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Title: Labours of excavation: Reflections on “Unearthing the collection”

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Source: Armstrong, E. S. & Oroweng, K. V. (2024). Labours of excavation: Reflections on “Unearthing the collection”. *Journal of Natural Science Collections*, Volume 12, 19 - 36.

URL: <http://www.natsca.org/article/2841>

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Labours of Excavation: Reflections on "Unearthing the Collection"

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Received: 30th July 2023

Email for correspondence: eleanor.armstrong@su.se

Accepted: 24th Nov 2024

Citation: Armstrong, E. S., and Oromeng, K. V. 2024. Labours of Excavation: Reflections on "Unearthing the Collection." *Journal of Natural Science Collections*. 12. pp.19-36.

Abstract

This article explores how theoretical framings of *heritage as process* can be employed to contextualise natural science collections as complex, dynamic and contested assemblages of objects, places, practices and people. This research is a result of reflections on a workshop the authors organized, "*Unearthing the Collection*", with the aims of exploring and engaging with empirical, theoretical, and practical considerations of anti-colonial approaches when working with mineralogical collections. Using mineralogical collections as a model, the article draws on scholarships of critical heritage studies, science communication, and decolonial curatorial interventions to interrogate natural science collections' past, present, and future lives. Leveraging insights from the workshop, this article expands on labour as a key theme and a critically neglected social dimension of natural science collections. We build on this and frame labour as a tactic and tool for strategic intervention through museum activism or curatorial approaches. We define three different labour-centric perspectives that serve as lenses for constructing spatiotemporal life-histories of collections and specimens (from points of extraction to acquisition and maintenance) and for implementing anti-colonial praxis. This article concludes with a reflection on the limitations of labour as a lens and other tactics that can be explored to unearth collections.

Keywords: Heritagisation; labour; mineralogical collections; Anthropocene; science communication; education; anti-colonial; extraction; anti-racist

Introduction

In response to calls in natural history and science museums to develop real, truthful historical contextualization of science collections, this paper takes on the challenge by reflecting on a workshop the authors ran, "*Unearthing the Collection*" (UtC), that used anti-racist and anti-colonial scholarship as a critical lens to examine mineral collections. The workshop brought together advanced undergraduate and graduate students from the University of Delaware to explore the ways in which science communication, anti-racist and

anti-colonial practices can be employed to contextualize mineralogical collections. UtC was funded by the University of Delaware Anti-Racist Initiative (UDARI) to develop community engagement with anti-racist practice in public institutions. A key observation by the authors from the workshop was how highlighting labour acted as a powerful device for unveiling hidden histories of collections and as a tool for strategic curatorial interventions. By closely examining different types of labour linked to mineralogical



collections such as the work of mineral specimen extraction, the logistics and histories of the mobility required for specimen trade or to get into exhibitions, and the attentive care and maintenance of collections, we unlock productive pathways for anti-colonial and anti-racist interventions. In practice this might involve proactively including in public displays the traces of the historical forms of labour that contributed to the establishment of a collection, and the acknowledgement of processes of erasure, concealment and under-documentation of distant or marginalized actors.

We present our framing questions for the data and discussion of this paper: What does it mean to be contextualising science within the mineralogical museum? What has our workshop's specifically anti-colonial orientation allowed us to highlight? Finally: how are these approaches understood or engaged within the workshop? We draw on Liboiron's (2021a) formulation of *anti-colonial* (emphasis ours) in this text, rejecting colonial and settler practices, instead drawing on lineages that span Indigenous, queer, feminist, and Afro-futurist, decolonial and postcolonial approaches and lenses. Then we utilise two theoretical frameworks:

- i.) heritage as a dynamic process that ongoingly assembles objects, places, bodies, histories, and practises
- ii.) the strategic use of activist tactics as guiding principles and prompts for anti-colonial interventions within mineral collections.

We explore how these theoretical framings illuminated three different types of labours at work: the labour of extraction, the labour associated with mobility, and the labour of maintenance. In conclusion, we offer a reflection on our focus on labour, and gesture towards other themes that may also give those working in public-facing mineralogical collections further avenues to explore their own tactics in museum activism praxis.

This paper contributes to the scholarship by continuing discussions in the *Journal of Natural Science Collections* on capital-colonialism in natural science collections (including Das and Lowe, 2018; Gelsthorpe, 2021; Hearth and Robbins, 2022), by documenting an intervention at the university-level to stimulate engagement with these questions beyond the scholarly archive and into public practice with collections, and finally by suggesting ways that these theoretical insights may be picked up in praxis elsewhere. Our workshop approach also aligns this work with innovations in teaching and learning in the natural sciences that employ situated and embodied inquiry-led learning,

particularly introducing elements of verticality such as atmospheres (e.g., Engelmann, 2023) and the subterranean (e.g., Truys, 2018) to the classroom.

Heritagisation and the Mineralogical Museum

The relevance of heritage is always a question of the present, rather than the past - shaped by contemporary needs and demands (Tunbridge and Ashworth, 1996). This perspective is particularly well theorised in literature that grapples with "heritage as process", a framework that conceptualises "heritagisation" as a dynamic process involving the continuous creation and maintenance of heritage. Such a perspective opens a space for discussions about the processes that have shaped our institutions, and the possibilities for them going forwards. Rather than heritage (objects, places, practices) as static, fixed, and unchanging in meaning and relevance over time; this theoretical lens helps us see how heritage is (re)made over time. In *Heritage: Critical Approaches*, Harrison (2012) posits that:

Heritage is not a passive process of simply preserving things from the past that remain, but an active process of assembling a series of objects, places and practices that we choose to hold up as a mirror to the present, associated with a particular set of values that we wish to take with us into the future. (p. 4)

While Harrison formulates this in relation to *cultural* heritage, we argue that this is equally applicable to *scientific* heritage. Science (and its collections) somewhat resists heritagisation (as Harrison coins) as the idea of 'objectivity' (Daston and Galison, 2021) permits scientific heritage to be formulated as not socially specific or historically contingent. The literature on science centres as a space for demonstrating 'laws' and 'theories' rather than 'facts' lends credence to the idea that science heritage is not (re)made but, rather, simply *is*. In the context of mineralogical collections - typified in display by cases of rocks and minerals which are often wooden, often arranged spatially such that one can look down on the collections, frequently unchanged over many years - the impression of the space is to make the objectivity, and thus *realness*, of science tacit to the visitor. The mineralogical collections are framed as part of a system that delivers value-neutral, scientific knowledge about the world, obscuring the intentional creation of these spaces, preparing visitors for particular views about the position of science in society, the security of scientific futures, and the idea that science is 'outside' social systems.

Attending to processes of making this scientific heritage, through a focus on embodied and interactive mechanisms, can help researchers and curators articulate the tensions of the collection to visitors as we demonstrate in the discussion below.

This changing understanding of science museums by scholars and practitioners has been conceptualised through frameworks such as the fourth-generation science museums, those seeking to promote active citizenship and social responsibility through a dialogical and participatory model (Pedretti and Iannini, 2020). This work builds on previous scholarship that has examined the development of museums through a 3-tier successive generations model, where first-generation science museums were defined by conservation, collection, research and training which was marked by their strong affiliations to academic institutions and a strong adherence to the 'look-but-don't-touch' principle (Amodio, 2013). These were succeeded by second-generation science museums which shifted their attention from experts and scholars towards using their collections for public science education (Friedman, 2010; McManus, 1992). By the early

1960s third-generation museums emerged distinguished by the development of science-technology centers that have little to no permanent collections, and the inclusion of contemporary science concepts and interactive hands-on science exhibits (Figure 1). Pedretti and Iannini (2020) conceptualise the fourth and new generation of science museums which tackle contemporary socioscientific phenomena such as climate change, sustainability and COVID-19. They employ dialogical and participatory models and techniques such as blogs, newsletters, forums and public lectures in addition to exhibits. A critical examination of their own colonial, imperialist and racist historical ties may serve as a key marker of evolving towards the realization of fourth-generation science museums.

Perhaps most visible in socio-cultural museums, the values embedded in such orientations are increasingly visible in discourses of scientific heritage. Employing Harrison's call to understand that 'our futures are imagined and made possible through the pasts which are produced through heritage in our present' (Harrison, 2013: 7), we



First- generation

- Showcase 'hands-off' exhibits of rare specimens in closed glass cabinets
- Collections and exhibits are presented with no broader context
- Originally served as a resource for scholars and even offered training, most were housed in Universities and colleges.

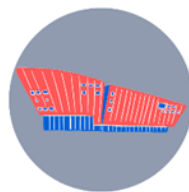
Franklin Institute (1824), Philadelphia ; American Museum of Natural History (1869), New York City



Second- generation

- Marked by the prioritization of public education over acquisition and conservation
- Audience mix includes the general public and younger children as primary targets, secondary to scholars and experts

Museum of Science and industry (1933), Chicago; New York Museum of Science and Industry (1930), New York City



Third- generation

- Purely devoted to public science education, with little to no permanent collections. Most identified as 'science centers' rather than 'science museums'
- Centers pay attention to the links between science, technology, and science (STS)

NEMO Science Museum (1997), Amsterdam; Richard Gilder Center for Science, Education & Innovation (2023), New York City; Wellcome wing - Science Museum (2000), London



Fourth- generation

- Museums pay attention to the links between science, society, technology, and history, e.g. covering topics such as climate change, sexuality, and biodiversity loss
- Multimedia engagement with their patrons through virtual tours, blogs, and lectures

"Circular Factory" (2019), Heureka Finnish Science Center, Vantaa; "Indigenous Ingenuity" (2022), Montreal Science Center, Montreal

Figure 1: Illustrates the various successive generations of science museums, including Pedretti and Iannini's proposed 'fourth-generation museum'. Distinct characteristics for each generation and relevant examples of museums or key exhibits are also provided for contextual and illustrative purposes.

find a process of (re)developing our narratives of the past in relation to science integral to bringing these futures into being. Particularly relevant to our questions of international networks of accumulation (e.g. trade), Harrison (2012) especially draws attention to the recent heritagisation of "globalised and globalising processes of broad international concern." We argue that our focus on mineralogical museums comes in tandem with other similar pushes across heritage sectors to embed global systems - by which we mean systems such as colonialism, capitalism, extraction - within local collections. A focus on these global systems in heritage can take many forms. For instance, Harrison and Sterling (2020, p.22) argue that centring heritage in the planet-wide Anthropocene is not "a nostalgic longing for how things were, but [is] a means of expanding our collective imagination," giving a way for visitors in one heritage to site to see both the site and themselves as part of a global system.

Our workshop's call to "unearth," or expose, some of the tensions inherent in mineralogical collections adhered to an anti-colonial approach that is specific and intentional about the promotion of an ethics of "good relations" between humans and nonhumans (Liboiron, 2021a), and challenges to dominant knowledge systems, by treating 'Indigenous knowledge as expertise, rather than culture' (Liboiron, 2021b). Our anti-colonial orientation drew attention particularly to the way museums appeal to "objective science" - a notion that claims scientific knowledge as impartial, neutral, and presents science museums as apolitical and ahistorical institutions. The anti-colonial perspective challenges this notion by highlighting how museums are necessarily entangled with larger systems of power and prompts us to critically examine the values that underpin the scientific practices that result in scientific collections.

Many natural science museums are undertaking reflective exercises to address their colonial histories. One example is Leeds Museum and Galleries which are acknowledging and addressing the institution's colonial ties through restructuring their collections database to flag controversial or offensive objects and engaging with local African diaspora communities to undertake provenance research. Expanding a decolonial approach, which calls for the 'repatriation of Indigenous land and life' (Tuck and Yang, 2012, p.21), an anti-colonial approach urges us to additionally acknowledge, critique and address the historical ties between science museum collections and colonialism.

Using the metaphor of 'unearthing', our work

mobilises an anti-colonial approach that places emphasis on values over objects. We depart from a longstanding focus on the histories of museum and heritage objects (such as the rocks and minerals themselves). Instead of dwelling on their entangled histories, our work is oriented towards the possibility of action in communicating to visitors. We look not at further documentation of the objects, but rather how to make this knowledge more widely available. In *What comes after entanglement* Giraud (2019, p.7) argues that while the focus on entanglement - which Giraud uses as a term to describe complex histories of phenomena - captures the complexity of world-making relationships, 'there is still a tendency to celebrate entanglement - or treat it as good in itself - with questions about intervention hinted at but ultimately left underdeveloped'. Guided by Giraud's use of the term *tactics* to describe the possibilities of such interventions (2019, p.18), we also offer *tactics* in this paper where 'tactics are a useful concept in maintaining a focus on how praxis is framed by power'. These tactics for activism and change which can be undertaken by anyone in the institution reveal where and how power operates. Thus, the tactics are processes of resistance in themselves. Giraud (2019) differentiates *tactics* from *strategies*, where the latter seek to impose their own way of doing things as instructions. We, like Giraud's theorising, aim to highlight in this paper that there are a multiplicity of *tactics* that can be used by interested parties. In doing so, we draw attention to how such tactics are context-specific, plural, and can open the possibilities for the future in different places and at different times. We resist the idea that this paper can offer a series of universal *strategies* for museum folk to implement. Instead, *tactics* direct the reader to their specific context and it's possibilities. One deliberate tactic we used in the set up of *UtC*, for example, is celebrating multiple existing projects as a group to demonstrate the values we hope to see in mineralogical contexts, rather than seeing these individual projects as templates, or strategies, to be directly replicated elsewhere.

Contextualizing Mineralogical Museums

Alongside a rise in industrialised mining, which underpinned the extractivist capitalist-colonialism of the late 1700s and early 1800s, was an expansion of rock and mineralogical collections. Collectors were nearly exclusively Western aristocrats who had the time and resources to leisurely amass mineral collections to use as symbols of class and wealth (Hearth and Robbins, 2022). The impetus to identify, categorise, and collect materials that could be extracted from the ground based on their physical properties, morphology, chemistry,

and chemical purity increased from the 16th century onwards, as a motivation to maximise capital accumulation from a mine. For example, as Claire Sabel (2021) notes, the early Royal Society of London was extensively invested in the composition of the Earth and the sources and origins of metals and precious stones; frequently with a view to their industrial and capital potential. Elsewhere Stafford (1984) shows how geological surveys by the British were linked with intelligence gathering both on minerals and on local politics. Advances in chemically categorising materials and separating out inorganic materials removed objects such as fossils from mineralogical collections. Even the remaining collections were subject to repeated re-classification impulses of scholars and amateur enthusiasts alike, visible through both the changing names and the changing organisational structures of the collections in archives. These begin to demonstrate how the collections are constituted and shaped by power-knowledge acts by those responsible for them (Foucault, 1981).

From the late 1700s onwards public museums and institutions in western nations (and their colonial outposts - see, e.g., Stafford, 1984) began facilitating the large-scale collecting of geological materials beyond wealthy individuals, during what Knell (1996) describes as the 'heroic age' of geology. A formalising of the field through the coalescing of specialist societies, professionalisation of the practice (including unified museum display styles), and prolific popularisation had taken place by around 1850 (Wyse Jackson, 1999); and by the late 1800s natural history became not only a professional pursuit but an amateur hobby of great popularity. Private and public geology collections were part of a growing fascination with understanding the history of the Earth - and the tension of natural history's epistemic position with that of Christian religious doctrine - as well as placing 'civilisations' in geological time (Allen, 2008). Geology collections were primarily employed in service of a geological education for school children in public museums and in higher education at university collections until the mid-1900s, when the geology field shifted to laboratory and fieldwork studies, leading to a decline in the use of university collections as teaching objects.

These collections had multiple purposes. Utilised as a demonstration of wealth and prestige, to a documentation of imperial expansion, to a resource for scientific practice; mineralogical collections were located in multiple places including the houses of miners, wealthy patrons' private showcases, in the shops of dealers, exhibitions in museums, displays at world fairs.

An example of collecting for imperial expansion to exhibition can be seen in the Sedgwick Museum's John Watson Building Stones Collection. Collected by John Watson (1842 - 1928) with over 1100 samples of building materials throughout the then-British Empire in the late 19th and early 20th centuries (Merrill, 1911). This collection and a descriptive catalogue published in 1911 were donated to the Museum of Economic Geology (later incorporated into the Sedgwick Museum) and continues to expand, now housing over 2500 samples.

Contrastingly, Sendino and Porter (2020) demonstrate how, for example, Louisa Finch, Countess of Aylesford (1760 - 1832) had a mineral collection that was primarily sourced through dealers and at auction between 1810-1832, a collection that was auctioned off itself after her death to various institutions across the United Kingdom and United States of America including the Natural History Museum and Yale Center for British Arts.

Geological and mineralogical collections are now largely housed as i.) stand-alone institutions, ii.) as part of larger natural history - or indeed science or social - museums, or iii.) as part of higher education collections (Hearth and Robbins, 2022). Consequently, mineralogical museums and collections are part of both formal and informal geological education, as well as being part of the other functions of contemporary science museums in lifestyle and leisure choices of publics (e.g. see Figure 1). Current collections are diverse in terms of how they are affiliated with institutions, the style of ownership of the collections, the size and composition of the collection, the number of staff who work with the collections, and the way that collections are being used. Some mineralogical museums (and/or geological museums) have been removed from their physical display locations, while others were disposed of altogether by institutions. Wyse Jackson (1999, p.425) makes the argument that although legacy collections may be of use to historians of geology to move beyond paper records and into a material turn to focus on the rocks as artefacts, this use is dependent on their retained documentation: 'an undocumented and unidentified piece of granite is simply that: perhaps attractive but worthless in terms of scientific history; regardless of where it is kept'.

Worldwide, displays of mineral collections share a visual and physical vernacular in looks and structures: often glass-topped wooden display cases with draws of materials populated with samples; labels that declared their name, type, and location of origin; all sorted according to

standardised classificatory schemes (see for example Figure 2). A number of these rooms at prominent national institutions remain unchanged over decades, invoking an affective experience in contemporary audience members that is often characterised by nostalgia and awe in the space, as our workshop speaker Florence Okoye demonstrated in her presentation on members of the public's experiences of the Minerals Gallery of the Natural History Museum, London. The original intention of such cases being for education in stratigraphy and natural history, many visitors to museums around the world in the twenty-first century experience these spaces as part of a growing experience economy of museums (Harrison, 2012) and "edutainment" (Buckingham and Scanlon, 2001): the museum visitor interest is often in taking photographs of the collections - especially large visually spectacular gemstones such as giant purple amethysts from Uruguay, a 9-foot geode displayed at the American Museum of Natural History.

Despite this longevity of these display styles (the Swedish Museum of Natural History, for example, retains some of the older display cases as a museum of mineralogical museology in their more recently refurbished gallery), some mineralogical collections have been part of a turn towards contextualising science in public institutions. Some of this is led internally in the institutions. The 2021 opening of the Allison and Roberto Mignone Halls of Gems and Minerals at the American Museum of Natural History (New York, USA) sees displays that highlight the people who worked in building the collections (e.g., George F Kunz, a New York based gem dealer for Tiffany & Co; or students Elijah Hamlin and Ezekiel Holmes in the finding

Tourmalines - see Figure 3). This builds on other contextualising elsewhere in the museum around, for example, the theft of the Ahnighito Meteorite (also known as the Cape York Meteorite). Elsewhere, the work to contextualise artefacts comes from grassroots movements outside the institution. *Beyond Extraction* (2022), a community group, led counter tours titled 'Mining the Museum' at the Royal Ontario Museum's Teck Suite of Galleries that critiques both the histories of colonial extraction as well as the continued benefit to the extractive industry in the mineral-intensive transition to renewable energy in Canada and around the world. These changing dynamics take place against a larger shift in public pressure against the mining and extractive industries that originated many of these collections worldwide. For instance, rejection of oil sponsorship in museums is happening apace - in the UK the Natural History Museum London has stopped accepting oil sponsorship (2021), and protest by grassroots organisations such as Liberate Tate, BP or Not BP, and Culture Unstained, as well as specific actions against institutions that continue to take their funding, work to reshape the relation between extraction and processes of heritage.

Alongside scholarship on the Anthropocene and in environmental humanities, a rising interest in the entanglement of geoscience collections and larger systems of power is visible, demonstrating shifting values both in museums and in society at large (see e.g., Roy, 2018). While, '[p]ublic memory, it would seem, can be just as selective as the individual sort,' as Hooper (2017, p.9) asks, 'can such guilty landscapes ever truly be forgotten?' A rich strand of art and design engages with mining and extractivism constantly resurfacing the impacts of



Figure 2: Author photograph of the mineral collection at the Vienna Natural History Museum. (Photo Eleanor Armstrong, 11th October 2023)



Figure 3: Museum exhibition board detailing the discovery of tourmaline gemstones by two college students at Mount Mica, Maine in 1820. Photograph taken at the American Museum of Natural History's Allison and Roberto Mignone Halls of Gems and Minerals. (Photo Eleanor Armstrong, 10th November 2021)

of industrialisation (see, for example, Berlo, 2009; Lippard, 2013; Premiyak 2020). Engaging questions of human-inflicted changes of the landscape through the extraction of materials from the subsurface, these acts of socio-cultural contextualisation are yet another way to help return us as scholars and scientists to the impacts extractive industries have on human lives, global and local environments, and social and cultural practices.

Through foregrounding this existing work that grapples with pulling these changes into view for audience members, UtC worked within a heritage framework that centres on reparative history (Hall, 2018, p.6). The process of heritagisation makes clear that there is always 'contestation over memory – what was to be remembered and how?' (Hall, 2018, p.6). Rather than disavowal or

evasion of the past as is the current regime, we use this idea of remaking our heritage 'in ways that enable thinking about responsibility in the present' (Hall, 2018, p.6) and orient us towards the possibilities for action and transformation of futures. Reparative history in heritage work, as part of a large frame of transformative justice (Sharpe, 2016), sees a reprisal of interest in setting contemporary systems in the contexts of larger historic and global networks. We pick up this movement here in its emphasis not just within academic scholarship, but also within public history and public pedagogy spaces such as mineralogical museums. We equally heed the call of Joseph-Salisbury and Connelly (2021) to think about how we as scholar-activists within the institution could leverage the resources of the university to support communities of resistance and social justices in scientific heritage spaces.

Unearthing the Collection: The Workshop

The workshop was hosted as three half-day workshops aimed at advanced undergraduates and graduate students at the University of Delaware (UD) to initiate thinking on practical, public-facing tactics for anti-racist and anti-colonial practice and public scholarship in/on museums through mineralogical collections. Our project was financed by the University of Delaware Anti-Racist Initiative (UDARI) through their anti-racist programming sub-committee. Three invited speakers-facilitators - Chitra Ramalingam, Selby Hearth, and Florence Okoye - with expertise ranging from mineralogy, natural history collections, and museum user experience unpacked the ways systemic and institutional racism are manifested by and can be subverted in museums.

After active engagement with speakers in their ninety-minute sessions and an initial framing session, participants undertook a speculative design-informed project (Dunne and Raby, 2013) to produce anti-racist and anti-colonial programming ideas for a mineralogical museum context and beyond with rock collections outside of museums. Many of the participant's reflections and ideas have been collated into a legacy workbook zine that will be made available to non-attendees. The workshop legacy includes a digital resource repository for contributors holding an annotated bibliography, relevant readings, and mineral biographies. In the workshop we had three key aims: to raise awareness of existing anti-colonial practice in science museums and science communication; to have a practical element that allowed participants to develop their own ideas; and to develop a legacy that allows future UD learners - particularly those in museum studies - to be engaged in anti-colonial practice in science museums, which has been a lacuna of the museum studies scholarship at large. Our evaluation included questionnaires for participants and for the developers and discursive analysis by ourselves of the anti-colonial content in the projects proposed in the workshop.

Workshop participants came from humanities to geoscience departments and indicated a strong interest in pursuing future careers in museums or archival studies and a shared enthusiasm for science and museums. Some participants already had work experience in museums, and almost all of them expressed enthusiasm for learning more about anti-colonial practices in museum spaces. The cohort for this workshop thus represented both museum visitors and future museum workers. As part of the grant, we offered honoraria to

students to defray the costs of participation outside of their usual studies. Future workshops and research will benefit from a consideration of the labour of engagement (and its compensation) from museum visitors and patrons when engaging with critical questions in ethical, non-extractive engagement, which we took steps to in this project.

Possibilising new narratives and values through a focus on labour

Drawing on our framework of developing tactics (Giraud, 2019) to think through (re)heritagisation in mineralogical museums, it became apparent to us during the workshop that one tactic that is being utilised in research and public communication is to trace, track, and talk about the entangled nature of labour in these collections. As is well documented in other scholarship on mineralogical museums, a focus on labour complicates the histories and futures of heritage-making by highlighting the people, processes, and knowledge systems that underpin the extraction, scientific identification, cataloguing, acquisition, and care of specimens in their journeys from the Earth to within the museum. We argue that a focus on labour reframes what purposes and values the mineralogical museum might have in learning contexts. It makes the possibilities of (re)heritagisation for the public in these collections visible to researchers and practitioners.

Using labour as an analytical device within the context of mineralogical museums, particularly whilst reaching into the past, serves as an anti-colonial strategy. This approach highlights the obscured intersections between histories of empire-expansion, colonial wealth accumulation, and the symbolic significance large assemblages of mineral specimens played in aristocratic social landscapes. Moreover, it demonstrates how science knowledge production is subsumed in these complex histories, sometimes positioned as the result of the collection and at other times serving as a justification for its existence. We echo other researchers' call to reflect on and see the 'role of science...in both colonialism and militarism and in resistance' (Pollock and Subramaniam, 2016). We argue science and natural history museums provide a microcosm of exploring this relationship, and a testing field for possible points of intervention and advocacy. By virtue of being meaning-making spaces for the public, science and natural history museums are especially well-positioned to address colonialist and imperialist logics through critical engagement with topics of labour or accumulation in and in relation to knowledge production (Pedretti and Iannini, 2020). For instance, while mineralogical museum

catalogue and display labels often reflect mineral provenance, there is room to address place-specific histories of labours of extraction and attend to the sociocultural landscapes that led to mineral extraction. This could offer visitors a chance to engage with the material in a more meaningful way and explore its histories beyond the museum.

In the following sections, we trace and discuss three broad categories of labour identified from the workshop: labour of extraction of mineral objects; labour of mobility that put objects in motion and congregate them in mineral collections; as well as the labour of maintaining museum spaces. Using data from the workshop content, participant reflections, and project proposals we highlight corresponding themes of labour and then show how this framing demonstrates their potential as tools and tactics for anti-colonial interventions in public spaces.

i. Labours of extraction

Workshop discussions and presentations indicated an array of interest in obscured histories and legacies of labours of extraction in various ways. Chitra Ramalingam's workshop contribution, "*Out of Place: A British Mineralogy*", engaged with the intersecting histories of mineral collections from India's Deccan Traps formation and the imperialist occupation of India by Britain. Ramalingam's presentation also highlighted the successes of collaborative efforts with Indian artist Garima Gupta, where photographs, maps, and mineral imagery were employed to unpick the layered histories of mineral specimens from a natural history collection for public visitors. This demonstrated how innovative and collaborative interventions could serve as a tactic for (re) heritagisation of mineral collections, as well as documenting the labours of interdisciplinary collaborations. Ramalingam's work highlighted how different forms of labours could be productively assembled to bring specimen-specific or subject-specific histories within museum collections to the fore. A contemporary focus on the ongoing relationship between mineral extraction and digital technology was made visible in Florence Okoye's workshop talk "*Mobiles, minerals and missing links*." Today, while mineralogical museums might hold and practice rigorous ethical sourcing codes, exploitative labours of extraction persist in gems and mineral industries that supply the global smartphone market from the same sites, offering an opportunity to utilise collections to highlight ongoing global issues and to showcase networked supply chains.

During the speculative design component of the workshop, participants built on existing interventions similar to the "*Mobiles, minerals and missing links*" to develop ideas for projects, exhibitions and alternative forms of intervention. We successfully employed a critical speculative design format to allow participants to reimagine museum practices for the public. Participants were encouraged to develop ambitious interventions that used science communication, anti-racist and anti-colonial takeaways from the session to generate new narratives and improve accessibility. A key advantage of employing speculative design in this workshop were that anxieties about project feasibility are removed as potential limiting factors to creativity and innovation. As a result, participants developed projects for interventions that explored the use of digital platforms to improve public participation and access, and considered the potential for stories and narratives unconfined by borders as demonstrated by discussions of some of the proposed interventions that follows.

One group of participants formulated and prototyped a museum exhibition that memorialise the thousands of Black miners who died in and near the *Kimberley* mine - apartheid South Africa's largest diamond mining operation. This intervention resonates with inquiries within the dark tourism field (Lennon, 2017; Scarlett and Riede, 2019) that question what kinds of commemorations are deemed (un)acceptable. In the case of *Kimberley* mine, the 'Big Hole' attracts thousands of visitors mostly on account of its status as the largest hole excavated by hand in the world. The intervention responded to the *Kimberley* Mine Museum, where a sanitised narrative about the lives of Black labourers in the hand-dug mine (Hatcher, 2016) is presented; and associated local monuments such as the *Diggers' Memorial*, a fountain statue in the *Oppenheimer Gardens* of *Kimberley* that was commissioned from Herman Wald (1906 - 1970) in 1960 to honour the men "who pioneered the diamond industry." The narrative of pioneers and "hero-workers" that both portray are countered by a memorial stone that was installed in 2009 to the *Bafokeng Regiments* who died while working as labourers at the mine. The epitaph reads: "They toiled here to earn money for their people so that the land which had been forcibly taken from *Bafokeng* could be bought back". This acknowledgement of the *Bafokeng's* labour and sacrifice highlights the pressures of apartheid-induced displacement that pushed their men into the mines. The participants envisioned a project that built on this by incorporating the untold stories of migrant labourers.

This interest our participants worked on in showcasing the labour that was required to excavate at the mine was in fact considered at the time of a recent re-development of the museum in South Africa. In their masters thesis, Brown (2006, p.52) interviewed contributors who undertook this re-development in the early 2000s, who themselves described the choice to leave out the "social history and the life of the diggers" motivated by how it was "not appropriate in the Big Hole Project," because it was "negative history" that would be on display in a space where those developing the display hoped that visitors were to be entertained: "They want to have fun – not be depressed" (Brown, 2006, p.54). In reviewing the documentation of the mine in local museums, Morris (2021) argues that both the Mine Museum and other local socio-cultural museums (such as the McGregor Museum, the Rudd House) are places where labours of extractivism and labours that facilitated the lives of mine-owners are being ongoingly made visible. The speculative project at UtC that imagined a display that moved around local communities, echoes the tactics for engaging in the entanglement of labours of extraction and mines that have taken place at Sol Plaatje University on the 'Big Hole Counter Narrative Project' that sought to subvert the "reigning imperial and colonial fantasy imbued in the particular place of Kimberley" (Truys, 2018, p.55) through questions of value, worth and waste; past, present and future; and about which narratives are told in these contexts.

Post-workshop feedback from participants also recognised the missing discussions of "families of those affected, the communities that are experiencing residual effects of mining and/or empire" in narratives about extraction that we discussed in the workshop. While we advocate for re-heritagisation to foreground these labours in relation to mineralogical collections, we are astute to the critiques of ethical practice in displaying images or stories, discussing narratives, and encouraging the consumption of what are often exploitative and extractive events. Photographs of workers in mines or gravesites generate issues about how they were captured and their display. As Hooper argues, the practices of 'late modernity, where everything is available for sale and consumption, including images and narratives associated with death' (Hooper, 2017, p.4) are not unambiguously good and require caring and careful engagement in public history contexts.

We argue that employed as a tool for anti-colonial work in mineralogical collections, including the labour - past and present - that has been and is

key to mineral extraction in processes of re-heritagisation can be used to bring to attention the narratives of colonial-capitalism that have been smoothed from scientific spaces. This separation creates the idea that such contexts and labours are perhaps not of concern to science - they are somehow non-scientific (although, is it not science, technology and engineering that supports the development and maintenance of these extractive sites through labour?), and allows publics to not have to engage in the discomfort of reparative histories (as acknowledged in the case of the Kimberley Mine Museum). We see this process of re-heritagisation around labours of extraction as part of a value shift that engages with labour-relations, centres the conditions of miners and near-mine communities, and acknowledges the power dynamics governing labour contracts. These are not struggles relegated to the annals of history: the contemporary global mineral extraction systems remain critical to the flows of materials and capital but largely invisible especially in museum collections. A focus on labours of extraction is a tactic that pulls mineralogical specimens metaphorically out of the display case and back into entanglements with the geology from which they came.

ii. Labours of mobility

Having explored labours of mineral extraction, we also noted a theme of the labour involved in the movement of mineralogical specimens. What are the processes, trade routes, territories, and forms of relations that connected mineral collectors and gem traders with distant mining sites? Once lifted out of their geological beds, how did these specimens come to be in the collections; described, named, and valued? We see some of these in the narratives of the mineralogical museum already - the human-centred stories that are present often feature the individuals who were or are central to the acquisition of objects. For instance, the Carnegie Museum of Natural History, established in 1896, boasts a mineralogical collection of over 30,000 specimens. The museum's largest mineral acquisition was in 1904 when Andrew Carnegie (1835 - 1919) purchased a \$20,000 collection from William W. Jefferis (1820 - 1906). The movement of these purchased minerals from Philadelphia to Pittsburg required two railroad cars. Though this anecdote is often shared in stories about the collection, the logistical efforts and labour involved in such a transfer remain underexplored and only two central figures are emphasized. In this section, we document what anti-colonial approaches to these labours of mobility and acquisition might bring to light in the mineralogical collection.

During the workshop, one of the speakers, Selby Hearth, the curator of Bryn Mawr College's mineral collection, highlighted and illustrated the complex hidden historical ties of wealth accumulation, industrial oligarchs, and labour that can be drawn from a mineral collection. For instance, consider the foundations of the College's mineral collection which was established by Florence Bascom (1862 - 1945), who was also the founder of the Geology Department at Bryn Mawr. The beginnings of the mineralogical museum were a consolidation of donations including contributions from Theodore D. Rand (1836 - 1903), and George Vaux Jr. (1906 - 1927), both prominent industrial oligarchs. The Vaux family's vast wealth was generated by a range of ventures - through licit and illicit trade with China and India; inherited capital from plantation exploitation; and colonial land theft through the Walking Purchase of 1737 (Newman, 2012). By the late 1800s, the money financed the family's interest in mineral collection. Their sponsorship of work in the field led to not only a collection of specimens that now comprise part of multiple university collections with George Vaux Jr bequeathing his to Bryn Mawr College and William Samsom Vaux's (1811 - 1882) going to Drexel University's Academy of Natural Sciences, but also a range of rocks named after them as exemplified by the likes of "vauxite", "paravauxite", and "metavauxite".

While it is, in this instance, the donors and affluent collectors whose stories are carried through the names of their collections, these minerals were rarely excavated by them. Instead, mineral specimens moved through networks of international mineral dealers such as George Letchworth English (1864 - 1944). English's influence also extends to neighbouring institutions like the University of Delaware's Du Pont mineral collection. The circulation of minerals occurred through World's Fairs, trade within the mineral community, and at times even through theft from miners. These networks connect not only specimens within any single collection like a latticework of threads that show the interrelation of capital, purchase, and trades; but also connect one collection to another - showing the vast web that contributed to the development of mineralogical knowledge. More than being mere curiosities, mineral collections serve as a means of illustrating the contingencies of consolidating scientific power and authority through capital.

Tracing these mobilities was also something we aimed to make visible in the resources we created for participants on the project to help inform the design of their final interventions during the speculative design session of the workshop. These

object biographies, were developed from the available and accessible material on the mineralogical collection of the University of Delaware and using platforms such as ARTSTOR a digital image library that hosts records of images from museums, archives and scholars. Biographies comprised of sections describing the different uses and significance, extraction and mining techniques, origins of the specimens, and where possible names of specific mines that specimens came from. The development of mineral biographies drew on wider critical science history scholarship that has, through the influence of anthropological work, proposed object-centred biographies within museums of science, technology and medicine as a way of illustrating the objects' trajectories and entanglements with people, institutions and places (Alberti, 2005).

Inspired by Alberti's (2005) direction on process, and the question-based calls to action in Gelsthorpe's (2021) work on mineralogical displays at Manchester Museum, we also presented a series of prompt questions at the beginning of the mineral biographies for the course, some of which are reproduced verbatim here, that offer mineral-collection-specific departures into anti-colonial possibility in public displays:

- Where, when and how was the mineral named? Notice the differences in the resolution of the place of origin, some minerals have specific mine names and others only have district and province names e.g. Rhodochrosite (South Africa) and Azurite (Namibia) specimens were sourced from named mines while the Cassiterite (Afghanistan) and Mesolite (India) place of origin does not go beyond district and sub-district levels.
- Origins of mineral names - connections to specific languages and people? e.g. Sillimanite is named after Yale Chemistry Professor Ben Silliman.
- Why is it scientifically interesting? What sorts of geologic occurrences and environments is it normally found in? Does it have any cultural significance?
- What is it used for? Industrial etc, can it be substituted for something else or serve as an affordable alternative for another type of good?
- How is it mined? Purified or converted to other goods? What kinds of infrastructure (skills included, artisanal and technical) does it require?
- What funding structures support it? In the collection, in extraction? In transportation?

As Hearth and Robbins (2022, p.14) observe, while the questions in displays might be about *which* minerals are used in everyday items such as your toothpaste (a tactic which sits largely in line with projects about connecting people's everyday lives to scientific displays), it is rarely if ever "how do these get into your toothpaste?". Working through these questions, a workshop participant reflected in the after-survey that "being more transparent about the violent histories of mineral acquisition" stood out for them as a strategy for undertaking anti-colonial work in physical science museums.

One of the interventions developed a public-facing project about mineral resources in high-end commodities, tackling the *how* question more explicitly. The project took inspiration from the Center for Plants & Culture (2022), which works to educate on "the many ways our politics, economics, and culture are shaped by plants... encourag[ing] critical thinking and self-reflection", by using plants as a mechanism to discuss history, labour and economics, and arts and culture. The Center's Instagram account, @plants.and.culture, runs a series of posts that document the circulation of individual plants in global systems - for instance, the documenting the "Rise & Fall of Mahogany", with text in English and Spanish (21 March 2022) shows how the Honduran mahogany tree's changing uses from ongoing canoe carving, to western shipbuilding, to western cabinetry, adversely impacted local communities through its logging and transport in dangerous conditions.

A participant had worked on the University of Delaware's ThingStor, a digital collection of objects that document antiquated items in literature for those unfamiliar with them. Exploring objects such as a doubloon, pewter plates, a tea urn, a silver rattle, or a marble table inventoried on the ThingStor prompted questions about how these minerals made their way into the object - information that is not included in the artefact classification information the same way other functional, literary, or 'origin' content are. The participants built proposed Instagram carousels that documented the marble table, showing how colonial dispossession of Indigenous communities and canal infrastructure building in the north-east United States led to a vogue for marble furniture in an effort to invoke the white-washed classical civilisations of Rome and Greece. This project demonstrated the possibility to show inter-museum links between minerals collected as specimens in mineralogical collections with artefacts composed of some minerals in socio-cultural institutions. Similar work on making visible natural material elements of socio-cultural objects

and the gendering of labour involved in their mobility had been undertaken at the Victoria and Albert Museum on wool caps and tortoiseshell snuff box (Daybell *et al.*, 2020), and we see similar possibilities to make visible these traced processes that highlight how minerals, networks of trade and production, and commodity goods are connected.

As a tool for anti-colonial interventions and re-heritagisation, we argue that considering the labour of mobility and acquisition in public-facing materials serves as a tactic for exploring the routes, forces, actors or agents, and processes that make minerals mobile. Part of the larger processes of extraction from mineral exploration (including searching for new mineral prospects, evaluation of economic potential and infrastructural possibility) and exploitation; attending to and foregrounding processes of acquisition, circulation, and reconfiguration in mineralogical collections can make visible the networks of science and systems of capital that underpin(ned) the Industrialised world. For instance, the British East India Company historically traded both opium as well as gems and minerals such as silver between its Indian colonies and China (Lintner, 2000). The configurations that facilitated these movements of mineral specimens were also essential to the movement of people, both forced (including enslavement) and voluntary such as the migration of miners or forced displacement of communities for mining. By following the routes of licit and illicit commodities, past and present, we can unearth the complex interrelation between natural science collections, colonial and imperial histories, and the collection's connections to contemporary extractive practices.

iii. Labours of care, maintenance and engagement

While contemporary labours of museum maintenance, care, and engagement are distinct from past labours of extraction with respect to differentiated power dynamics, labour conditions and risk exposure; it would be remiss not to discuss the institutional labours that are so integral to all museum operations as both a tool for anti-colonial practice and a reflective point of intervention. Staff from curators to the front-of-house engage in daily processes that utilise the collection to create experiences for visitors. Collections care and maintenance includes the careful management and handling of objects under display, storage, or in transit, while labours of engagement concerns itself with building relevance, engagement and exploring avenues for renarrativising collections and objects.

Recent work to make visible these practices and

processes has seen a rise in, for example, open storage spaces (e.g. Yale Peabody Museum), public viewing of museum workers at work through open labs (e.g. Field Museum and Burke Museum's *Testing Testing 1-2-3: Work in Progress* exhibitions which gave visitors a chance to watch staff scientists analysing or preserving specimens), or showing the processes of returning stolen objects (e.g. Technical Museum of Vienna). Showing the labours of care, maintenance, and development of the public space of museums and their collections rejects the hegemonic motif of 'tidying away' (Macdonald, 1998) traces of the labour of exhibitions at technoscience museum and its commensurate creation of a voice of 'objectivity' for the museum. We introduce this theme in the paper as, in the feedback from the workshop, we asked participants what they felt was still missing from the discussions we had had though the sessions and many noted that it was those working in the institution today (e.g. "staff that work at museums and archives", "volunteers") whose experiences we had not engaged with sufficiently. Here, we re-trace the ways that the workshop made such forms of labour visible and what these contribute to the practice we aimed for.

The recurring theme for better institutional support structures that can facilitate change within the museum was a shared concern for participants and speakers throughout the sessions. One topic, raised through a selection of experiences shared within the group, was the affective impact on individuals and groups within institutions to make change, and the challenges of reaching sustainability in worker-facilitated transformations within an institution or collection. These ranged, in the experiences of the group, from challenges with securing longer-term funding to continue work, time in long-term positions to continue work on projects, or long-term positions altogether. There was a prevailing sense that work that tackled anti-colonial and anti-racist themes seemed to be particularly likely to be seen as beyond the usual job-remit of individuals. Compensating, supporting, and crediting all forms of labour is in itself an anti-colonial practice. Cognizant of this dynamic, the UtC workshop recognised the labours of participation done by attendees and speakers who were offered honoraria out of recognition of time invested and knowledge shared. One session led by Florence Okoye made visible the labour of undertaking research on how mineralogical galleries are received by the public. Documenting a 2017 interactive exhibit that sought to connect mineral specimens in the collection at London's Natural History Museum to the lives of visitors through

seeing them as components of mobile phones; the research also captured how visitors relate to the displays as they stand and the working practices that went into doing the research in the gallery. Emergent in this talk was the importance of financial support in sustaining research and longevity in (especially anti-colonial) practices in the museum, a sentiment echoed by other participants.

Labours of care and maintenance in the institution are also visible by highlighting collaboration within an institution, between institutions, and with interested parties beyond institutions. Different collaborations surfaced through the project: Ramalingam talked about her work on the collaborative project *100 Histories of 100 Worlds in 1 Object*; Okoye described and analysed collaborative knowledge-making with members of the public at the Natural History Museum; and Heath's practice included researching the collection at Bryn Mawr in collaboration with students at the University. Stimulated by this, one of the interventions proposed in this project that might see collaboration between museums in the Global North and Global South around meteorites in their collections and where they had been collected from, particularly exposing the artifice of nation-state-based origins against rocks that came from beyond Earth itself. We also tied this emphasis on collaboration into the bedrock structure of the workshop. We aimed towards building a community where different types of expertise were brought together.

This work to value different ideas and perspectives was recognised by participants, with one respondent noting: "Everyone knows something" in the workshop feedback; and others finding that this workshop helped them see "collaboration" and "connections" as a key tactic for doing anti-racist and anti-colonial work in the museum space. As a tactic for anti-colonial work, collaboration facilitates a shift from the single authoritative voice constructing an abstract and apolitical voice of science, working instead towards a polyvocality that encourages resistance to the totalising power of knowledge systems. In recognising that workshop participants, other institutional professionals, students, or museum-goers are active knowledge participants with their own existing knowledge, we demonstrate the process of making heritage on the local scale, and ask how this personal knowledge could be valued in heritage contexts. As Harisson (2012, p.10) argues, this model of heritage facilitates 'more democratic decision making,' connecting heritage with systemic issues such as environmental change.

Acknowledging the forms of labour and knowledge systems that are integral to the museum industry also exposes ongoing relations of production that introduce a human element to the collections and are bound up with the public-facing functions of museums. While conditions of labour differ significantly from historical labours of extraction, institutional support structures that affect the impact and sustainability of worker-facilitated change were a shared theme from speakers and participants. Failures to adequately support and value worker labour through the provision of financial and human resources often led to short-lived and forgotten anti-colonial and anti-racist programming.

Reflecting on the challenges of providing invisible work for collections care, Kiersten Latham (2007) indicated levels of invisibility at an institutional level as well as from the public with ramifications for whose labour (worker) and the kinds of labour (the work itself) is prioritized and valued:

I realized that there are at least three levels of invisibility in the museum world. The museum itself is somewhat invisible to our public. What we do, as a whole, is not well-understood, or even thought of, by much of our public. On another level, within the museum, the work of caring for our material heritage is often not understood by other museum staff, administration or the board. The ramifications of this are very serious. And what's more, the work of preserving and protecting our cultural heritage is not seen by most of the visiting public.

Seeing institutional labour as co-relation and co-productive is instructive for highlighting opportunities for collaboration. Institutions, workers and patrons form an active congregation that dynamically engages in the continued heritagisation of museum spaces and collections. These forms of labour extend beyond mineral collections under public ownership to private collections care which remains largely unexplored in the past and present contexts.

However, our collaborations were imperfect. Our participants noted, as we did, that we lacked local Indigenous representation in the project, considerations of repatriation and reparations as well as multispecies perspective (Figure 4). Despite our efforts to bring local knowledge on land relations, geology, and mineralogy in collaboration with the Nanticoke nation on whose unceded territory the University of Delaware is located, we were unsuccessful in this regard. While we introduced literature from Indigenous authors globally, we acknowledge the issues with thinking

through anti-colonial work, situated in now-Delaware, without the inclusion of Indigenous communities, scholars, or students from the area. We encourage those seeking to replicate such a project to ensure that similar issues are considered and tackled in their planning and execution. Additionally, though our project took an intersectional approach to these themes, as one participant noted, this meant we did not fully address "social justice beyond race, class, and into issues around disability and access." Both engaging post-intersectional approaches (Nash, 2019) and a specific focus on access and disability going forward would tackle this. Bringing labours of collections care, maintenance and engagement illustrates the dynamic processes of heritagisation and the many people who participate in it with taking place through the engagement of many actors that all museums are key figures in.

Reflections: A mineralogical museum in/for the future?

Creating the mineralogical museum as a space of Enlightenment scientific knowledge performs an agential cut - the active making of a separation between two fundamentally interlinked phenomena (Barad, 2003) - between the collections of rocks, minerals and gems and the labours that has gone into getting them where they were today. The rock material and the work on the collection are not intrinsically separated, but rather require individuals and institutions to regulate their separation. Our paper has demonstrated how we can challenge the naturalisation of these actions. Instead, we have utilised labour as a tactic to unpack anti-colonial orientations that make possible re-heritagisation of mineralogical museums. However, we argue this is not the *only* lens that can be used as a tactic - but one of many. Labour perspectives (on excavation, acquisition, and maintenance - but also more that we have not documented here) gives a particular spatiotemporal orientation to the museum and mineralogical collections. For example, as we have documented it here, there is a focus on the place-specificness of labour (e.g. labour *at* the museum) that can imply linear temporality to work, that sees different genres of labour as sequential work - doing things one *after* the other, or *only* looking in particular places - rather than as networks of ongoing labour in the contemporary period as well as completed transits and of the past.

Additionally, this focus has the potential to circumscribe particular labours as 'of legitimate concern' to the work of anti-colonial museum practice. Where, for example, would activism labour (within or without the museum) sit within



Figure 4: “What are we still missing in the discussions we had...?” - An illustrated compilation highlighting workshop participant responses to the question, with accompanying details based on post-workshop evaluations and discussions.

the lens we have outlined? Is there a way to make space for activist labour in these narratives, labour that works to stymie the ‘productive’ labour of the mine? What of labour in the museum: our formulation of ‘care and maintenance’ here, prioritises what is often curatorial labour with a collection over and above other museum labour (security, janitorial, exhibition maintenance, back-of-house) that has the potential to slip our resistance of tidying actions away in the making of exhibitions (Macdonald, 1998)? How could we include the labour of advocacy and protest that precedes the repatriation of mineralogical objects, as evidenced by the work of the Confederated Tribes of Grand Ronde that culminated with the Evergreen Aviation & Space Museum in McMinnville return of their portion of the meteorite Tmanowos (Ross, 2019)? Can we make space for describing the labours of ongoing collaboration with source communities across countries? Where our workshops raised questions that focused on individuals through labour, we might focus on making visible systems of power and capital (and, as a corollary, knowledge) instead.

In acknowledging the limits of a focus on labour, we offer other such lenses that future work might pick up as a way to formulate tactics - which

themselves are but some among many possibilities. For example, legacies of mineral extraction that persist in the form of degraded landscapes and fragmented social networks may be strands of continuous linkages between museum collections as repositories of objects sourced from such sites. What, then, might a focus on sites and their landscapes bring to the museum that a focus on labour cannot? We also offer a turn towards more-than-human onto-epistemologies: what might questioning what the distinction between life and non-life (Reinert, 2016) that the separation of mineralogical collections from other parts of natural history collections reproduces, do? Might this reshape where and how the mineral collection exists?

Finally, we reflect on what drawing on a framing of heritage as a process has given us access to in this paper. Seeing heritagisation as a process gives agency to those working to change the collection by showing the collection as something always already under construction. Inversely, rather than understanding the status quo as neutral or natural, from which any (socially just, reparative) work might move, understanding heritagisation as a process illuminates that retaining the old story is also an act of making heritage as much as the

process of developing new heritage narratives is. As Gelsthorpe (2021, p.21) argues, a focus on the process of making of displays illuminated the multiple reasons that things do not change:

There are a few practical reasons why this research has not happened before and other reasons that reflect racism in the museum sector and wider society.

Gelsthorpe (2021) shows that the retention of (racist) displays is in part enabled by believing that they do not need re-framing, as much as practical reasons of limited time and labour. Seeing heritage as a process also foregrounds who gets to participate in recognised heritage, and who gets to define what heritage is. As Harrison (2013, p.4) argues, this lens permits us 'to hold up as a mirror of the present' and articulate a 'set of values that we wish to take with us into the future'.

Conclusion

In this paper, we have documented the 'Unearthing the Collection' workshop that took place in March 2022. We have employed theorising of (re) heritagisation, and the making of heritage as a process as lens on the project. We argued that it is important not only to find and understand entanglements of mineralogical collections, but also use tactics to bring this knowledge to public spaces. We showed how using 'heritage as a process' as a lens to analyse our workshop drew attention to the labours involved in collections made visible through the workshop, and have focused on three different types of labour in the contexts of mineralogical museums that emerged. In the discussion of the paper we worked to show how this orientation to labour as process is only one tactic that could be used in the re-heritagisation of mineralogical museums, and that heritage in all contexts including mineralogical museums are ongoingly remade - and that it is as possible to engage in thinking and doing differently as much now as at any time.

We see this paper as a call to action for those working in (and/or training those who will be working in) scientific collections that are especially perceived as 'objective' or 'neutral' to integrate critical work on anti-colonial and anti-racist perspectives not only into understanding their own collections but into the public-facing content their institutions are producing and maintaining. We argue that similar questions serve equally well in thinking through the process of heritagisation and tactics for making these entanglements visible to publics in other parts of natural science collections; as many of these shared both similar forms of

labour (extraction, acquisition to care, preservation and engagement), as well as identical networks of collection and mobility. The Enlightenment scientific structure that spatially separates the rock and the plant specimen in the museum itself, for example, was not observed during the collecting mission. This is not new - we are building on existing dialogues in the journal (Das and Lowe, 2018; Gelsthorpe, 2021; Heath and Robbins, 2022) that argue the same, as well as in history of science literature on museums that theorise the fundamental "role of natural knowledge in the construction of empire (and vice versa)" (Alberti, 2005: 560). Our paper sustains this conversation and has expanded it to pluralise who can participate in it through running a workshop for aspirant heritage workers. We have also introduced an existing theoretical framing of heritagisation into the novel context of scientific heritage. We look forward to continued action within mineralogical collections and their host institutions, in teaching about museum and heritage futures, and in working with those outside collections.

Acknowledgements

The authors are thankful to the University of Delaware Anti-Racist Initiative for funding Unearthing the Collection under their 'Anti-Racist Programming Initiative.' We collaborated with the Geography and Spatial Sciences Department, and the Museum Studies Program. Special thanks to our colleagues Kenneth Cohen and LeMar Gayles for working on this grant with us. We are grateful to those we created this workshop with - particularly Florence Okoye, Chitra Ramalingam, and Selby Hearsh - and our participants. Versions of this paper were presented in 2022 at the American Museum of Natural History's Earth and Planetary Sciences Department Seminar Series, to the Geological Curators Group (GCG) and The Society of Mineral Museum Professionals (SMMP)'s Uniting Earth Science Collections Symposium; and the UDARI Showcase; and we thank the audiences of these events for their helpful feedback on this content. The writing of this paper was partially facilitated through the Schlumberger FFT Fellowship 2021.

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