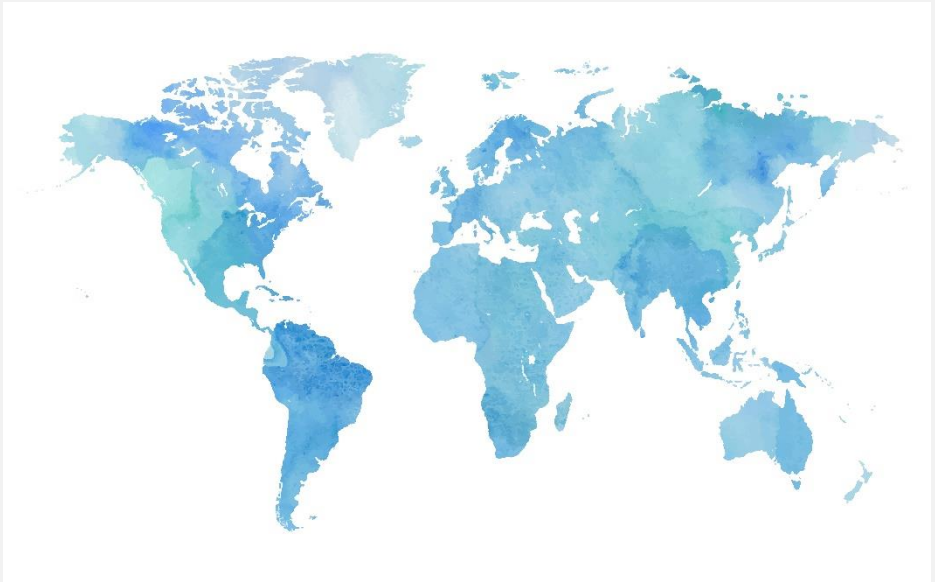




Decolonising the Geosciences

A zine exploring the role of colonial and imperial legacy upon our curriculum.

By Shannon James and Rose Meadows



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About Us

Shannon James

Through this project, I was keen to learn about how the colonial legacy has impacted geosciences as a student studying the course. Historical colonialism and imperialism have casually been brought up by friends who study at the UCL Department of Archaeology and Geography. I was aware of the controversy surrounding this topic, however, through this research, I was only more convinced of the importance of understanding the colonial legacy and its apparent links to geoscience, as I hope you'll agree after reading through our zine. We source many articles that include discussions of scientists from the global north and south who have become aware of the legacy colonialism has left behind and how it impacts their science and those in their field. We hope this raises some questions. Most importantly, we hope it assures you that the colonial legacy and its impacts are being looked at by scientists globally, who have a keen interest in expanding the scope of geosciences. It is important to consider the legacy colonialism has left behind, as often stories of colonialism are untold, with what we see today the only identifiable and relatable consequences.



Rose Meadows

I am an MSc Geoscience student with a background in Geography. What drove me to create this zine is how global a study the Earth Sciences are and yet its neglect of the very history it's built upon, one of neocolonial, colonial, and imperial legacies that continue to shape the subject. The aim of this project was to explore the hidden and imbedded colonial legacies that linger within our science and put forward some suggestions for the future of our subject. I predominantly fall under and am informed by feminist, critical race theory, and intersectional approaches to the subject. Although we



have attempted to comply to scientific objectively and approach this from a neutral position, understanding the social context and historical values controlling the scientific process is necessary and as a result the foundations of this zine could be controversial.

The importance of Context

It is very easy to see our colonial past as just that, a thing of the past. Colonialism: the acquiring of political control over another country, occupying it, and exploiting it economically ¹. Despite this the colonial is embodied in material culture, our institutions of education, our political, social, and development policy, ongoing trade, and our archives and collections. Connections across space (e.g., contemporary imperialism) and across time (e.g., colonial histories) are made invisible, so although it is not perhaps less obvious and tangible than during the beginning of colonial and imperial conquest, it is no less crucial, it impacts not just political, economic, and individual life but our education system, as you will see within this zine. We will explore areas needed to undergo decolonisation within the Earth Sciences, although this is also applicable to wider subjects and audiences too. Our research highlights that ongoing systematic practices are impacting sciences and the quality of scientific research and collaboration. Therefore, it is not only of ethical and moral importance, but also of educational to recognise the wider context our subject stems from and untangle these colonial roots.

¹Nwanosike, O.F. and Onyije, L.E., 2011. Colonialism and education. *Mediterranean Journal of Social Sciences*, 2(4), pp.41-41.



Controversial figures: does historical context impact scientific outcomes?

It is perhaps obvious with hindsight that famous figures within the Earth sciences and sciences generally may reflect ideas and beliefs from the period of history to which they originated.

When looking back to famous figures within science it is important to recognise and not bury history, which is often done within the colonial narrative, this is called ‘white washing’ ².

THE AGE OF IMPERIALISM

European imperialism reached its peak between 1850 and 1950; the expansion of western dominion needed justification which was found in their ‘civilising missions’ ^{3,4}. These missions were given the scientific support they needed in the publication of *On the Origin of Species by means of natural selection; or, The preservation of favoured races in the struggle of life (1868)*, which somewhat challenged dominant narratives, despite this it was also employed as a



² Apple, J., Lemus, J. and Semken, S., 2014. Teaching geoscience in the context of culture and place. *Journal of Geoscience Education*, 62(1), pp.1-4.

³ Havinden, M. and Meredith, D., 2002. *Colonialism and development: Britain and its tropical colonies, 1850–1960*. Routledge.

⁴ Andreotti, V., 2007. An ethical engagement with the other: Spivak’s ideas on education. *Critical literacy: Theories and practices*, 1(1), pp.69-79.

'scientific' explanation for Western and European supremacy ⁵, ⁶, ⁷. Charles Darwin's later research on *The Descent of Man, and Selection in Relation to Sex* (1881) concluded race was merely superficial, and that a lack of civilization was the cause of savagery ⁸. Although known for his love of finches and groundbreaking theories on evolution the impact he had on race theory at the time is less well known. This impeded on evolutionary and



social theory, in particular imperial policy at the time, and was later used to justify eugenics for fascist governments during the 20th century ⁹. His research also required lots of exploration, this too being an imperialist import with its root linking to the Age of Exploration¹⁰

Alongside this work by the founding father of taxonomy, Carl Linnaeus has long been debated due to its roots in colonial exploits of the time. He devised **binomial nomenclature** – a system devised to organise organisms by genus and species¹¹. This work was then used by Carl to classify humans, with Europeans



⁵ Shields, S.A. and Bhatia, S., 2009. Darwin on race, gender, and culture. *American Psychologist*, 64(2), p.111.

⁶ Gillispie, C.C., 1996. *Genesis and geology: a study in the relations of scientific thought, natural theology, and social opinion in Great Britain, 1790-1850*. Harvard University Press.

⁷ Darwin, C., 1871. *The descent of man*. New York: D. Appleton.

⁸ Sharp, P.B., 2007. *Savage perils: Racial frontiers and nuclear apocalypse in American culture*. University of Oklahoma Press.

⁹ Dennis, R.M., 1995. Social Darwinism, scientific racism, and the metaphysics of race. *Journal of Negro Education*, pp.243-252.

¹⁰ Sobe, N.W., 2017. Travelling researchers, colonial difference: comparative education in an age of exploration. *Compare: A Journal of Comparative and International Education*, 47(3), pp.332-343.

¹¹ Toma, C. and Murariu, D., 2007. 300 YEARS SINCE CARL von LINNÉ'S BIRTH-FOUNDER OF THE BINOMIAL NOMENCLATURE. *Analele Stiintifice ale Universitatii "Al. I. Cuza" din Iasi*, 53, p.167.

being ascribed positive traits and people of colour negative, in turn laying down a foundation for supporting the expansion of colonisation and supporting attitudes of the ‘savage other’¹².

The accomplishments of these great scientists are in their own regard brilliant, but as you can see, they are fallible and constrained to their own social period. This in turn impacts society, our histories and science generally, even today. The wider **context of science** needs to be considered and addressed as the hidden colonial narratives have influenced science.

The global climate change by decade. Created using GISTEMP, Nasa.^{4 6}



The invading civilization[s] confused ecology with idolatry. Communion with nature was a sin worthy of punishment... Nature was a fierce beast that had to be tamed and punished so that it could work as a machine, placed at our service for ever and ever. Nature, which was eternal, owed us slavery’¹³ – Eduardo Galeano

Climate change is a hot topic of debate amongst not only scientists, but the media too. It is generally understood as a

¹² Schiebinger, L., 2005. Forum introduction: The European colonial science complex. *Isis*, 96(1), pp.52-55.

¹³ Voskoboynik, D.M., 2018. To fix the climate crisis, we must face up to our imperial past. *OpenDemocracy*. Available online: <https://www.opendemocracy.net/en/opendemocracyuk/to-fix-climate-crisis-we-must-acknowledg-e-our-imperial-past/> (accessed on 13 February 2020).

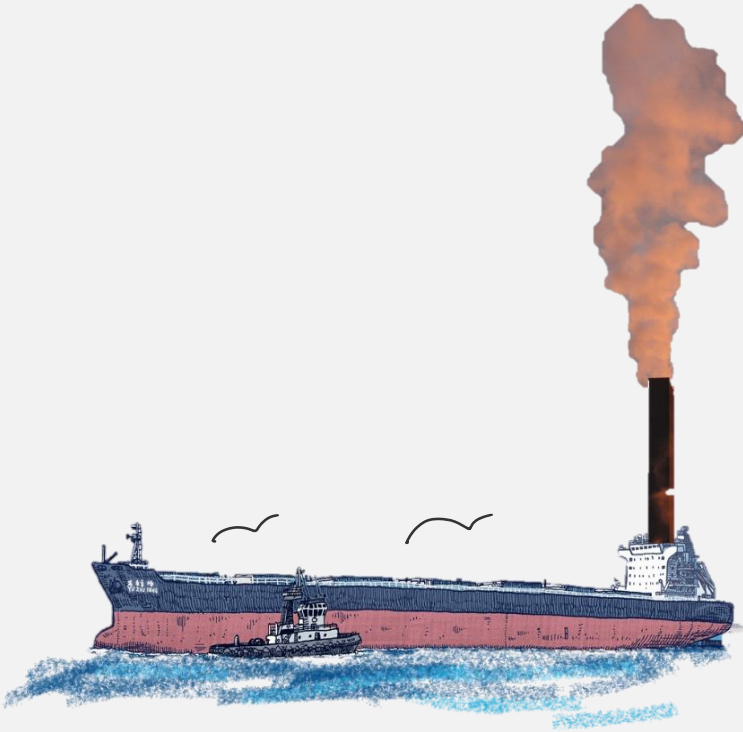
process driven by ‘**anthropogenic**’, meaning originating from human behaviours, fossil fuel emissions ¹⁴. The West is considered the main perpetrator of these, colonialism, and the beginning of meteorological studies ¹⁵. To improve trade and imperial power global climate emissions calling into question the ethics of a term like ‘**anthropogenic**’, some scientists and philosophers have advised its use is problematic placing the blame on humanity as a whole ¹⁶. Mahoney and Enfield (2018) carry out a comprehensive review of the link between British imperialism systems were explored, often being destructive and far from ethical practices ¹⁷. An example mentioned within the paper highlights Australia as an example whereby this occurred, it was assumed to have a climate matching that of the UK, as a result mass crop failures occurred ⁴. Again, in the 17th century misunderstanding native environments led to dense vegetation in North America being deforested to help make it temperate like Britain ⁴.

¹⁴ Sayre, N.F., 2012. The politics of the anthropogenic. *Annual Review of Anthropology*, 41, pp.57-70.

¹⁵ Mahony, M. and Endfield, G., 2018. Climate and colonialism. *Wiley Interdisciplinary Reviews: Climate Change*, 9(2), p.e510.

¹⁶ Simpson, M., 2020. The Anthropocene as colonial discourse. *Environment and Planning D: Society and Space*, 38(1), pp.53-71.

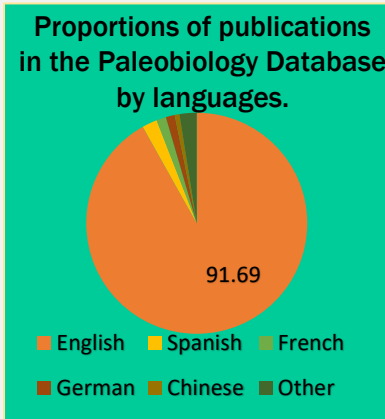
¹⁷ Trentmann, F., 2007. Before “fair trade”: empire, free trade, and the moral economies of food in the modern world. *Environment and Planning D: Society and Space*, 25(6), pp.1079-1102.



Questions to ask ourselves:

- ✓ How can we reframe conversations on climate change to recognize its primary contributors?
- ✓ Should we actively be looking at the ethical implications of our scientific language?
- ✓ What can we do to improve our understanding of climate change science?

Systematic issues and the ethical implications of museums and their collections



The presence of the colonial within museums is fundamental to museum collections themselves ¹⁸. The colonial is seldom addressed despite its formative and ongoing persistent influence on contemporary culture ¹⁹. It is important therefore, that we recognise the history tied with the field and ongoing collection issues, challenging palaeontological practices that descend from 18th century colonialism and imperialism, beginning with ‘voyages of discovery’ across the globe ²⁰. An ongoing pattern of fossil

¹⁸ Classen, C. and Howes, D., 2006. The museum as sensescap: Western sensibilities and indigenous artifacts. *Sensible objects: Colonialism, Museums and Material culture*, 5, p.199.

¹⁹ Edwards, E. and Mead, M., 2013. Absent histories and absent images: Photographs, museums and the colonial past. *Museum and society*, 11(1), pp.19-38.

²⁰ Shelton, A., 2013. Critical museology: A manifesto. *Museum Worlds*, 1(1), pp.7-23.

specimens being removed from the so called ‘developing world’



which are then shipped to predominantly the west for display and ongoing scientific study, in turn extends colonial legacies and practises ²¹. The history of natural history museums and palaeontology itself arose in the 18th century

when European powers were actively colonising the globe, sucking wealth in the form of physical fossils and a wealth of knowledge into imperial capitals ^{22, 23}. Today, much of Palaeontological research is published in European languages >91%, countries with higher GDPs tend to report more data, although the basis of these GDPs also has colonial legacies ²⁴. Linguistic diversity within academia is low, however, not all scientists are native speakers or even speak English. Therefore, there are large unseen difficulties that occur for those whose native language is not English ²⁵.

²¹ Schofer, E., 2003. The global institutionalization of geological science, 1800 to 1990. *American Sociological Review*, pp.730-759.

²² Dunne, E. and Raja, N.B., 2021. Ethics, law, and politics in palaeontological research: The case of Myanmar amber.

²³ Das. S. and Lowe, M., 2018. Nature read in black and white: Decolonial approaches to interpreting natural history collections. *Journal of Natural Science Collections*, 6, pp.4-14

²⁴ Das. S. and Lowe, M., 2018. Nature read in black and white: Decolonial approaches to interpreting natural history collections. *Journal of Natural Science Collections*, 6, pp.4-14

²⁵ Raja, N.B. and Dunne, E., 2021. Minority Language Speakers in Palaeontology.

Palaeobiology Database and Parachute science

- ❖ Further analysis of the PBDB, over 1.5 million fossil records found ¼ of palaeontological research in Morocco, Tunisia, and Algeria (former colonies) was done by researchers in France.
- ❖ 10% of papers from South Africa and Egypt included UK based researchers.
- ❖ 17% of papers from Tanzanian fossil localities were written and published in Germany.

Most of these statistics highlight there has been little to no collaboration with locals, with both Myanmar and the Dominican Republic scoring the highest on the Parachute index ^{1 1}



Questions to ask ourselves:

- ⊗ Where do museums continue to exist in their current form?
- ⊗ Are there tradeoffs in where and how samples are acquired?
- ⊗ Who “owns” a sample when it is collected? And are there situations in which samples should not be collected?
- ⊗ How common are long-term, mutually beneficial partnerships between researchers and communities local to field sites?
- ⊗ How have modern practices inherited the legacies, traditions, and attitudes practiced by Western explorers?
- ⊗ How has this affected our science?



Mineral Extraction, Mapping and Native Geographies

As touched upon in the previous pages, colonialism and imperial efforts required the expansion of land for resource. This led to questionable exploration by colonial forces, the erasure of native spaces and places, as well as the centring and exaggeration of the west's position on the globe.

NATIVE GEOGRAPHIES

This is what happens when using the Mercator projection, it shrinks land at the equator and exaggerates the poles ultimately picturing the 'developed' global north as bigger and the developing as smaller¹. These first maps were also produced by European colonisers, Europe was and continues to be the centre of the conventional world map.



European colonisers erased the hard-to-understand native place names with more 'palatable' words, often renaming features of a landscape like volcanoes or mountains, roads, and even homes ^{26, 27}

²⁶ De Blij, H., 2012. *Why geography matters: More than ever*. Oxford University Press.

²⁷ Akerman, J.R. ed., 2009. *The imperial map: cartography and the mastery of empire* (Vol. 15). University of Chicago Press.

28, 29, 30. This erasure can even be seen today where former colonies continue to use European names. Colonies were arranged to maximise and facilitate extraction, with land determined useful or useless depending on the predicted profit ⁵. Land was surveyed and mapped for this purpose, essentially made blank and inhabitants ousted with new methods of production.

Unfortunately, even today in discussions on development the spatialisation of time and the temporalisation of space, imagines non-Western places as contemporary re-enactments of Western parts ³¹. ‘We were like them but developed, they are like us and have yet to develop’, allowing the west to reinforce and facilitate indirect rule. It is clear this needs to be explored further, the historical legacy of acts that seem far from relevant continue to play a role in our today.

²⁸ Brown, N., 2014. *Landscape, justice, and the politics of indigeneity: denaturalizing structures of settler colonialism in the Alberta/Montana borderlands* (Doctoral dissertation, University of Illinois at Urbana-Champaign).

²⁹ Brennan, R.E., 2006. *European representations of the New World in travel narratives and literature, late-fifteenth to mid-seventeenth centuries*. Cardiff University (United Kingdom).

³⁰ Nna, O.U., 2015. Decolonizing place-names: Strategic imperative for preserving indigenous cartography in post-colonial Africa. *African Journal of History and Culture*, 7(9), pp.180-192.

³¹ Rao, R., 2014. The locations of homophobia. *London Review of International Law*, 2(2), pp.169-199.



The history of Fieldwork: How can we make global research mutually beneficial?

The history of fieldwork is far from glamorous, with links to the slave trade and oppression³². **GeoContext** is a website aimed at decolonising the geoscience curriculum. It was designed by a group of American scientists, and they link some of geoscience’s most prominent figures to a darker colonial past. They have created slides explaining the links between Matthew Fontaine Maury’s investigation of trade winds, “Scientist of the seas” by Maury, to his pro-slavery advocacy during the 19th Century in “The Amazonian Republic”. This points to the long history of oppression that allowed early Western-led science to develop.

EXTINCTION

There are many examples of hunting and capture in colonial countries that led to the extinction of a species. For example, the Quagga was hunted to extinction by European settlers in South Africa³³. The passenger dove was also hunted to extinction in North America at a

³²GeoContext. (n.d.). Welcome to GeoContext! [online] Available at: <https://geo-context.github.io/> [Accessed 26 Jul. 2022].

³³Twiby, L. (2019). The Quagga and Colonialism. *Retrospect Journal*. [online] Available at: <https://retrospectjournal.com/2019/12/02/the-quagga-and-colonialism/> [Accessed 26 Jul. 2022].

record-breaking pace. In the past, many settlers were in favour of imperialism³⁴ and many resources and animals were taken from natural environments. During the colonial period, animals died in zoos due to poor maintenance. Many indigenous practices that preserved the natural environment were ignored³⁵. The exploitation of the land during the colonial era resulted in increased deforestation³⁶. The history of Western science is embedded with these colonial roots. Western scientists also have relatively unrestricted access to many countries while scientists from the global south face financial barriers to accessing knowledge, for example, rigorous visa checks. Science can greatly benefit from diverse research origins to remove dataset biases³⁷, for example, the palaeobiological database.

One way to strengthen this North-South divide is to improve collaboration between western and southern universities. Schemes such as the Jameel fund have driven collaboration between Imperial College London and King Abdulaziz University (KAU). This collaboration can boost the commercialisation of science encouraging more innovation and discovery in the Global South. Overall, the

³⁴Roy, D. (2018). Science Still Bears the Fingerprints of Colonialism. [online] Smithsonian. Available at: <https://www.smithsonianmag.com/science-nature/science-bears-fingerprints-colonialism-180968709/>.

³⁵Murphy, A. (2019). Conservation's Biggest Challenge? *The Legacy of Colonialism (Op-Ed)*. [online] livescience.com. Available at: <https://www.livescience.com/65507-conservation-colonialism-legacy.html>.

³⁶McQuade, J. (2019). Earth Day: Colonialism's role in the overexploitation of natural resources. [online] The Conversation. Available at: <https://theconversation.com/earth-day-colonialisms-role-in-the-overexploitation-of-natural-resources->

³⁷Raja, N.B., Dunne, E.M., Matiwane, A., Khan, T.M., Nätscher, P.S., Ghilardi, A.M. and Chattopadhyay, D., 2022. Colonial history and global economics distort our understanding of deep-time biodiversity. *Nature Ecology & Evolution*, 6(2), pp.145-154.

collaboration will establish ethical connections between countries boosting innovative science globally³⁸.



Spreading **knowledge** can help to balance the **North-South divide**.

³⁸Forum, W.E. (2022). 3 ways to address the North-South divide in scientific research. [online] The European Sting - Critical News & Insights on European Politics, Economy, Foreign Affairs, Business & Technology - europeansting.com. Available at: <https://europeansting.com/2022/02/07/3-ways-to-address-the-north-south-divide-in-scientific-research/> [Accessed 26 Jul. 2022].

80% of papers published in Africa were done in collaboration with Western nations, demonstrating the reliance of the global south on the global north³⁹.

Dismantling historical colonialism with future collaboration



A paper by Dodsworth, 2019⁴⁰ explains some of the challenges of making research collaborations in Africa more equitable today. The paper explains current links between colonialism and research capacity today, pointing to the fact that ‘colonialism, for example, has shaped who collaborates with whom. In North-South research

partnerships, this is evident in patterns of co-authorship’. The paper talks about current collaborative research and the diminished role scientists from the global south are often allocated to, because of the history of colonialism.

³⁹Boshoff, N., 2009. Neo-colonialism and research collaboration in Central Africa. *Scientometrics*, 81(2), pp.413-434.

⁴⁰Dodsworth, S., 2019. The challenges of making research collaboration in Africa more equitable. In *Oxford research encyclopedia of politics*.

A great example of collaborative and ethical fieldwork was published in an article by The Atlantic (Yan, 2021)⁴¹. It tells the story of Cheryl Knott, an American anthropologist, who worked closely with locals in Borneo. Throughout her time there, she managed to get funding to pay her local collaborators for their assistance and inspire the community to take an interest in her research on Orangutans in Borneo. During the pandemic, Knott's movements were restricted; luckily her locally trained colleagues were able to take over field data collection and continue her work!

⁴¹Yan, W. (2021). The Pandemic Is Undoing Field Researchers' Oldest Assumption. [online] *The Atlantic*. Available at: <https://www.theatlantic.com/science/archive/2021/04/parachute-science-doesnt-work-in-a-pandemic/618522/> [Accessed 26 Jul. 2022].

Barriers: Are you a native English speaker?

When it comes to science, colonisation has resulted in the construction of a subtly biased system towards the West and creates barriers for scientists in the global south.

A notable barrier that scientists in the global south face is the language, as most papers are written in English⁴². This puts non-native speakers at a disadvantage and creates biases. Studies have shown that papers not written in English can be overlooked in literature reviews⁴³. To combat this, peer-language proofing has become more accessible to non-native speakers. Conferences are often held in the Global North and in English.

Questions to ask ourselves:

- ☺ How 'powerful' is your passport? What do visa processes look like for different nationalities?
- ☺ How accessible is knowledge to those in the Global North vs. the Global South?
- ☺ What steps can be taken to ensure respectful and equitable collaboration between Earth scientists and indigenous or local communities when conducting research on their land.
- ☺ What changes can be made to Earth Science education to promote diversity and decolonisation



A marine biologist from India details his modern-day experience that is rooted in colonialism. He says that when “researchers from the developed

⁴²Khelifa, R., Amano, T. and Nuñez, M.A., 2021. A solution for breaking the language barrier. *Trends in Ecology & Evolution*.

⁴³Amano, T., González-Varo, J.P. and Sutherland, W.J., 2016. Languages are still a major barrier to global science. *PLoS biology*, 14(12), p.e2000933.

world come to countries like mine, do research and leave without any investment in human capacity or infrastructure... ..it creates a dependency on external expertise and cripples local conservation efforts...”⁴⁴. He then goes on to talk about [parachute science](#), saying: “if we acknowledged that working anywhere other than our home country is a privilege and not a right, and if we all looked to learn and share equally and were equally equipped to do research based on the needs on the ground, then we would be better off”. Barriers such as reliance on Western publishers, language, and passports all discourage scientists in the global South.

Thierry Zomahoun, 2019⁴⁵ founded the AIMS Next Einstein Forum, a global forum for science, the first on African soil, which sets out to establish Africa as the next hub for global science. Thierry is passionate about science, business, and innovation for the development of Africa, and he supports schemes to tackle barriers scientists in the global south face.

“Africa remains the greatest untapped pool of scientific genius”.

Thierry Zomahoun

⁴⁴Vos, A. de (2020). The Problem of ‘Colonial Science’. [online] Scientific American. Available at: <https://www.scientificamerican.com/article/the-problem-of-colonial-science/>.

⁴⁵The University of Pretoria, Hill Crest Campus (2023). *Future Africa*. [online] Available at: <https://www.futureafrica.science/index.php/about-us> [Accessed 26 Jul. 2022].

What does an Earth Scientist look like?

Perhaps you imagine a scientist working in a lab, a field scientist mapping an outcrop, collecting data, or a scientist coding at their computer all day. All these are geoscientists working today, across the globe!⁴⁶. Challenging what some might consider a traditional image of a geoscientist is important in promoting inclusivity.



You might not be surprised to know that a colonial legacy has shaped the traditional image of an Earth Scientist⁴⁷. Many explorers were pro-slavery such as Henry De La Beche who created the first geological map of Jamaica. This concept addresses the fact that much of the history of science is credited to European settlers and explorers. The late 17th to 20th-century scientific discoveries & developments, that have contributed to modern science, do not always acknowledge the contributions of natives as well as their mistreatment.

⁴⁶Keller, G. (n.d.). 1. Deccan Volcanism – An Adventure in Science | Gerta Keller, Professor of Geosciences, Emeritus. [online] Available at: <https://massexinction.princeton.edu/deccan-volcanism/01-deccan-volcanism-adventure-science>.

⁴⁷Rogers, S.L., Lau, L., Dowey, N., Sheikh, H. and Williams, R., 2022. Geology uprooted! Decolonising the curriculum for geologists. *Geoscience Communication*, 5(3), pp.189-204.

There have been calls by scientists for historical species names to be re-evaluated and for indigenous names to be used where appropriate⁴⁸. For example, the giant conifers in New Zealand are called *Agathis australis* when they have already been named “Kauri” by New Zealand’s indigenous population, Māori.

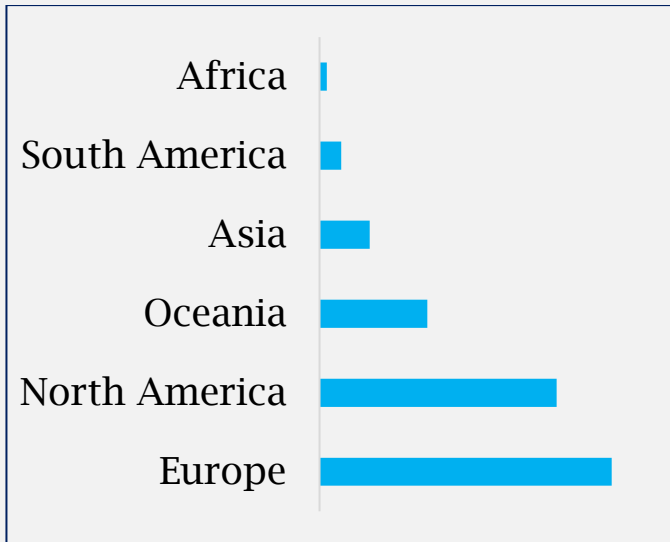


Changing the image of geosciences is a priority, but UCL is not the only university promoting the decolonisation of geosciences. For example, the University of Minnesota School of Earth and environmental sciences published an article explaining changes such as the labelling of stolen specimens and reviews into the curriculum ‘to ensure that it respectfully includes indigenous Peoples’ histories and the colonial legacy of geoscience and geo engineering in Minnesota⁴⁹.

⁴⁸Evans, K. (n.d.). Change Species Names to Honor Indigenous Peoples, Not Colonizers, Researchers Say. [online] *Scientific American*. Available at: <https://www.scientificamerican.com/article/change-species-names-to-honor-indigenous-peoples-not-colonizers-researchers-say/>.

⁴⁹Aristide, A. (2021). Recognizing Geology’s Colonial History for Better Policy Today. [online] Eos. Available at: <https://eos.org/science-updates/recognizing-geologys-colonial-history-for-better-policy-today> [Accessed 26 Jul. 2022].

Climate: Who has a say?



Studies by Carbon Brief⁵⁰ have shown that there is a lack of diversity and inclusivity within climate research. Published figures from the report show that ‘The percentage of authors from the top 100 most-cited climate science papers during 2016-2020...’ from Europe and North America combined are over 70% while authors from Africa and South America make up less than 4%.

⁵⁰Carbon Brief. (2021). Analysis: The lack of diversity in climate-science research. [online] Available at: <https://www.carbonbrief.org/analysis-the-lack-of-diversity-in-climate-science-research/> [Accessed 26 Jul. 2022].



A paper written in 2021 by Dolors Armenteras⁵¹ about guidelines for healthy global scientific collaborations received much agreement from the global south about the imbalances felt during the collaboration, she explains in an interview with Carbon

Brief, that a lack of funding and facilities puts them in an undesirable position. Scientists in the global south such as Dr. Quan-Hoang Vuong a researcher at Phenikaa University in Vietnam believe that countries that have been facing the severe consequences of climate change should be able to contribute more.

⁵¹Armenteras, D., 2021. Guidelines for healthy global scientific collaborations. *Nature Ecology & Evolution*, 5(9), pp.1193-1194.

Useful resources

We understand that what we have discussed within this Zine is just but a fraction of the wider colonial and imperial legacy in our sciences. Below are some resources we came across that you might find useful for exploring this topic further.

- i. **GEO CONTEXT** – a social and political context but Geo science education:
<https://geo-context.github.io/>
A free resource aimed at giving a clear social and political context for Geo science education
- ii. **Paleosynthesis workshop series DDCP – Diversity Dynamics and Crises in Paleontology**
<https://www.paleosynthesis.nat.fau.de/index.php/ddcp/>
- iii. **Racism. A history, part 2: “Fatal Impact 2” (digital)**
This video explores racism, the colonial domination of Africa and social Darwinism, particularly of interest to those who want to explore imperial policies further and potentially their contemporary role
- iv. **Geology uprooted! Decolonising the curriculum for Geologists** – Steven Rogers, Lisa Lau, Natasha Dowey , Hinna Sheikh and Rebecca Williams - 08/07/22
<https://gc.copernicus.org/articles/5/189/2022/>
This paper also explores some alternatives to the current curriculum.
- v. **A critical Museology – Antony Shelton (2013)**
<https://arenet.org/img/critical%20Museology%20A%20Manifesto.pdf>
- vi. **5 Maps that will change how you see the world**
<https://theconversation.com/five-maps-that-will-change-how-you-see-the-world-74697>
An article looking at various maps and exploring how our histories may have altered our world view.

THANK YOU

We hope that this zine has been informative and provided – if not new information – perhaps a new perspective upon our beloved subject. We know that within the scope of this subject there is so much more that could be explored, and we hope that future research can be done to combat the impact of colonial and imperial import. All the images and graphs used within this zine are free use and/ or the author was contacted and gave us permission to use them.

