

To encourage young researchers and students to be actively contributing to the newsletter, the best description of the Grand-Canyon geology will be published next newsletter with a photo of the author. The author should be an African student or young researcher. Deadline for receiving the descriptions is 1 December 2018. (tamerabualam@yahoo.com).

AN AFRICAN SCIENTIST

African Scientists can do great if they have the right working environment. In this series, we will put the spotlight on who found the right environment either in Africa or outside Africa.

Dr. Farouk El-Baz is Director of the Center for Remote Sensing and Research Professor at the Departments of Archaeology and Electrical & Computer Engineering, and Associated Faculty at the Department of Earth and Environment, Boston University, Boston, MA, U.S.A. He also serves as an advisor to two student organizations: "1001 Wells for Darfur," and "Egyptian Club."

He was born on 2 January 1938 in the Nile Delta town of Zagazig, Egypt. Twenty years later, he received a B.S. in chemistry and geology from Ain Shams University. In 1961, he received a M.S. degree in geology from the Missouri School of Mines and Metallurgy, Rolla, MO; his performance won him membership i Sigma Xi and Sigma Gamma Epsilon. In 1964 he received a Ph.D. in geology from the University of Missouri-Columbia after conducting research in 1962-1963 at the Massachusetts Institute of Technology (MIT), Cambridge MA.

El-Baz points to the River Nile and Egypt.

In recognition of his professional standing, he received the following honorary degrees: Doctor of Science from the New England College, Henniker, NH (1989); Professional Degree from the University of Missouri-Rolla (2002); Doctor of Philosophy from Mansoura University, Mansoura, Egypt (2003); Doctor of Laws from the American University in Cairo (AUC), Egypt (2004); Doctor of Engineering from the University of Missouri-Rolla – now the Missouri University of Science and Technology, MUST (2004); Doctor of Humane Letters from the American University of Beirut (AUB), Lebanon (2009).

Dr. El-Baz was elected to membership of the following academies of science and technology: The World Academy of Sciences (TWAS); African Academy of Sciences (AAS); Arab Academy of Sciences (AAS); Islamic World Academy of Sciences (IAS); Missouri Academy of Sciences; Palestine Academy for Science and Technology; Royal Moroccan Academy Hassan II of Science and Technology, Rabat; and the U.S. National Academy of Engineering (NAE).

With ASTP crew from left to right Tom Stafford, Vance Brand, El-Baz and Deke Slayton

His professional career began by teaching geology at Asyut University, Egypt (1958-1960) and Heidelberg University, Germany (1964-1965). In 1966, he joined the Pan American – U.A.R. Oil Company, where he participated in the discovering the first offshore oil field in the Gulf of Suez.

From 1967 to 1972, Dr. El-Baz participated in the Apollo Program as Supervisor of Lunar Science Planning at Bellcomm Inc., a division of AT&T that conducted systems analysis for NASA Headquarters in Washington DC. During these six years, he was Secretary of the Landing Site Selection Committee for the Apollo missions, Principal Investigator of Visual Observations and Photography, and Chairman of the Astronaut Training Group of the Apollo Photo Team. His outstanding teaching abilities were confirmed by the Apollo astronauts; while circling the Moon for the first time during Apollo mission 15, Command Module Pilot Alfred Worden said, "After the King's [Farouk's nickname] training, I feel like I've been here before."

During the Apollo years, Dr. El-Baz joined NASA officials to brief members of the press. His appeal resulted from an ability to simplify complex issues in clear, succinct and easily understood words. His remarks on the scientific accomplishments were regularly quoted by the media

during the Apollo missions. He became a naturalized U.S. citizen in April 1970.

With Apollo Program Director Dr. Rocco Petrone (to the right).

In Episode 10 ("Galileo Was Right") of the TV series "From the Earth to the Moon," produced by Tom Hanks for HBO, his role in the training of the Apollo astronauts was featured in a segment entitled: "The Brain of Farouk El-Baz." In his honor, the popular television program "Star Trek: The Next Generation" featured a shuttle craft named "El-Baz".

After the Apollo Program ended in 1972, he joined the Smithsonian Institution in Washington DC to establish and direct the Center for Earth and Planetary Studies (CEPS) at the National Air and Space Museum (NASM). At the same time, he was elected member of the Lunar Nomenclature Task Group of the International Astronomical Union (IAU). In this capacity, he continues to participate in naming features of the Moon as revealed by lunar missions.

In 1973, NASA selected him as Principal Investigator of the Earth Observations and Photography Experiment on the Apollo-Soyuz Test Project (ASTP), the first joint American-Soviet space mission of July 1975. Emphasis was placed on photographing arid environments, particularly the Great Sahara of North Africa and the Arabian Peninsula, in addition to other features of the Earth and its oceans.

Emphasizing the study of the origin and evolution of arid landscapes, he collected field data during visits to every major desert on Earth. One of his significant journeys took place, soon after the United States and China had normalized relations in 1979, when he coordinated the first visit by American scientists to the deserts of northwestern China. The six-week journey was chronicled in National Geographic and the Explorers Journal. His research on the origin and evolution of the desert resulted in his election as a Fellow of the American Association for the Advancement of Science (AAAS), and President of the Arab Society for Desert Research.

Prior to embarking on extensive field trips to harsh deserts, Dr. El-Baz analyzed space photographs utilizing innovative techniques to select sites for detailed ground investigation. He first used this approach in the Western Desert of Egypt and soon applied the method to study deserts in Kuwait, Qatar, United Arab Emirates, Sultanate of Oman, the deserts of China, and the Rajasthan of India.

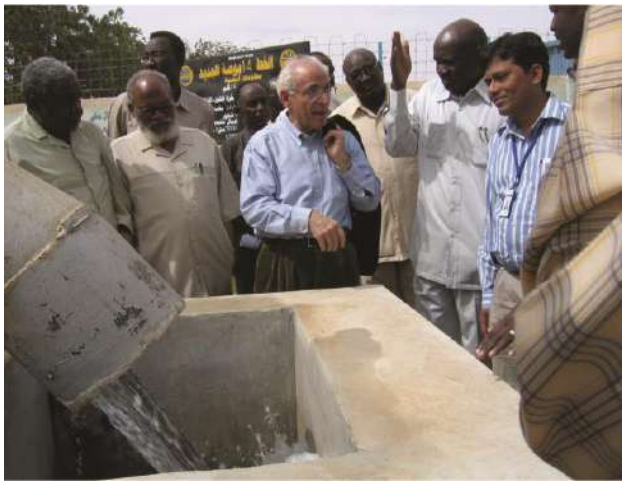
Dr. El-Baz served his native land as Science Advisor to the late Egyptian President Anwar Sadat from 1978 to 1981. Because of population growth and the attendant food and fiber requirements, President Sadat believed that Egyptians should not continue to be confined within the Nile Valley and must reclaim more land from the desert.

El-Baz (to the right) with President Anwar Sadat of Egypt (to the lift)

He was assigned the task of selecting desert tracts to develop, without detriment to their environment. He traveled to Egypt's far corners and described each region's natural resources and how they could be appropriately used. The many projects that began during those four years continue to help the people of Egypt today. In 1995, the Governor of the Province of Dakahliya, in the eastern part of the Nile Delta, gave him the "Distinguished Son of Dakahliya Award" and inaugurated the "Farouk El-Baz Primary School" in his ancestral village of Toukh El-Aqlam in the eastern Nile Delta.

His desert research, spanning over four decades, helped to dispel the public misconception that deserts were man-made and explained how arid lands originated and evolved in response to global climatic variations over thousands of years. His research methods are now commonly replicated in desert studies throughout the world.

From 1982 to 1986, Dr. El-Baz was Vice President of Science and Technology at Itek Optical Systems, Lexington, MA. He oversaw the application of data from the Space Shuttle's Large Format Camera. The photography of this advanced system assisted greatly in his program of desert study from space.



With local water experts in Darfur.

He was elected Fellow of The World Academy of Sciences (TWAS) in 1985, and became a member of its Council in 1997. He represents the Academy at the Non-Governmental Unit of the Economic and Social Council (ECOSOC) of the United Nations (UN), New York.

In 1986 he joined Boston University as Research Professor and Director of the Center for Remote Sensing to promote the use of space technology in the fields of archaeology, geography and geology. Under his leadership, the Center has grown to become a leading force in the applications of remote sensing technology to environments around the world. In 1997, NASA selected it as a "Center of Excellence in Remote Sensing."

The Gulf War of 1991 presented an opportunity for Dr. El-Baz to disseminate knowledge of the desert terrain with emphasis on the effects of environmental disturbances. As chairman of the committee on Environmental Hazards and Global Change of the TWAS, he led a team of scientists on a fact-finding mission to six Gulf States. His findings were reported in the media throughout the world including on the Evening News of the British Broadcasting Corporation (BBC) and interviews on CBS News and CNN. Print media interviews with Dr. El-Baz appeared in the New York Times, Washington Post, Boston Globe, and news magazines.

Research at the Center has particularly pushed forward the frontiers of applying remote sensing in archaeology. For example, Dr. El-Baz developed a methodology for non-destructive investigation of a sealed chamber containing a disassembled boat at the base of the Great Pyramid in Giza, Egypt. He reported the results of this unique investigation in National Geographic and American Scientist, as well as many prints, radio and television interviews. He also contributed an article on worldwide applications of remote sensing to archaeology in the "1991 Yearbook of Science and the Future" of the Encyclopaedia Britannica, and another to the August 1997 issue of Scientific American. In 2007, he co-edited with colleague James Wisman a book on "Remote Sensing in Archaeology."

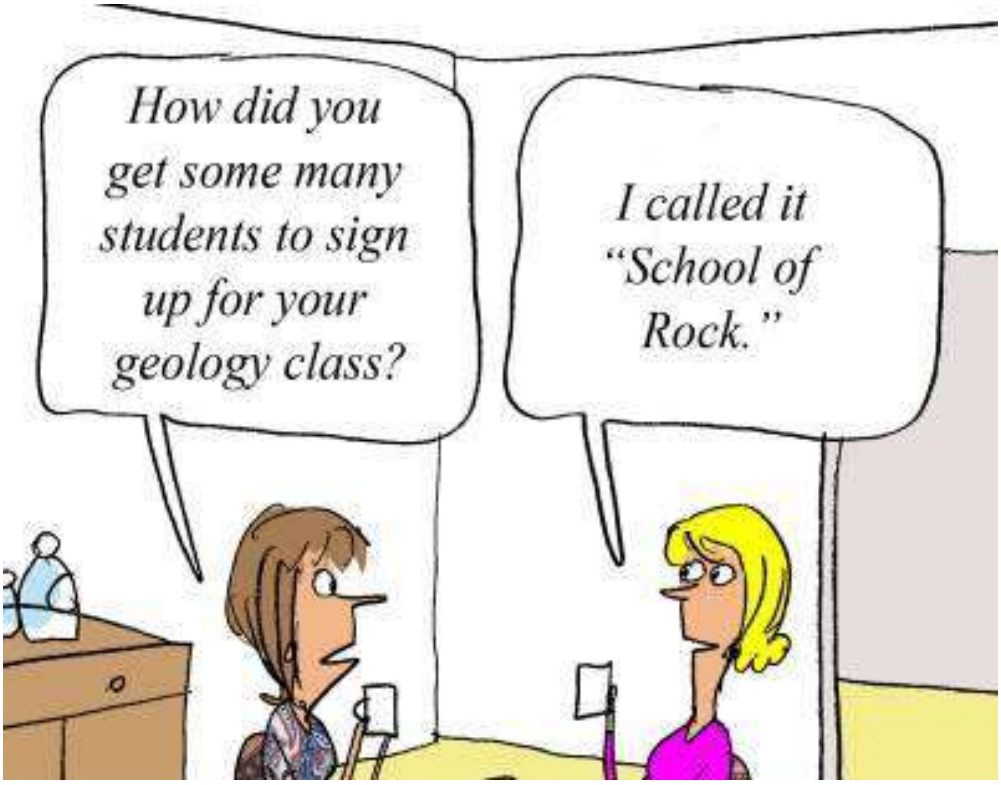
With US President Bill Clinton

In 1999, the Geological Society of America (GSA) established the "Farouk El-Baz Award for Desert Research," an annual award aimed at rewarding excellence in arid land studies by experts worldwide. It was followed by the "Farouk El-Baz Student Award" to be presented annually to one male and one female graduate student to encourage desert research throughout the world.

Dr. El-Baz has won numerous honors and awards, including NASA's Apollo Achievement Award, Exceptional Scientific Achievement Medal, and Special Recognition Award, the University of Missouri Achievement Award for Extraordinary Scientific Accomplishments.

A great story of another African scientist who found the right working environment in Africa is waiting for us next issue. One of our main aims at the GSAf, is to help to create this right environment – the ANESI program is one of these programs.

GEOLOGY COMIC



From: https://www.cartoonstock.com/

AFRICAN GEOPARK AND GEOHERITAGE

The Lakes of Ounianga – Chad

With an area of 628 km^2, The Lakes of Ounianga are found in the heart of the Sahara Desert, in an area of northern Chad that receives no more than 2mm of rain annually. They depend on an underground supply of 'fossil' water that fell on the area in ancient times when the Saharan climate was much wetter than it is today. The lakes are situated in a shallow basin below sandstone cliffs and hills, from where the ancient water flows. Remarkably, this unique hydrological system is able to sustain the largest permanent freshwater lakes to be found in such an arid desert environment anywhere in the world.

There are 18 lakes altogether, in two groups about 40 km apart. They vary greatly in chemical composition, some being so salty that they can only support the most basic

forms of life, while others are fresh enough to provide habitat for aquatic plants, fish and a diversity of other species. The largest and most biologically important lake (Lake Teli, in the eastern group known as Ounianga Serir) has a surface area of 4.4km^2 and a maximum depth of 10 m. Its water is fresh, and supports an abundance of life. The sandy substrate is highly porous, so water flows freely underground between Lake Teli and 13 other smaller lakes in the eastern group. Further west, across the dunes and sandstone ridges that characterise this part of the Sahara, the second group of four lakes (known as Ounianga Kebir) is found, dominated by Lake Yoan (3.6 km^2 and 27 m deep). This is a hyper saline lake which supports only algae and a few other micro-organisms. Rocks around its shores are encrusted in white salt deposits, and a sprawling village of some 9,000 people is spread amongst the nearby hills and dunes. There is a customs post, as this is the last habitable place on the main trans-Sahara truck route through to Libya (a little over 200 km further north).

Photo by George Steinmetz

By all accounts, the area is outstandingly beautiful, its golden dunes and natural sandstone hills, cliffs and wind-eroded 'sculptures', set against its palm-fringed lakes. A trickle of intrepid tourists (about 500 annually) finds its way to this remote corner of Chad.

Photo by Jacques Taberlet

Modified from: https://www.pandotrip.com/lakes-of-ounianga-oasis-in-the-arid-sahara-desert-chad-19006/ and https://www.africanworldheritagesites.org/natural-places/deserts/lakes-of-ounianga-chad.html

NEWS

About Africa

Rediscovering the sources of Egyptian metals

ScienceDaily, (7 August 2018)

First comprehensive analytical datasets of copper-based museum artifacts shed new light on provenance and production of Egyptian metal objects.

Two new studies, published in the Journal of Archaeological Science, offer the first comprehensive analytical datasets of Protodynastic to Old Kingdom Egyptian copper-based artifacts (c. 3rd millennium BC), analyzing the provenance of Egyptian copper. As elaborated in a methodological comment, the studies constitute an important step forward in current knowledge on copper provenance and the subsequent economic, social and cultural insights into ancient Egypt.

Advancements in scientific analyses have allowed archaeologists to reconstruct the prehistoric trade of metals around the Mediterranean in remarkable detail. However, there was a notable gap in Egypt, one of the most important ancient civilizations, due to the difficulties in accessing Egyptian metal artifacts for analysis. Two teams of researchers have overcome this challenge by using collections of Egyptian objects held in Europe, providing the first glimpse of how Egyptians sourced their metals, encouraging further research in the field.

The first study by Frederik W. Rademakers, Georges Verly, Luc Delvaux and Patrick Degryse, based on artifacts from the Royal Museums of Art and History (RMAH) in Brussels, suggests predominant reliance on relatively local ore, from the Eastern Desert and the Sinai Peninsula. The study carried out lead isotope and chemical analyses on a total of 40 metal samples and seven ore samples dating from the Predynastic, Protodynastic and Old Kingdom Periods. The results suggest significant developments in smelting technology that may have been adapted to different ore types.

"These findings are based on a very particular segment of the ancient Egyptian metal economy (namely funerary consumption) and thus only reveal the tip of the iceberg," said Frederik W. Rademakers, PhD, Earth and Environmental Sciences, KU Leuven in Belgium. "The underlying organization of early supply networks, clearly reliant on a variety of mining and production zones, and the development of copper production technology are only slowly revealed through ongoing research."

Archaeometallurgist Georges Verly, Royal Museums of Art and History in Brussels, added, "We integrated field excavation with technology and provenance studies of these museum artifacts. We aim to understand how these objects were made and used within their particular ancient contexts, with arsenical copper alloys being a specific point of interest for these earliest periods."

The second study from four Czech institutions, led by PhD candidates Jirí Kmošek (University of Pardubice) and Martin Odler (Charles University, Prague), investigates Egyptian copper-based artifacts from the Egyptian Museum of Leipzig University in Germany, found at the sites of Abusir, Abydos and Giza. The 22 artifacts show similar production technology, but diverse origins of the metal, including an Early Dynastic Egyptian object from Abusir, high nickel metal in which is consistent with ores and artifacts from Early Bronze Age Anatolia, in present-day Turkey.

"Lead isotopes showed us where the ore was most probably coming from," said archaeometallurgist Jirí Kmošek. "The results were quite unexpected," added Egyptologist Martin Odler. The study confirms that special metals had circulated around the Ancient Near East earlier than previously thought.

Finally, in a methodological comment responding to the two studies, Prof. Erez Ben-Yosef, PhD, based at the J. M. Alkow Department of Archaeology and Ancient Near Eastern Cultures, Tel Aviv University, Israel, indicates that despite the similar context of the artifacts, all from funerary sites, these new studies exemplify the great potential of analytical data to shed new light on various topics related to ancient Egyptian society, and encourage future research. The commentary highlights the importance of maintaining curated, shared, and constantly updated databases to the progress of provenance research.

"These studies constitute important steps forward in our understanding of early Egyptian metallurgy and raw materials procurement strategies. These and future studies can benefit from a modular presentation of interpretational insights that takes into account differences in the insights' robustness and susceptibility to change as more data become available," Prof. Ben-Yosef concluded.

Journal References:

Erez Ben-Yosef. Provenancing Egyptian metals: A methodological comment. *Journal of Archaeological Science*, 2018; 96: 208 DOI: 10.1016/j.jas.2018.06.001

Jiří Kmošek, Martin Odler, Marek Fikrle, Yulia V. Kochergina. Invisible connections. Early Dynastic and Old Kingdom Egyptian metalwork in the Egyptian Museum of Leipzig University. *Journal of Archaeological Science*, 2018; 96: 191 DOI: 10.1016/j.jas.2018.04.004

This story originally appeared on www.sciencedaily.com/releases/2018/08/180807095100.htm (Rediscovering the sources of Egyptian metals: First comprehensive analytical datasets of copper-based museum artifacts shed new light on provenance and production of Egyptian metal objects."

News: About the World

Earth Could Face 'Hothouse' Climate With Uninhabitable Parts, New Study Warns

By Jessica Miley (7 August 2018)

A new international study has found that the world could face a "hothouse" climate where efforts to reduce emissions will have no impact if the Earth's global average temperature increases by a further 1 degree Celsius.

Researchers from around the world contributed to a study titled "Trajectories of the Earth System in the Anthropocene", which has been published in the international journal Proceedings of the National Academy of Sciences of the United States of America (PNAS).

The research found that Earth is heading for a crisis point known as a "hothouse" climate. If this tipping point is reached, average temperatures may climb 5˚C higher than pre-industrial temperatures which in turn could cause rises in sea level of up to 60 meters. If this happens much of the world would be uninhabitable for humans.

Domino effect is possible says lead author

Lead researcher Professor Will Steffen from the Australian National University (ANU) explained that Earth system processes known as feedbacks could be triggered if human emissions raise global temperatures to 2˚C above pre-industrial temperatures.

"The real concern is these tipping elements can act like a row of dominoes," Professor Steffen said.

"Once one is pushed over, it pushes Earth towards another. Global average temperatures are currently just over 1˚C above pre-industrial temperatures and rising at 0.17˚C each decade," added Professor Steffan.

"Even if the Paris Accord [Agreement] target of a 1.5˚C to 2˚C rise in temperature is met, we cannot exclude the risk that a cascade of feedbacks could push the Earth system irreversibly onto a 'hothouse Earth' pathway," the study says. "As yet [these initiatives] are not enough to meet the Paris target."

Paris agreement may have no effect

Professor Steffen goes on to say that although it's not just humans responsible for the rise, they are playing the largest part and need to work collaboratively to 'greatly accelerate the transition towards an emission-free world economy'.

"The impacts of a hothouse earth pathway on human societies would likely be massive, sometimes abrupt, and undoubtedly disruptive."

He insists that a radical collaborative action is needed to stabilize the Earth in an interglacial-like state. The study looked at 10 feedback processes, some of which can cause "the uncontrollable release" of carbon back into the atmosphere, after it had been stored in the earth.

These processes can include permafrost thaw, Amazon rainforest dieback, a reduction of northern hemisphere snow cover, a loss of Arctic summer sea ice, and a reduction of Antarctic sea ice and polar ice sheets. The exact timeframe for these events to happen isn't detailed in the report, but the authors hypothesized that it could happen in less than two centuries.

"The impacts of a hothouse earth pathway on human societies would likely be massive, sometimes abrupt, and undoubtedly disruptive," the study states.

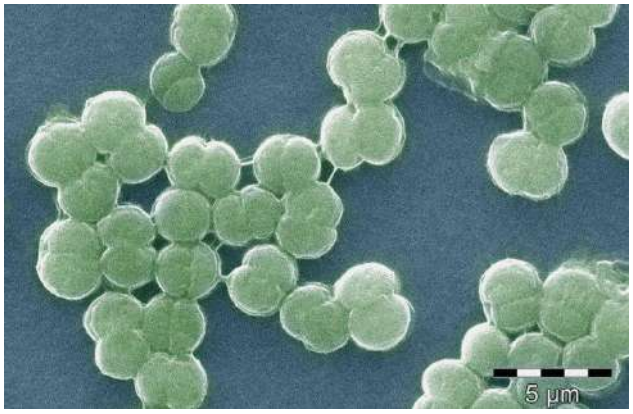
This story originally appeared on https://interestingengineering.com/earth-could-face-hothouse-climate-with-uninhabitable-parts-new-study-warns?_source=newsletter&_campaign=RlqJYJga7yYen&_uid=5xe7G8Ge7r&_h=a2202f6fd275d0f4142fb1aa5b0666961f0e687b&utm_source=newsletter&utm_medium=mailing&utm_campaign=Newsletter-07-08-2018

News: About the World

Iron-silica particles unlock part of the mystery of Earth's oxygenation

By Katie Willis (University of Alberta)

The oxygenation of Earth's atmosphere was thanks, in part, to iron and silica particles in ancient seawater, according to a new study by geomicrobiologists at the University of Alberta. But these results solve only part of this ancient mystery.



Iron-silica particles helped shield cyanobacteria like these, which played a key role in the oxygenation of Earth's atmosphere according to new research from U. Alberta.

Early organisms called cyanobacteria produced oxygen through oxygenic photosynthesis, resulting in the oxygenation of Earth's atmosphere. But cyanobacteria needed protection from the sun's UV radiation in order to evolve. That's where iron and silica particles in ancient seawater come in, according to Aleksandra Mloszewska, a former PhD student who conducted this research under the supervision of Kurt Konhauser, professor in the Department of Earth and Atmospheric Sciences, and George Owttrim, professor in the Department of Biological Sciences.

The research team characterized the effect of UV stress on cyanobacteria and the degree of radiation through the seawater medium through a combination of microbiological, spectroscopic, geochemical and modelling techniques. Their results show that the presence of high silica and iron concentrations in early sea water allowed for the formation of iron-silica precipitates that remained suspended in the ocean for extended periods of time.

"In effect, the iron-silica particles acted as an ancient 'sunscreen' for the cyanobacteria, protecting them from the lethal effects of direct UV exposure," said Konhauser, the senior author from U. Alberta. "This was critical on the early Earth before a sufficiently thick ozone layer was established that could enable marine plankton to spread across the globe, as is the case today."

More missing pieces

But, the researchers explain, the iron-silica rich precipitates tell only part of the story.

"The accumulation of atmospheric oxygen from cyanobacterial facilitated the evolution of oxygen-based respiration and multicellular organisms," says Owttrim. But the reason for the large amount of time that it took for free oxygen to accumulate permanently in the atmosphere after the initial evolution of cyanobacteria remains a mystery.

While iron-silica precipitates would have allowed early cyanobacteria to survive, UV radiation would still have prevented their widespread growth.

"It is likely that early cyanobacteria would not have been as productive as they are today because of the effects of UV stress. Until the accumulation of sufficient cyanobacteria-derived oxygen allowed a more permanent means of protection to develop, such as an ozone layer, UV stress may have played an even more important role in shaping the structure of the earliest ecosystems," explained Mloszewska.

These new findings are helping researchers to understand not only how early cyanobacteria were affected by the high level of radiation on the early Earth but also the environmental dynamics that affected the oxygenation history of our atmosphere.

"These findings could also be used as a case study to help us understand the potential for the emergence of life on other planets that are affected by elevated UV radiation levels, for example Earth-sized rocky planets within the habitable zones of nearby M-dwarf star systems like

TRAPPIST-1, Proxima Centauri, LHS 1140 and Ross 128 among others," said Mloszewska.

The research was conducted in collaboration with colleagues at the University of Tuebingen and Yale University and was supported by the National Science and Research Council of Canada, and by the NASA Alternative Earths Astrobiology Institute. The paper, "UV radiation limited the expansion of cyanobacteria in early marine photic environments" is published in *Nature Communications*.

Journal References:

Aleksandra M. Mloszewska, Devon B. Cole, Noah J. Planavsky, Andreas Kappler, Denise S. Whitford, George W. Owttrim, Kurt. O Konhauser. UV radiation limited the expansion of cyanobacteria in early marine photic environments. Nature Communications, 2018; 9 (1) DOI: 10.1038/s41467-018-05520-x

This story appeared on https://www.sciencedaily.com/releases/2018/08/180807103659.htm

News: About the World

Size matters: If you are a bubble of volcanic gas

Source University of Cambridge

The chemical composition of gases emitted from volcanoes -- which are used to monitor changes in volcanic activity -- can change depending on the size of gas bubbles rising to the surface, and relate to the way in which they erupt. The results, published in the journal *Nature Geoscience*, could be used to improve the forecasting of threats posed by certain volcanoes.

A team of scientists, including a volcanologist and mathematician from the University of Cambridge, discovered the phenomenon through detailed observations of gas emissions from Kīlauea volcano in Hawaii.

At many volcanoes around the world, gas emissions are monitored routinely to help with forecasting eruptions. Changes in the output or proportions of different gases -- such as carbon dioxide and sulphur dioxide -- can herald shifts in the activity of a volcano. Volcanologists have considered that these chemical changes reflect the rise and fall of magma in the Earth's crust but the new research reveals that the composition of volcanic gases depends also on the size of the gas bubbles rising up to the surface.

Until the latest spectacular eruption opened up fissures on the flank of the volcano, Kīlauea held a vast lava lake in its summit crater. The behaviour of this lava lake alternated between phases of fiery 'spattering' powered by large gas bubbles bursting through the magma, and more gentle gas release, accompanied by slow and steady motion of the lava.

In the past, volcanic gases have been sampled directly from steaming vents and openings called fumaroles. But this is not possible for the emissions from a lava lake, 200 metres across, and at the bottom of a steep-sided crater. Instead, the team used an infrared spectrometer, which is employed for routine volcano monitoring by co-authors of the study, Jeff Sutton and Tamar Elias from the Hawaiian Volcano Observatory (US Geological Survey).

Kīlauea eruption, 2018

The device was located on the edge of the crater, pointed at the lava lake, and recorded gas compositions in the atmosphere every few seconds. The emissions of carbon-

and sulphur-bearing gases were measured during both the vigorous and mild phases of activity.

Each individual measurement was used to compute the temperature of the volcanic gas. What immediately struck the scientists was that the gas temperatures ranged from 1150 degrees Celsius -- the temperature of the lava -- down to around 900 degrees Celsius. "At this temperature, the lava would freeze," said lead author Dr Clive Oppenheimer, from Cambridge's Department of Geography. "At first, we couldn't understand how the gases could emerge much colder than the molten lava sloshing in the lake."

The clue to this puzzle came from the variation in calculated gas temperatures -- they were high when the lava lake was placid, and low when it was bubbling furiously. "We realised it could be because of the size of the gas bubbles," said co-author Professor Andy Woods, Director of Cambridge's BP Institute. "Larger bubbles rise faster through the magma and expand rapidly as the pressure reduces, just like bubbles rising in a glass of fizzy drink; the gas cools down because of the expansion." Larger bubbles form when smaller bubbles bump into each other and merge.

Woods and Oppenheimer developed a mathematical model to account for the process, which showed a very good fit with the observations.

But there was yet another surprising finding from the gas observations from Hawaii. As well as being cooler, the emissions from the large gas bubbles were more oxidised than expected -- they had higher proportions of carbon dioxide to carbon monoxide.

The chemical balance of volcanic gases such as carbon dioxide and carbon monoxide (or sulphur dioxide and hydrogen sulphide) is generally thought to be controlled by the chemistry of the surrounding liquid magma but what the new findings showed is that when bubbles get large enough, most of the gas inside follows its own chemical pathway as the gas cools.

The ratio of carbon dioxide to carbon monoxide when the lava lake was in its most energetic state was six times higher than during the most stable phase. The scientists suggest this effect should be taken into account when gas measurements are being used to forecast major changes in volcanic activity.

"Gas measurements are critical to our monitoring and hazard assessment; refining our understanding of how magma behaves beneath the volcano allows us to better interpret our observations," said co-author Tamar Elias from the Hawaiian Volcano Observatory.

And there is another implication of this discovery -- not for eruptions today but for the evolution of the Earth's atmosphere billions of years ago. "Volcanic emissions in Earth's deep past may have made the atmosphere more oxidising than we thought," said co-author Bruno Scaillet. "A more oxygen-rich atmosphere would have facilitated the emergence and viability of life on land, by generating an ozone layer, which shields against harmful ultraviolet rays from the sun."

Journal Reference:

Clive Oppenheimer, Bruno Scaillet, Andrew Woods, A. Jeff Sutton, Tamar Elias, Yves Moussallam. Influence of eruptive style on volcanic gas emission chemistry and temperature. Nature Geoscience, 2018; DOI: 10.1038/s41561-018-0194-5

This story appeared on ScienceDaily, (7 August 2018) https://www.sciencedaily.com/releases/2018/08/180807095203.htm

News: About the World

Pacific Ocean's effect on Arctic warming

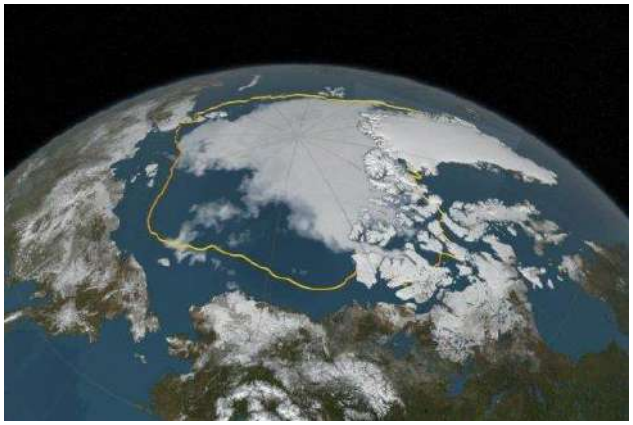
Source Carnegie Institution for Science

New research, led by former Carnegie postdoctoral fellow Summer Praetorius, shows that changes in the heat flow of the northern Pacific Ocean may have a larger effect on the Arctic climate than previously thought. The findings are published in the August 7, 2018, issue of Nature Communications.

The Arctic is experiencing larger and more rapid increases in temperature from global warming more than any other region, with sea-ice declining faster than predicted. This effect, known as Arctic amplification, is a well-established response that involves many positive feedback mechanisms in polar regions. Q7 What has not been well understood is how sea-surface temperature patterns and oceanic heat flow from Earth's different regions, including the temperate latitudes, affect these polar feedbacks. This new research suggests that the importance of changes occurring in the Pacific may have a stronger impact on Arctic climate than previously recognized.

Paleoclimate records show that climate change in the Arctic can be very large and happen very rapidly. During the last deglaciation, as the planet was starting to warm from rising greenhouse gases, there were two episodes of accelerated

warming in the Arctic -- with temperatures increasing by 15°C (27°F) in Greenland over the course of decades. Both events were accompanied by rapid warming in the mid-latitude North Pacific and North Atlantic oceans.



This image was taken in September 2016 showing the extent of Arctic sea ice then. The yellow line shows the average minimum extent of sea ice in the Arctic from 1981 to 2010. Credit: NASA

Using these past changes as motivation for the current study, the research team modeled a series of ocean-to-atmosphere heat flow scenarios for the North Pacific and the North Atlantic. They used the National Center for Atmospheric Research's Community Earth System Model (CESM), to assess the impacts to the Arctic's surface temperature and climate feedbacks.

Praetorius, who was at Carnegie at the time of the research and is now with the USGS in Menlo Park, CA explained: "Since there appeared to be coupling between abrupt Arctic temperature changes and sea surface temperature changes in both the North Atlantic and North Pacific in the past, we thought it was important to untangle how each region may affect the Arctic differently in order to provide insight into recent and future Arctic changes."

The researchers found that both cooling and warming anomalies in the North Pacific resulted in greater global and Arctic surface air temperature anomalies than the same perturbations modeled for the North Atlantic. Until now, this sensitivity had been underappreciated.

The scientists looked at several mechanisms that could be causing the changes and found that the strong global and Arctic changes depended on the magnitude of water vapor transfer from the mid-latitude oceans to the Arctic. When warm moist air is carried poleward towards the Arctic, it can lead to more low-lying clouds that act like a blanket, trapping warmth near the surface. The poleward movement of heat and moisture drive the Arctic's sea-ice retreat and low-cloud formation, amplifying Arctic warming.

The so-called ice-albedo feedback causes retreating ice and snow to lead to ever greater warming through increasing absorption of solar energy on darker surfaces.

In very recent years, the Arctic has experienced an even greater acceleration in warming. The authors note that the unusually warm ocean temperatures in the Northeast Pacific paralleled the uptick in Arctic warming, possibly signaling a stronger link between these regions than generally recognized.

"While this is a highly idealized study, our results suggest that changes in the Pacific Ocean may have a larger influence on the climate system than generally recognized," remarked Carnegie coauthor Ken Caldeira.

Journal Reference:

Summer Praetorius, Maria Rugenstein, Geeta Persad, Ken Caldeira. Global and Arctic climate sensitivity enhanced by changes in North Pacific heat flux. Nature Communications, 2018; 9 (1) DOI: 10.1038/s41467-018-05337-8

This story appeared on ScienceDaily, (7 August 2018)
www.sciencedaily.com/releases/2018/08/180807095149.htm

News: About the World

First North American co-occurrence of Hadrosaur and Therizinosaur tracks found in Alaska

Source Perot Museum of Nature and Science

An international team of paleontologists and other geoscientists has discovered the first North American co-occurrence of hadrosaur and therizinosaur tracks in the lower Cantwell Formation within Denali National Park, suggesting that an aspect of the continental ecosystem of central Asia was also present in this part of Alaska during the Late Cretaceous.

This comprehensive cross-disciplinary effort has resulted in a paper -- entitled "An unusual association of hadrosaur and therizinosaur tracks within Late Cretaceous rocks of

Denali National Park, Alaska" -- published in *Scientific Reports*, an online open access scientific mega journal published by the Nature Publishing Group, covering all areas of the natural sciences.

Anthony R. Fiorillo, Ph.D., chief curator and vice president of research and collections at the Perot Museum of Nature and Science in Dallas, Texas, is the lead author. Co-authors are Paul J. McCarthy, Ph.D., University of Alaska, Department of Geosciences; Yoshitsugu Kobayashi, Ph.D., Hokkaido University Museum, Sapporo, Hokkaido, Japan; Carla S. Tomsich, graduate student, University of Alaska, Department of Geosciences; Ronald S. Tykoski, Ph.D., director of paleontology lab, Perot Museum of Nature and Science; Yuong-Nam Lee, Ph.D., School of Earth and Environmental Sciences, Seoul National University, South Korea; Tomonori Tanaka, graduate student, Hokkaido University Museum, Sapporo, Hokkaido, Japan; and Christopher R. Noto, Ph.D., Department of Biological Sciences, University of Wisconsin-Parkside, Kenosha, Wisconsin.

Artist's rendering of therizinosaurs and hadrosaurs at Alaska's Denali National Park during the Cretaceous Period. Credit: Illustration by Masato Hattori

Fiorillo and a colleague published on a distinct single footprint in Denali National Park in 2012 that they determined to be made by a therizinosaur, an unusual predatory dinosaur thought to have become an herbivore. Therizinosaurs are best known from Asia. Upon his return in 2013 and 2014, they conducted a more detailed analysis of the area, and he and his colleagues unearthed dozens more tracks of therizinosaurs. What surprised Fiorillo and his team most was the co-occurrence of dozens of hadrosaurs, also known as duck-bill dinosaurs.

"Hadrosaurs are very common and found all over Denali National Park. Previously, they had not been found alongside therizinosaurs in Denali. In Mongolia, where therizinosaurs are best known -- though no footprints have been found in association -- skeletons of hadrosaurs and therizinosaurs have been found to co-occur from a single rock unit so this was a highly unusual find in Alaska, and it prompted my interest," said Fiorillo. "From our research, we've determined that this track association of therizinosaurs and hadrosaurs is currently the only one of its kind in North America."

The plant-eating therizinosaurs are rare and unusual creatures in the fossil record. The strange-looking dinosaurs had long skinny necks, little teeth, a small beak for cropping plants, and big torsos accompanied by large hind feet and long arms with "hands like Freddy Krueger."

Though therizinosaurs are known from Asia and North America, the best and most diverse fossil record is from Asia -- even up to the time of extinction -- and therein is the connection. Fiorillo has long postulated that

Cretaceous Alaska could have been the thoroughfare for fauna between Western North America and Asia -- two continents that shared each other's fauna and flora in the latest stages of the Cretaceous.

"This study helps support the idea that Alaska was the gateway for dinosaurs as they migrated between Asia and North America," said Dr. Kobayashi.

To support the theory, Fiorillo's international team of scientists from across the U.S., Japan and South Korea worked to establish if the tracks were those of a therizinosaur and to study any unique aspects of the ecosystem. The members -- including a sedimentologist, geologist, paleobotanist, paleoecologist and additional paleontologists including an expert on therizinosaurs -- determined that this particular area of Denali was a wet, marsh-like environment and that one fossil in particular looked like a water lily, which supported the theory that there were ponds and standing water nearby. They suspect that both therizinosaurs and hadrosaurs liked these wetter locations.

Fiorillo believes that this Alaskan discovery may connect these animals environmentally and perhaps behaviorally to other therizinosaurs in central Asia. An Asian report of these animals being associated also came from an interval of rocks that was unusually 'wet' at the time, relative to rocks above and below it.

"This discovery provides more evidence that Alaska was possibly the superhighway for dinosaurs between Asia and western North America 65-70 million years ago," added Fiorillo.

Journal Reference:

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This story appeared on ScienceDaily, (6 August 2018) https://www.sciencedaily.com/releases/2018/08/180806095216.htm

News: About the World

Earthquakes can be weakened by groundwater

By Sarah Perrin (Ecole Polytechnique Fédérale de Lausanne)

Around 100,000 earthquakes are recorded worldwide every year, but not all are naturally occurring. Some of the weaker ones are triggered by human activity underground -- this is referred to as induced seismicity. Researchers from EPFL's Laboratory of Experimental Rock Mechanics (LEMR) and the Ecole Normale Supérieure in Paris have just completed a study into the role of fluids in the propagation of induced earthquakes in an effort to decipher the underlying mechanisms. Their findings include the extremely counterintuitive discovery that highly pressurized water in the vicinity of an earthquake tends to limit -- rather than increase -- its intensity. These results were published today in *Nature Communications*.

Induced earthquakes can be the result of activities like mining, gas and oil extraction, toxic waste or CO_2 storage, and the construction of tunnels and dam reservoirs. The generation of geothermal energy is another potential source of induced earthquakes -- and the main one in Switzerland. According to the Swiss Seismological Service, a geothermal project near Basel caused a 3.4 magnitude earthquake in 2006, and one in St. Gallen triggered a 3.5 magnitude trembler in 2013.

Geothermal energy is captured by tapping into subterranean heat. Highly pressurized water is pumped into the earth's crust at a depth of between two and four kilometers. The water is then recovered as steam and used to drive an electricity-producing turbine. "Injecting water can affect water-rock equilibria and disrupt nearby faults, thus triggering earthquakes in the area," says Marie Violay, who runs LEMR.

This type of earthquake is a thorn in the side of geothermal proponents, notes Mateo Acosta, a PhD student at LEMR and the study's lead author: "These earthquakes may be low in intensity, but they can cause damage and affect public opinion -- to the point of derailing projects."

Heat absorption

Acosta ran tests in which he sought to replicate earthquake conditions in order to study the impact of different levels of underground water pressure on fault dynamics. He focused mainly on earthquake propagation, which is when the two plates in a fault rub against each other, sending seismic waves out into the surrounding area.

"Rock friction generates a significant amount of heat, which further fuels the propagation effect," says the PhD student. "Some of this heat is absorbed by the water in the surrounding rock, and the amount absorbed depends to a large extent on the water's thermodynamic parameters. What we learned from our experiments is that the closer the fluid's initial pressure is to the critical pressure of water, the weaker the earthquake will be."

"This research shows that the initial fluid pressure in the rocks is crucial, especially at depths commonly reached by geothermal activities. Geothermal models need to take this into account," says François-Xavier Passelègue, a LEMR researcher and the study's second author.

The laboratory recently acquired sophisticated equipment that can be used to simulate pressure and temperature levels at a depth of 10 to 15 kilometers in the earth's crust. The researchers plan to use this equipment to more accurately measure the impact of groundwater on earthquake intensity.

Journal Reference:

M. Acosta, F. X. Passelègue, A. Schubnel, M. Violay. Dynamic weakening during earthquakes controlled by fluid thermodynamics. Nature Communications, 2018; 9 (1) DOI: 10.1038/s41467-018-05603-9

This story appeared on ScienceDaily, (6 August 2018) https://www.sciencedaily.com/releases/2018/08/180806095201.htm

News: About the World

Those fragrances you enjoy? Dinosaurs liked them first

By Steve Lundeberg (Oregon State University)

The compounds behind the perfumes and colognes you enjoy have been eliciting olfactory excitement since dinosaurs walked the Earth amid the first appearance of flowering plants, new research reveals.

Oregon State University entomologist George Poinar Jr. and his son Greg, a fragrance collector, found evidence that floral scents originated in primitive flowers as far back as 100 million years ago as pollinator attractants — a role they still play even though today's flowers also have colorful petals for luring pollinators.

"I bet some of the dinosaurs could have detected the scents of these early flowers," George Poinar said. "In fact, floral essences from these early flowers could even have attracted these giant reptiles."

Glandular laurel in amber. Credit: Image courtesy of Oregon State University

The Poinars examined amber flowers from Burma, including the now extinct glandular laurel flower (*Cascolaurus burmensis*) and veined star flower (Tropidogyne pentaptera).

The research revealed that the flower-based chemical compounds that are the basis for the perfumes and colognes we use today have been providing olfactory excitement to pollinating insects and other animals since the mid-Cretaceous Period.

Without colorful petals, flowers from that period had to rely solely on scents to attract pollinators.

"You can't detect scents or analyze the chemical components of fossil flowers, but you can find the tissues responsible for the scents," said George Poinar, professor emeritus in the OSU College of Science.

The floral secretory tissues producing these scents include nectaries, glandular trichomes, eliaphores and osmophores.

Nectaries are glands that produce fragrances and sweet deposits that insects love. Glandular trichomes are hairs with cells that make and send out scented secretory products. Eliaphores are stalked aromatic oil glands. Osmophores, also known as floral fragrance glands, are cell clusters specializing in scent emission.

The study also found that secretory tissues of these Cretaceous flowers are similar in structure to those of their modern descendants. That suggests modern and ancient flowers of the same lineages produced similar essences.

Some of flowers studied were even in the process of emitting compounds at the time they were engulfed by the tree resin that later became amber.

The study also included a milkweed flower (*Discoflorus neotropicus*) and an acacia flower (*Senegalia eocaribbeansis*) in 20- to 30-million-year-old Dominican Republic amber.

The anther glands on the fossil acacia flower were especially attractive to bees, one of which was fossilized while visiting the stamens. Today, honeybees are still visiting acacia flowers that have the same type of flora glands that existed in the ancient past.

"It's obvious flowers were producing scents to make themselves more attractive to pollinators long before humans began using perfumes to make themselves more appealing to other humans," George Poinar said.

Journal Reference:

George Poinar, Greg Poinar. The antiquity of floral secretory tissues that provide today's fragrances. Historical Biology, 2018; 1 DOI: 10.1080/08912963.2018.1502288

This story appeared on ScienceDaily, (8 August 2018) http://www.geologypage.com/2018/08/those-fragrances-you-enjoy-dinosaurs-liked-them-first.html#ixzz5NauQypo7

News: About Space/Astronomy

Astronomers Have Detected an Intense and Mysteriously Low Frequency Radio Signal Coming From Space

By Fiona Macdonald

Astronomers have detected yet another mysterious and powerful fast radio burst hitting Earth from an unknown source in space.

If that's not strange enough, this particular fast radio burst is incredibly low, in the 580 megahertz frequency range – nearly 200 MHz lower than any other fast radio burst we've picked up on before.

If you haven't heard of fast radio bursts (FRBs), they're some of the most explosive and mysterious events in the Universe.

They can generate as much energy as 500 million Suns in mere milliseconds, and there could be as many as one happening every second. The problem is, we still don't know what's causing them.

One of the signals we've detected has repeated, sending out multiple FRBs from the same location, and this has allowed us to pinpoint where in the Universe it's coming from (spoiler: not our galaxy).

But we still don't know for certain what caused it, or even if there are different varieties of FRBs coming from different sources. The vast majority signals we only ever detect once, which gives us very little to go off.

Now we have another anomaly to investigate.

According to a report in The Astronomer's Telegram, on the morning of 25 July 2018, an array of radio telescopes in British Columbia, Canada, detected a very strange FRB.

The fast radio burst has been named FRB 180725A after the year, month, and day it was detected.

The most interesting part is that the intense signal was transmitted in radio frequencies as low as 580 megahertz - making it the first detection of a FRB under 700 MHz.

The Astronomer's Telegram is a bulletin board of observations posted by accredited researchers - so while these are genuine detections, it's important to note that they haven't been peer reviewed as yet and independent teams haven't verified that the signals are from space.

That sounds like a silly thing to say, but let's not forget that back in 1998, researchers thought they had discovered a new type of radio signal coming from space, only to figure out 17 years later that it was coming from a microwave oven in their research facility. Or even the very recent rediscovery of Mars.

But so far, all signs point to this being a new and very interesting FRB detection.

"These events have occurred during both the day and night, and their arrival times are not correlated with known on-site activities or other known sources," Patrick Boyle, a project manager for the Canadian Hydrogen Intensity Mapping Experiment (CHIME), wrote in The Astronomer's Telegram.

So what do scientists think these weird signals could be?

The most recent research on the repeating FRB suggests the source is a neutron star, but other hypotheses for FRBs include black holes, pulsars with companion stars, imploding pulsars, a type of star called a blitzar, a connection with gamma-ray bursts (which we now know can be caused by colliding neutron stars), and magnetars emitting giant flares.

It's also increasingly likely that there's more than one explanation for the explosive events.

We should add that it's also not impossible that FRBs could be engines firing on giant alien spaceships, either, according to a Harvard physicist.

What we do know is that they cover a spread of frequencies - an even wider spread than initially thought, this new detection shows - and they seem to be coming from very far away, possibly billions of light-years. This suggests whatever is causing them has to be extremely energetic.

Regardless of their source, if we can get better at detecting them and understanding their origin, they could help unveil clues as to the origin of the Universe and the mysterious Epoch of Reonisation, the time during which the interstellar medium, primarily hydrogen, became ionised in the very early universe.

"FRBs are like incredibly powerful flashlights that we think can penetrate this fog [of the interstellar medium] and be seen over vast distances," said Anastasia Fialkov of the Harvard-Smithsonian Center for Astrophysics about another FRB discovery last year.

"This could allow us to study the 'dawn' of the Universe in a new way."

With new, powerful tools coming online that will help us detect more and more of these FRBs, scientists are optimistic it won't be long until we can narrow down where they're coming from, and, hopefully, what's causing at least some of them.

We'll be waiting white-knuckled for those results when they come in.

This story appeared on sciencealert, (6 August 2018) https://www.sciencealert.com/astronomers-have-detected-an-intense-and-mysteriously-low-frequency-radio-signal-coming-from-space

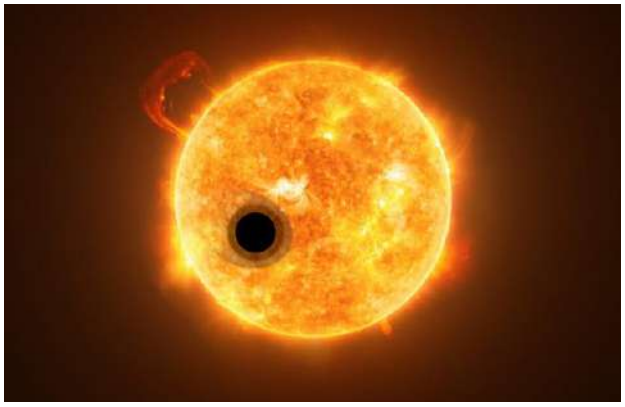
News: About Space/Astronomy

The first detection of helium in an exoplanet's atmosphere

Astronomers have finally detected helium in the air of an alien world — and there's apparently plenty of it.

By Jake Parks

In a new study published May 2 in the journal Nature, an international team of researchers used a novel technique to probe the atmosphere of the exoplanet WASP-107b, resulting in the first-ever detection of helium in the air of an alien world.



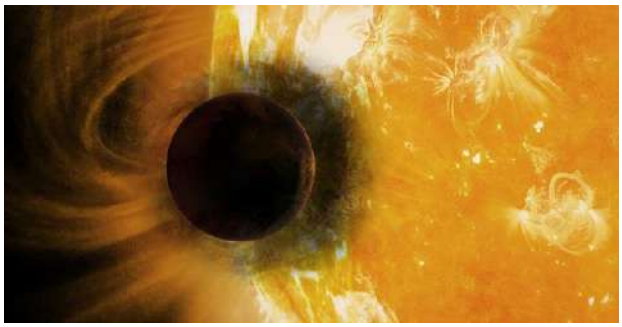
Using the Hubble Space Telescope, researchers probed the exoplanet WASP-107b, located about 200 light-years way, and discovered that it has an abundance of helium steadily escaping its atmosphere.

ESA/Hubble/NASA/M. Kornmesser

"Helium is the second-most common element in the universe after hydrogen. It is also one of the main constituents of the planets Jupiter and Saturn in our solar system," said lead author Jessica Spake of the University of Exeter, in a press release. "However, up until now, helium had not been detected on exoplanets — despite searches for it."

Furthermore, the helium signal the researchers discovered was so strong that they think the planet's upper atmosphere may stretch many thousands of miles into space, making it susceptible to erosion through intense stellar winds. According to the study, this wind-induced erosion is also likely creating an extended, comet-like tail of gas around the exoplanet, which causes the planet to shed up to 4 percent of its total mass every billion years.

"The helium we detected extends far out to space as a tenuous cloud surrounding the planet," said co-author Tom Evans of the University of Exeter, in a press release. "If smaller, Earth-sized planets have similar helium clouds, this new technique offers an exciting means to study their upper atmospheres in the very near future."



WASP-107b, which was initially discovered last year, is a gas giant roughly the size of Jupiter, but is only 12 percent as massive, making it one of the lowest density planets known. WASP-107b is also about eight times closer to its host star — an active K-type main-sequence star — than Mercury is to the Sun, which also makes it one of the hottest planets yet known (932 degrees Fahrenheit, or 500 degrees Celsius).

Engine House VFX

To carry out their investigation of WASP-107b, the researchers used the Wide Field Camera 3 on the Hubble Space Telescope to view infrared light passing through the planet's upper atmosphere. Then, by analyzing the light's spectrum, the researchers were able to decode the elemental composition of the planet's air, ultimately finding a great deal of helium in an excited state.

The traditional method for studying exoplanetary atmospheres is to observe them in ultraviolet or optical light, which both have relatively high energies. However, this new study focused on infrared light, which has a much longer wavelength (and, therefore, lower energy) and passes directly through Earth's atmosphere. Previous ultraviolet-based searches required orbiting space observatories to investigate the chemical makeup of an exoplanet's atmosphere. But, by proving that infrared light can also be used, astronomers have shown that ground-based telescopes can help study the air around exoplanets, too.

"The strong signal from helium we measured demonstrates a new technique to study upper layers of exoplanet

atmosphere in a wider range of planets," says Spake. "Current methods, which use ultraviolet light, are limited to the closest exoplanets. We know there is helium in the Earth's upper atmosphere, and this new technique may help us to detect atmospheres around Earth-sized exoplanets — which is very difficult with current technology."

Although future projects could use telescopes here on Earth to study exoplanets, the technique may be even more valuable for future space-based observatories. "We hope to use this technique with the upcoming James Webb Space Telescope, for example, to learn what kind of planets have large envelopes of hydrogen and helium, and how long planets can hold on to their atmospheres," said Spake. "By measuring infrared light, we can see further out into space than if we were using ultraviolet light."

This story appeared on astronomy.com, (3 May 2018) http://www.astronomy.com/news/2018/05/the-first-detection-of-helium-in-an-exoplanets-atmosphere

GEOETHICS

The genetics (and ethics) of making humans fit for Mars

By Jason Pontin

In May of 1969, Apollo 10 flew at 25,000 miles per hour. Two months later, the crew of Apollo 11 walked on the moon. Since then, no one has flown so fast nor walked so high. NASA is now preparing for a human mission to Mars, but if our descendants ever shrug off their terrestrial bonds, it won't be Homo sapiens who leaves, but another, more intelligently designed species. We're not fit.

Long-term spaceflight beyond low Earth orbit and the Van Allen belts exceeds NASA's current bounds of "acceptable risk." Barring an unlikely series of technological tricks—including an expedited route, radiation shielding inside the spacecraft, subsurface quarters on the planet, and a hurried return—our biology is incompatible with a Mars mission. Permanent colonies there or farther out are unthinkable.

But serious biologists, including some who work with NASA, have begun to ask whether humans could be genetically altered for space travel. Their queries prompt more profound questions about our responsibilities and duties in the next phase of human evolution.

Their proposals are also richly ironic. A defining characteristic of our species is our mania for expansion. Other hominins didn't share it, so far as we know; our Neanderthal cousins, with whom we lived for 5,000 years, never left Eurasia. With us, exploration is a mad compulsion. Think of how many frail corracles and canoes set out with only the hope of land to populate all the islands of the seas!

Mars is next. But we may have to employ all our technology to create an inheritor species to satisfy our longings.

As George Church, a Harvard geneticist and leading synthetic biologist, argues: "One likely path for risk reduction in space does seem to involve biological engineering of adult would-be astronauts." He has identified 40-some genes that might be advantageous for long-term spaceflight (and would benefit those who stayed behind, too). His list includes CTNNBI, which confers radiation resistance, LRP5, which builds adamantine bones, ESPA1 (common in Tibetans), which allows people to live with less oxygen, as well as a host of genes that might make us smarter, more memorious, or less anxious. The menu even includes a gene, ABC11, which endows its possessors with "low-odor production," a friendly trait in a confined space. (A spaceship with standard humans smells like the Harris County Jail, according to one recent inhabitant of the space station.)

Church cofounded Harvard Medical School's Consortium for Space Genetics, along with other prominent biologists like the anti-aging researcher David Sinclair, in order to study human health in space and promote exploration. He imagines "virus-delivered gene therapies, or microbiome or epigenome therapies" that astronauts would take to transform their biologies. "Quite a bit is already known about resistance to radiation, osteoporosis, cancer, and senescence in mice," he says. Church stresses that many of these genes are already targeted by pharmaceutical companies, with drugs in clinical trials. Using gene therapies as a kind of preventative medicine for astronauts isn't so far-fetched.

Gene therapies may make us fitter for space, but if we want to colonize new worlds, humans would want to breed a new

race. The geneticist Chris Mason, whose lab at Weil Cornell is participating in a NASA study of how twin astronauts changed when one spent a year in space while another remained on Earth, has proposed a "500-year plan" for space colonization. Its three main components are expanding our knowledge of genomics, including determining which genes should wear a "do-not-disturb sign," because their alteration would kill or disable us; engineering microbes; and adding, deleting, and modifying genes to create permanent, heritable changes in a population.

In the first stage of his plan, Mason is combining human cells with a gene called Dsup, unique to the indestructible tardigrade, that suppresses DNA breaks from radiation. Tardigrades can survive the vacuum of space; perhaps their genes might make us more fit for space, too. His lab has also created an artificial construct of the gene p53, involved in preventing cancer, which it hopes later to insert into a human cell. Elephants have many copies of p53 and seldom die from cancer; adding copies of p53 to human genomes might protect us from space radiation. Mason's less speculative research includes editing Deionococcus radiodurans, sometimes called "Conan the bacterium," a polyextremophile that can survive cold, dehydration, acid, and very high levels of radiation, the last by rewriting its damaged chromosomes. Mason wants the microbe to live as flora on our skin or in our guts, or on the surfaces of spaceships, protecting us from the deadly rays of space. "The microbiome is an extraordinarily plastic thing," he says.

Some researchers have proposed more science-fictional projects. Harris Wang of Columbia wants to coax human kidney cells to synthesize the nine amino acids our bodies cannot make. A human cell able to synthesize all the organic compounds needed for health would require around 250 new genes, but if our tissues were made of such cells, astronauts could thrive by drinking just sugar water, a liberating adaptation: Missions wouldn't have to lug bulky food or send it on ahead. Other scientists have suggested photosynthetic spacefarers, or editing the personalities of the space corps, so that they fearlessly longed for the high frontier because it was their true terminus.

If humans hope to leave Earth, we'll need to be different. But if it's possible to transform ourselves so radically, should we? Politically, eugenics has been an ugly word: the promise of genocidal tyrants. More generally, would it be ethical to call into existence a new people who had no say in their own design? The case for a race of astronauts is that they would not really be the products of eugenics as the word is ordinarily used: No one with undesired habits or traits would be coerced to have fewer children; no captive populations would be sterilized or worse. As for the new people themselves, none of us chooses our inheritance; we are all the products of our parents. Mason believes there is a categorical imperative to try. The primary goal of his 500-year plan reads: "Establish habitable environments in multiple star systems, to avoid extinction due to a cataclysmic event in one solar system." He explains, "Whatever your moral priorities, you have to exist first."

In Mr. Sammler's Planet, published shortly after the flights of Apollo 10 and 11, Saul Bellow asked, "How long … will this earth remain the only home of Man? How long? Oh, Lord, you bet! Wasn't it the time—the very hour to go? To blow this great blue, white, green planet, or to be blown from it." Perhaps it's time to think of children who can leave home. Scientists are telling us we should consciously direct our evolution, rather than surrender our fate to time, chance, and death—evolution's historical servants. Of course, the inheritors who left Earth would be as different from sapiens as we are from Neanderthals. "There will be a speciation," says Mason. "It's not if, it's when."

This story appeared on www.wired.com, (7 August 2018) https://www.wired.com/story/ideas-jason-pontin-genetic-engineering-for-mars/?mbid=social_fb_onsiteshare

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Paola Reichenbach, Mauro Rossi, Bruce D. Malamud, Monika Mihir, Fausto Guzzetti

Precambrian Research

Ediacaran glaciations of the west African Craton – Evidence from Morocco
Volume 310, June 2018, Pages 17-38
Dominik Letsch, Simon J. E. Large, Marius W. Buechi, Wilfried Winkler, Albrecht von Quadt

Ore Geology Reviews

A review of the mineral potential of Liberia
Volume 101, October 2018, Pages 413-431
A. G. Gunn, J. K. Dorbor, J. M. Mankelow, P. A. J. Lusty, K. M. Goodenough

Science of The Total Environment

Pattern of blood concentrations of 47 elements in two populations from the same geographical area but with different geological origin and lifestyles: Canary Islands (Spain) vs. Morocco
Volume 636, 15 September 2018, Pages 709-716
Luis Alberto Henríquez-Hernández, Ana González-Antuña, Luis D. Boada, Cristina Carranza, Octavio P. Luzardo

Risk factors associated with rural water supply failure: A 30-year retrospective study of handpumps on the south coast of Kenya
Volume 626, 1 June 2018, Pages 156-164
Tim Foster, Juliet Willetts, Mike Lane, Patrick Thomson, Rob Hope

Earth and Planetary Science Letters

A long-lived Indian Ocean slab: Deep dip reversal induced by the African LLSVP
Volume 497, 1 September 2018, Pages 1-11
Huilin Wang, Yaoyi Wang, Michael Gurnis, Sabin Zahirovic, Wei Leng

Quaternary International

Geoarchaeological and 3D visualisation approaches for contextualising in-situ fossil bearing palaeokarst in South Africa: A case study from the ~2.61 Ma Drimolen Makondo
Volume 483, 30 July 2018, Pages 90-110
Andy I. R. Herries, Ashleigh Murszewski, Robyn Pickering, Tom Mallett, Giovanni Boschian

EVENTS

In Africa and about Africa

- The 12 Edition of the International Congress 13 -17 November 2018. Abstract submission deadline 30 /09/ 2018. More information: http://www.geotunis.org/
- The 5th ISR conference on Renewable Energy & Water Sustainability 26-29 March 2019 in Sharm El-Sheikh, Egypt. More information: http://isr.tanta.edu.eg
- 17th Annual Africa Conference convened by the Houston Geological Society (HGS) & the Petroleum Exploration Society of Great Britain (PESGB) - September 10-12, 2018. More information: https://www.hgs.org/civicrm/event/info?id=1931&reset=1
- ICMRG 2018: 20th International Conference on Mineral Resources and Geology – 15-16 November, 2018 in Cape Town, South Africa. More information: https://waset.org/conference/2018/11/cape-town/ICMRG/home
- The AAPG 2018 International Conference & Exhibition will be held 4-7 November 2018 in Cape Town, South Africa and the Cape Town International Convention Centre. More information: http://capetown2018.iceevent.org/
- Online e-Symposium: From Qualitative to Quantitative Interpretation: An Interpreter's Guide to Fluid Prediction in West African Turbidites Combining Geology and Pre-Stack Inversion Attributes. More information: http://www.aapg.org/Career/Training/Online/e-Symposia/Details/ArticleID/1500/From-Qualitative-to-Quantitative-Interpretation-An-Interpreters-Guide-to-Fluid-Prediction-in-West-African-Turbidites-Combining-Geology-and-Pre-Stack-I

Rest of the World

- The EGU (European Geosciences Union) General Assembly 2019 will bring together geoscientists from all over the world to one meeting covering all disciplines of the Earth, planetary and space sciences.
  - Call-for-sessions: until 6 September 2018
  - Abstract submission: October 2018–10 January 2019
  - Support application: October–1 December 2018
  - More information: https://www.egu2019.eu/

- The AGU (American Geophysical Union) 2018 Fall Meeting will mark another dynamic year of discovery in Earth and space science, serve as the advent of AGU's Centennial year, and provide a special opportunity to share our science with world leaders in Washington, D.C. As the largest Earth and space science gathering in the world, the Fall Meeting places you in the center of a global community of scientists drawn from myriad fields of study whose work protects the health and welfare of people worldwide, spurs innovation, and informs decisions that are critical to the sustainability of the Earth.
  - Deadline for submission is 11:59 PM EDT, 15 September, 2018
  - More information: https://fallmeeting.agu.org/2018/welcome/

COURSES

- Cape Town, South Africa (3-4 November 2018)
  ICE SC 02 | Stratigraphy - Siliciclastics Seismic Sequence Stratigraphy

- Cape Town, South Africa (3 November 2018)
  ICE SC 01 | Petroleum Geology of East Africa

- Cape Town, South Africa (3-4 November 2018)
  ICE SC 03 | Basin and Petroleum Systems Modeling: Applications for Conventional and Unconventional Petroleum Exploration Risk and Resource Assessments

- Cape Town, South Africa (4 November 2018)
  ICE SC 04 | SAMOG Reporting Code, PRMS, and the UN Framework Code

- Cape Town, South Africa (4 November 2018)
  ICE SC 07 | Maximizing the Impact and Application of Analogues across the E&P Lifecycle

- Cape Town, South Africa (4 November 2018)
  ICE SC 05 | Petroleum Geology of West Africa

- Cape Town, South Africa (4 November 2018)
  ICE SC 06 | Deep-water Slope Channel Complex Reservoirs in Exploration and Production

OPPORTUNITIES

3D Geology Modelling and Inversion PhD Scholarships & Fixed-term positions	Australia, Canada	19/09/18
Senior Exploration Geoscientist (Expat Terms)	Asia	Until Filled
Postdoctoral Position - Active Tectonics (m/f)	Potsdam, Germany	11/09/18
PhD Position: TRAFFIC (Trophic TRAnsfer eFFICiency in the Benguela Current)	Bremen, Germany	01/09/18
PhD Studentship in earthquake geodesy and machine-learning	Durham, UK	07/09/18
PhD Fellowships in interdisciplinary climate research	Hamburg, Germany	15/09/18
Researcher position in marine and coastal sedimentology	Rostock, Germany	30/09/18
Geologe / Geologin	Frauenfeld, Switzerland	15/09/18
iCRAG 2 year MSc Studentship: RM1.4 MSc1 - Aggregate Potential of Irish South Coast Offshore Palaeovalleys (AggrePOP)	Dublin, Ireland	15/09/18
Graduate student: earthquake seismology	Tuscaloosa, AL, USA	14/09/18
Explorationist	Oslo, Trondheim, Norway	14/09/18

Geophysicist	Oslo, Trondheim, Norway	14/09/18
Geologist	Oslo, Trondheim, Norway	14/09/18
Geoscience Students Seeking Full-Time or Intern Opportunities	Spring, TX, USA	Until Filled
Postdoctoral Research Positions in Geotechnical Engineering/Engineering Geology - 2018 CALL	Chengdu, Sichuan, China	14/11/18
Engineering Geologist	Bolton, UK	10/09/18
Postdoctoral Research Assistant in Macroecology	Oxford, UK	23/11/18
Postdoctoral Fellowships in Geomicrobiology	Kensington WA, Australia	10/09/18
Postdoctoral Researcher (Climate Science)	Oxford, UK	04/09/18
Post-Doctoral position in Thermochronology	Tucson, AZ, USA	07/09/18
Postdoctoral Research Scientist position in cryospheric sciences	Pallisades, NY, USA	15/09/18
Post-doctoral fellowship on surface water and groundwater interaction	Avignon, France	01/09/18
Centre for Freshwater Ecosystems Post-graduate Research Scholarships	Albury-Wodonga, Australia	30/09/18 31/10/18
Master of Science in Petrophysics	Kingsville, TX, USA	27/09/18
SaltGiant ETN announces 2 PhD student positions in Earth, Biological and Social Sciences	Paris, France	21/09/18
Doctoral Studentship: Solar and Planetary Science	Oxford, UK	Until Filled
MSc in Petroleum Geoscience (Distance Learning)	London, UK	14/09/18
Research Scientist in Experimental Rock Physics (m/f)	Potsdam, Germany	01/09/18
Outreach Officer - European Consortium for Ocean Research Drilling	Aix-en-Provence, France	07/10/18
MSc Position - terrestrial disturbance on soil phosphorus	Windsor, Canada	30/09/18

PhD position - Great Lakes Institute of Environmental Research	Windsor, Canada	30/09/18
PhD Student: Microorganisms involved in Marine Nutrient Cycling under Anoxic Conditions	Texel, Netherlands	23/09/18

CONTACT THE COUNCIL

The Geological Society of Africa's council is appreciated your opinion and inputs. All of your suggestions and comments will be taken into considerations. Just drop us an email:

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