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ORIGINAL ARTICLE

Record-Making, Research, and Removal: Mitigating Impacts on Rock Art in a CRM Context in Southern Africa—the Case of the Metolong Dam, Lesotho

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Abstract This paper reports on the steps taken to mitigate the impact of the Metolong Dam (Lesotho) on the rock art present within the catchment of its associated reservoir. Mitigation took four major forms: comprehensive survey and documentation, including both photography and tracing; pigment characterization and radiocarbon dating; exploration of the ongoing significance of rock art as a form of living heritage for people living in the vicinity; and removal of selected panels for permanent safekeeping. These steps are placed within the wider context of other cultural heritage management projects in Africa and their success evaluated. Recommendations are made for how similar work should be undertaken in future.

Résumé Cet article rend compte des mesures prises pour atténuer l'impact du barrage de Metolong (Lesotho) sur l'art rupestre présent dans le bassin versant de son réservoir associé. L'atténuation a pris quatre formes principales: une enquête et une documentation complètes, comprenant à la fois la photographie et le traçage; caractérisation des pigments et datation au radiocarbone; l'exploration de l'importance actuelle de l'art rupestre en tant que forme de patrimoine vivant pour les personnes vivant à proximité; et le retrait de certains panneaux pour une garde permanente. Ces étapes sont placées dans le contexte plus large d'autres projets de gestion du patrimoine culturel en Afrique et leur succès évalué. Des recommandations sont formulées sur la manière dont des travaux similaires devraient être entrepris à l'avenir.

Author Rethabile Mokachane is deceased

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Introduction

Rock art forms a significant component of Africa's cultural heritage, extending back at least 27,000 years and found from one end of the continent to another (Smith, 2013). That heritage is tangible in the sense that rock paintings and engravings constitute one of several surviving material expressions of the social lives, worldviews, and technological skills of past societies. However, rock art is not necessarily dead and gone for the communities in whose neighborhoods and landscapes it is found. Painted and engraved sites may still be used for community rituals. Local people may retain a degree of knowledge about how and why it was made, and they may also value or understand it in ways that differ from, and can even clash with, the views and values of archaeologists and other professional heritage managers (e.g., Taruvinga & Ndoro, 2003). In these senses, in many parts of Africa, rock art remains a vital element of the living or intangible heritage of the populations resident around it, much more so perhaps than many less visible components of the archaeological record. Moreover, like buildings and monuments, but unlike most excavatable finds, rock art is also—by its very nature—largely fixed in place. Only rarely—and even then at the risk of physical damage and with an inevitable loss of associations with the specific character of the rock face on which it was made and the broader landscape of which it forms a part—can it be removed from that setting and taken elsewhere (see Loubser, 1994, for a discussion of the pros and cons of in situ conservation versus removal to museums).

These multiple aspects of rock art as heritage come together—and come sharply into focus—where paintings and engravings are threatened with destruction. Such destruction is ongoing in much of Africa, as in other parts of the world, as a function of the natural deterioration and weathering of rock surfaces, exposure to the elements, the actions of animals (e.g., livestock rubbing against paintings inside rock-shelters), and those of people, who may reuse pigment as an ingredient of ritual medicines or record their presence at rock art sites by writing, drawing, carving, or painting over images (e.g., Hubbard, 2018; Mitchell, 2010; Nhamo, 2018; Pearce, 2010). Typically, however, these processes are also comparatively slow, if ongoing, and may be restricted to just some sites within a wider region. Attempts at removing rock art panels for sale, while destructive of individual sites, are also localized in nature. Other threats are both more sudden and more comprehensive in their capacity to destroy. The flooding of entire landscapes when dams are constructed and reservoirs impounded behind them is of particular concern (Arazi, 2009; Brandt & Hassan, 2000). Such projects have long posed major challenges for archaeologists in deciding how to mitigate their impacts, beginning with the first Aswan Dam in the early years of the twentieth century and continuing today. Those impacts may also raise profound questions about the human rights of the populations affected (e.g., Hafsaas-Tsakos, 2011). We use the opportunity of cultural resource management (CRM) work undertaken before the completion of the Metolong Dam in Lesotho, southern Africa, to explore some of these challenges. By discussing our experience at Metolong, we hope to contribute to the development of strategies that can mitigate potential damages to Africa's rock art cultural heritage by future development projects of this kind while simultaneously maximizing the research benefits that can be gained from rescue archaeology programs.

We begin by situating the archaeological fieldwork we undertook at Metolong between 2008 and 2013 within the broader context of dam projects in southern Africa, particularly in Lesotho. We then describe our multi-stage approach to mitigating the Metolong Dam's impact on the 29 rock art sites directly threatened by its construction. This involved identifying these sites on the ground, comprehensively photographing and describing them, and professionally tracing all the images identified in the rock art. At the same time, we devised a system for evaluating the cultural and scientific significance of the threatened art in order to draw up recommendations for, and then oversee, the removal of selected panels. We also systematically sampled the area's paintings to obtain materials for directly dating the art and characterizing the pigments used (Bonneau et al., 2014, 2017, 2020, 2021). Concurrently, we investigated the continuing use of rock art sites by local communities (Nic Eoin et al., 2013) and, in the process, identified ongoing traditions of rock art production (Mallen

et al., in press). Our article ends by discussing some of the potential ethical and practical challenges that situations of this kind create and tries to evaluate the success that our overall approach to mitigating and conserving Metolong's rock art may have had. In doing this, we offer recommendations for future dam projects in Lesotho, where much larger bodies of rock art are currently, or may in the future, be threatened by flooding.

Dams, Rock Art, and Archaeology in Southern Africa

Across most parts of southern Africa, low rainfall and recurrent drought episodes make access to water for domestic use, agriculture, and industry a cause for concern (Fig. 1). That concern has risen as living standards and population have increased and industrial demands have grown. Opportunities to generate power from hydroelectric schemes have provided additional motivation for building dams. Well-known examples include those on the Zambezi at Kariba Dam, on the border between Zambia and Zimbabwe, which was begun in 1955. Further downstream is the Cabora Bassa Dam in Mozambique, the construction of which was completed in 1974. Significantly, much of the energy from the latter is sold to South Africa. In neither of these cases were rock art sites numerous. However, the Kariba Dam is noteworthy for having seen one of the earliest efforts at mitigating the impact of a major construction project on the region's archaeological heritage, even if no explicit provision was made for this at the time (Pikirayi, 2000, p. 27). The situation was somewhat better, though still under-funded, a decade later in respect of the Vanderkloof (formerly P.K. Le Roux) and Gariep (previously Verwoerd) Dams built along South Africa's Orange (Gariep) River (Sampson, 1972). However, although extensive survey and excavation work was undertaken in and around the areas to be flooded, rock art sites were again few and of little consequence overall. Subsequent dam construction projects in South Africa have also typically engaged with only a small number of rock art sites. Hence, mitigation efforts have focused on tracing and photographing images in situ, as at Driel (Maggs & Ward, 1980) and in the catchment of the Welbedacht Dam (Brooker, 1980). Only the raising of the wall of the Clanwilliam Dam in South Africa's Western Cape Province has, in recent years, deviated from this norm (Hollmann et al., 2017).

Lesotho presents a very different situation for three reasons. First, the Maloti-Drakensberg region,

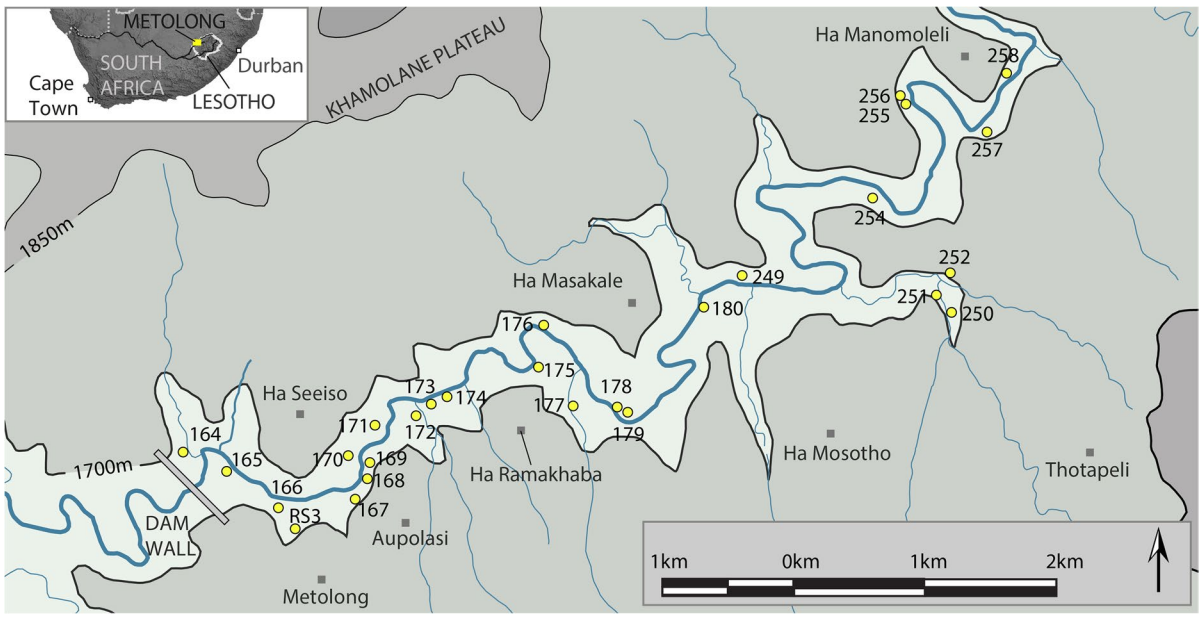

Fig. 1 Southern Africa, showing the location of the Metolong Dam and of archaeological sites within its catchment

of which Lesotho is the core, is home to one of the best-preserved, most detailed, and most extensive bodies of rock art on the continent. Although no national register of archaeological sites exists, over 800 sites with paintings have been identified within Lesotho alone, mostly by the Analysis of Rock Art of Lesotho (ARAL) Project, which operated in one form or another from the 1960s until 1986 (Smits, 1983, 1992). Many more sites are likely to be present in areas where survey coverage has been thin or absent altogether. Second, these sites concentrate overwhelmingly—although not exclusively (Forssman et al., 2020)—in rockshelters located in Clarens Sandstone formations, particularly along what are often narrow and deep, gorge-like river valleys ideally suited to reservoir formation. As we discuss below, the Metolong catchment is a prime example of this. Third, since the late 1970s, Lesotho and South Africa have been engaged in a joint project to exploit the fact that the former's Maloti Mountains are the sub-continent's principal water tower (Roga et al., 2017) and a crucial source of water for the rapidly growing urban populations of the greater Johannesburg/Pretoria area and their associated industries. Thus far, Phase I of the Lesotho Highlands Water Project (LHWP) has involved the construction of two major dams (Katse, completed in 1996, and Mohale, completed in 2003), with work ongoing on Phase II and its associated dam at Polihali. Rock art sites have been or are being impacted by all these dams, and more extensive impacts are likely if, as envisaged, more reservoirs are eventually constructed downstream along the main channel of the Senqu (Orange) River. While the Katse Dam appears not to have directly affected any archaeological sites (Lewis-Williams & Thorp, 1989), rock paintings at 14 locations close to the subsidiary facilities in the Hololo and Khukhune Valleys and the area submerged by the small 'Muela Reservoir, as well as several more vulnerable to increased risk of vandalism in the Hlotse Valley, were traced and photographed by Loubser (1993; Loubser & Brink, 1992). Three other sites were later identified and recorded in the Phase IB Mohale Dam area (Kaplan, 1995). More recently, 13 sites have been recorded within the planned catchment of the Polihali Dam (Forssman et al., 2020, p. 11). However, if the anticipated Phase III dam at Tsoelike is built to its anticipated maximum flood level of 1764 m a.s.l., it will lead to the destruction of 17 painted sites along just an 8.5-km-long stretch of the Senqu River near Sehonghong (Mitchell, 2018, p. 170). Dozens more will be subjected to flooding further downstream based on the results of largely unpublished surveys (Carter, 1978; Smits, 1973), including one undertaken by ARAL in 1985. To deal with a heritage management challenge of this scale, the lessons learned from the approach taken at Metolong in western Lesotho may prove useful.

The Metolong Dam

The Metolong Dam was commissioned in 2014, inundating a 14 km-long stretch of the Phuthiatsana River in western Lesotho (Fig. 2). The Phuthiatsana rises in the foothills of the Front Range of the Maloti Mountains and flows in a broadly southwesterly direction to enter the Caledon River, which forms Lesotho's western boundary with South Africa, a short distance downstream of Lesotho's capital, Maseru. For much of its course, the river flows through a narrow, steep-sided gorge cut into Clarens Sandstone, the top of which coincides with that formation's upper elevational level at approximately 1660 m a.s.l. This fact, and the area's proximity to Maseru, made it ideal as the location for a reservoir capable of supplying water for domestic and industrial use to the capital's growing population.

The Metolong Dam was constructed using funds principally obtained from Arab sources and the European Investment Bank. Initially, no provision was made to conduct archaeological mitigation

Fig. 2 The Phuthiatsana Valley upstream of the site of the Metolong Dam before its impoundment

work in the area to be flooded or otherwise affected by its construction. However, a feasibility study did recommend that a study be undertaken "due to the presence of some caves in the upstream area" (Consulting Engineering Center, 2003). An Environmental Impact Assessment reiterated this, specifically noting the presence of rock art (SMEC, 2007, pp. 143–144), but neither report was adequately detailed nor sufficiently resourced to constitute a meaningful basis for ascertaining how much art (or other forms of archaeological heritage) was present, what its importance might be, and what should be done about it. Detailed plans for assessing the status and significance of cultural heritage resources within the dam's catchment and to mitigate its impact on them only took shape in 2005–2007. These plans evolved as a result of discussions between one of us (Mitchell), representatives of the World Bank, which had agreed to provide funding to Lesotho for a variety of socio-economic programs in the wider Metolong area, and the Metolong Authority, the parastatal body charged with the execution of the project.

Those discussions led to a formal invitation to conduct a preliminary survey and assessment of Metolong's cultural heritage and develop additional recommendations for building a sustainable infrastructure for cultural resource management in Lesotho. Undertaken by Charles Arthur, Phase 1 of the project ran from September 2008 to April 2009. It was followed by a much fuller and more intensive excavation program, again directed by Arthur, from October 2009 to August 2010 (Phase 2) and by a period of post-excavation analysis that lasted until mid-2012 (Phase 4). Work on Metolong's living heritage by King and Nic Eoin (Phase 3) overlapped with this. Further, independently funded excavation work at the important site of Ntloana Tšoana was carried out in 2012 (Arthur, 2018, 2020; Arthur et al., 2018). The catchment's rock paintings were comprehensively documented by Lara Mallen and David Pearce between August 2010 and January 2011. Adelphine Bonneau and Pearce carried out a systematic sampling of pigments in situ in August 2011 and August 2012. Selected rock art panels were removed from their original location for safekeeping and possible display in April/May 2012. Along with other colleagues, we continue to work on various aspects of our fieldwork at Metolong.

Multi-stage Mitigation

Survey and Documentation

Our work benefitted enormously from the fact that Metolong was not archaeological *terra incognita*. Virtually the entire Phuthiatsana Basin was searched for rock art sites by ARAL between 1979 and 1982, resulting in the identification of 28 sites within the area at risk from flooding (Fig. 3). These sites were recorded using color slide transparencies complemented by written fieldnotes and sketches of visible images. These records now form part of the African Rock Art Digital Archive at the Rock Art Research Institute (RARI) of the University of the Witwatersrand, Johannesburg (www.sarada.co.za), with duplicate copies in Lesotho's Department of Culture. At the end of the 1980s, some of the sites were again briefly recorded during survey work associated with excavations at the area's two largest rockshelters, Ha Makotoko and Ntloana Tšoana (Mitchell, 1993, 1994; Mitchell & Steinberg, 1992). This fieldwork was directly responsible for the invitation for us to constitute the Metolong Cultural Resource Management Project almost 20 years later.

At the beginning of Phase 1 of our work at Metolong, it was essential to relocate all the sites identified by ARAL and identify any additional sites. Photographs, written descriptions, and map coordinates allowed all the ARAL sites to be found, while systematic fieldwalking throughout the dam's catchment identified one new site. Given the comprehensiveness of the two surveys, our prior experience of the area in 1989–1990, and the length of time that MCRM team members spent living and working in the catchment, we are confident that this tally of 29 sites represents all the rock art sites surviving in the area at the start of the twenty-first century.

During Phase 1, we carefully recorded all these sites using a standard system that sought to locate them much more precisely than had been possible for ARAL. To do this, we employed a GPS recording system and identified and characterized any other archaeological remains that were present. The sites and all the visible painted images were professionally photographed by Jessica Meyer and then associated with the South African Centre for Photography, using a Canon EOS-1D digital camera and tripod. A Canon G9 digital camera was used where images

Fig. 3 Metolong catchment, showing the location of the rock art sites documented in this project

were more difficult to reach. Complementing the Standardized Rockshelter Recording Sheets used to describe individual sites, photography sheets were completed to record the photographic procedures used for the documentation, including the equipment used, the conditions under which photographs were taken, camera position, and the sequence of photography. Images that ARAL did not previously record were photographed and also sketched, measured, and described verbally, again using a standardized format (Rock Art Panel Sheets) (Fig. 4). Notes, hand-drawn sketches, diagrams, and color photographs from the ARAL archive were compared with the paintings visible at every site to assess the degree of deterioration that had taken place between 1980—the date at which ARAL surveyed this portion of the Phuthiatsana Valley—and 2008.

While photography is essential, it is not sufficient for recording all the details that may be present in rock art (Whitley, 2005, p. 33). Therefore, the final component of Metolong's paintings documentation involved tracing all the surviving images using the procedures developed initially at RARI and now applied widely across southern Africa and elsewhere (Whitley, 2005). Tracings were made using 0.3 mm HB clutch pencils on single matte, archive-quality polyester drafting film, the surface of which is smooth and not abrasive (Fig. 5). This film is also chemically and dimensionally stable (Loubser & den Hoed, 1991). Further digital photographs were taken at this time to make certain that faded imagery, fine details, and any superpositional relationships between one image and another were recorded visually. Subsequently, digital copies of the tracings were produced at RARI, where they and the original tracings and associated photographs are currently stored. Tracings were undertaken for all the "panels" we identified, panels being arbitrary divisions of painted rock surfaces that group together images based on their proximity to one another. All told, 97 panels were recorded for the 29 sites documented. While most sites contained fewer than ten images, some were more extensive, and two contained over 30 separate images.

Fig. 4 Metolong Standardized Recording Sheets as exemplified by those used at ARAL 173: (**a**) rock-shelter; (**b**) photography; (**c**) rock art

Although three-dimensional scanning of rock art sites has been undertaken in a few instances in southern Africa (e.g., at the Clanwilliam Dam; Hollmann et al., 2017, p. 249), the use of this facility was not within our budget. Access to this technology would, however, have provided the opportunity to create lasting digital memories of elements of the Metolong landscape, not least for the benefit of local residents (Nic Eoin et al., 2013, p. 41). More than a decade on, and with costs now lower than they once were, it may be appropriate to re-evaluate this in future rock art mitigation projects to develop appropriate methods for the curation of digitized records and their dissemination to affected and stakeholder communities.

Pigment Characterization and Dating

Knowing that only a tiny fraction of Metolong's rock art could be safely removed for permanent safekeeping and that all the sites present in the reservoir's catchment were likely to be destroyed, we opted to engage in a systematic program of pigment sampling

Fig. 5 The late Rethabile Mokhachane (left), Lara Mallen (middle), and Pulane Nthunya (right) tracing images at ARAL 250

on a scale that would otherwise have been difficult to achieve given the obvious ethical concerns that arise about damaging rock art that is not under immediate threat. We draw attention to this here because, in our experience, other CRM projects in southern Africa have generally restricted themselves to documenting rock art via some combination of photography and tracing. With rare exceptions, such as Botswana's Thune Dam (Bonneau et al., 2017), scholars have not used the high probability of total loss to engage in further research of the art itself using the techniques of archaeological science.

Our research, funded independently of the wider MCRM project from non-World Bank sources, had two main goals. The first was to characterize and, if possible, source the pigments used to make the paintings at Metolong. The second was to directly date those paintings using the AMS radiocarbon technique. Samples were collected in situ, beginning with a preliminary study of 12 samples of white pigment from four sites (ARAL 172, 175, 180, and 254) to demonstrate proof of concept. These samples were examined with a light microscope, scanning electron microscopy—X-ray energy dispersive spectrometer (SEM–EDS), Fourier transform infrared (FTIR) spectroscopy, and Raman spectroscopy. The analyses identified three kinds of paint, with different pigments sometimes used at the same site to create different kinds of image (Bonneau et al., 2014). Subsequently, all identifiable representations at risk of flooding were sampled, bringing our total sample size to 178 images, 92 of which have since been studied in detail using the same multi-instrument protocol. Full details of that protocol and the results obtained have recently been published (Bonneau et al., 2021). Our laboratory work was complemented by surveys in and around the Metolong catchment to identify potential sources of the mineral coloring materials used for the paintings. Seventeen such sources were located, sampled, and analyzed to test if their main chemical composition matched those of the images and if they were suitable ingredients for making paint. Results indicated that, while it was impossible to track the exact provenance of any one material, it is likely that both red and white pigments could be sourced locally within the Phuthiatsana Valley. Grindstones from sites within the valley were stained with these materials (Bonneau et al., 2021). Black pigments, on the other hand, reflect the use of charcoal, soot, and carbon black. This much larger sample showed no concordance between the kind of pigment used and the kind of images made. However, the fact that in some cases images that seem to form part of a coherent scene share the same paint recipe suggests that those images may have been made at the same time (Bonneau et al., 2021).

Our pigment characterization project is one of the most comprehensive and high-density studies undertaken in southern Africa to date (Fig. 6). It was complemented and reinforced by dating samples of black pigment from 13 images spread across five sites and representing paintings of both the San fine-line and Basotho traditions (Bonneau et al., 2017; cf. Jolly, 2020 and the rebuttal by Bonneau et al., 2020). Two of these images did not contain enough carbon to produce a radiocarbon determination. In four more

Fig. 6 Adelphine Bonneau sampling pigments at ARAL 175

cases, the sample size was very small (< 100 μg), with two of these samples yielding unacceptably large errors. All the remaining determinations fall within the second millennium AD. This is consistent with the pattern from excavations and the typology of surface lithic assemblages at Metolong and in the wider Phuthiatsana Valley, which suggests that the area was episodically attractive to hunter-gatherers at that time and may have only been sparsely inhabited through much of the Late Holocene (Arthur et al., 2018). The dates obtained for paintings at Metolong are thus younger than some of those from localities in Botswana and South Africa that have also been sampled to determine the age of southern Africa's surviving fine-line paintings (Bonneau et al., 2017). The combination of direct dating of the art, investigating the pigments from which it was made, and seeking to identify their sources on the ground offers a powerful, coordinated approach to tackling questions that are crucial for understanding the links between rock art production and other human activities in the southern African past.

Rock Art as Living Heritage

The majority of Metolong's rock art falls into the San hunter-gatherer fine-line tradition, but other traditions are also present, with two, if not three of them, closely linked to the area's present-day inhabitants (Fig. 7). However, it would be false to envisage a sharp dichotomy between San and non-San or Basotho and non-Basotho artistic traditions in terms of the significance that paintings or painted sites hold for people living at Metolong today, not least because all the rock art present there before flooding formed part of a single culturally significant, lived-in landscape. Our CRM work thus included a strong "living heritage" component designed to explore the meanings of that landscape for Metolong's inhabitants and its importance in their lives. As there exists no academic consensus on what constitutes best practice for living heritage salvage (but see Apoh & Gavua, 2016), and Lesotho's policy reflected a focus on conserving *national* heritage, our decision to consider rock art within a network of tangible and intangible

Fig. 7 Examples of Metolong's rock art traditions: (**a**) San fine-line; (**b**) Type 3; (**c**) Basotho; (**d**) Ochre smears/handprints

associations was novel, context-specific, and derived from multiple survey strategies.

An initial pilot study was carried out from July to September 2011 by a team that included residents of the Metolong catchment and focused on their home villages: Ha Makotoko, Ha Makhale, Ha Seeiso, and Ha Sekantsi (Monyane & Phafoli, 2011). Individuals such as chiefs, community elders, traditional healers, and storytellers were specifically approached, as well as male and female members of the wider community. As we have explained elsewhere (King & Nic Eoin, 2014), the difficulty with this approach was that it assumed that intangible cultural heritage is a national concept shared, in this case, by all Basotho. It thus proceeded to document aspects of traditional knowledge using a questionnaire-based checklist approach of the kind favored by UNESCO (2012: Section IIF). What is typically lost in making such lists is any sense of how daily practices, memories, and narratives are embedded in place, a deficiency of obvious significance when that "place" (i.e., the Metolong catchment) is about to be wholly destroyed and rendered forever inaccessible to those who have previously used it.

Our pilot study was undertaken separately from the MCRM Project and was funded directly by the World Bank, in part to develop a framework for assessing intangible heritage in similar, future development projects elsewhere (Monyane & Phafoli, 2011, p. 5). However, it did not record anything directly related to rock paintings, the practice of making them, or specific painted sites. Subsequently, in September 2012, two of us (Rachel King and Nic Eoin) explored residents' understanding of the Metolong landscape and the material correlates of the intangible cultural and mnemonic aspects via a series of interviews and group discussions. Our work was explicitly place-based and included capturing information using audiovisual media as well as writing and precisely locating features in space with GPS. Reports on this work have been published elsewhere (King & Nic Eoin, 2014; Nic Eoin & King, 2013; Nic Eoin et al., 2013). Disappointingly, given their significance to archaeologists, paintings again barely registered in the material we captured, with informants attributing most of those present to the San and not claiming to have any further knowledge of them. They did, however, express the concern that any removal of paintings from the area would mean that younger members of the community would no longer be able to view them in situ, thereby losing a tangible part of their heritage.

This is not, however, the whole story since we were able to establish that some painted sites were significant for local residents, in several cases independently of the fact that they contained rock art. For instance, 'Me Malireko Masakale (pers. comm., 13 September 2012) vividly recalled that ARAL 180 was the original home of Masakale, the founder of the village of Ha Masakale on the plateau opposite the site (Fig. 8). She also noted that it was the location where Masakale performed magic and made medicines in still-visible cupules in the shelter's bedrock to protect the area during the Gun War of 1880–1881. 'Me Malireko Masakale and 'Me Bela Nthunya (pers. comm., 15 September 2012) also stated that several rockshelters, including perhaps ARAL 180, were used for girls' initiation ceremonies and worried that such rites would have to be moved elsewhere after the impoundment of the dam. Indeed, while we were tracing rock art in 2010 and 2011, we discovered that three sites—ARAL 250, ARAL 251, and ARAL 252—were being used by female initiates to rest and sing songs. Other residents informed us in 2008–2009 that ARAL 250, ARAL 252, and ARAL 172 were used by male initiation schools and that the red ochre smears and handprints at ARAL 250 had been made by the initiates attending those events (Ntate Maama Makotoko and

Fig. 8 View of ARAL 180 from within the valley of the Phuthiatsana River. ARAL 180 (Ntloana Tšoana) retained a long Middle and Later Stone Age sequence of occupation (Arthur, 2018, 2020; Mitchell, 1993; Mitchell & Steinberg, 1992) and a small number of fine-line images, as well as figuring strongly in local historical memories

'Me Pulane Nthunya, pers. comm., 12 December 2008). We argue elsewhere (Mallen et al., in press) that rows of black vertical marks at ARAL 172 and ARAL 252 and images of horses at the latter site are of Basotho origin and that both sets of images likely relate to male initiation given this contextual information and the rich symbolic associations of horses in Basotho culture (Ficq, 1988; Swart, 2010). Thus, even though most of the rock art that we recorded at Metolong did not seem to be particularly important or relevant for the communities living around it, specific *painted sites* were of significance. There was also a strong feeling that the destruction of individual panels or their removal to museums would break one of the visible ties linking people to the broader history of the area. Whatever the archaeological justification, our removal of the panels therefore amounted to taking away a part of people's landscape, never to be seen again and in a way that, as we note below, produced zero tangible gain for the communities in question (King & Nic Eoin, 2014). The creation of charcoal drawings and inscriptions at one of those sites (ARAL 254) in precisely the void left by our removal of rock art underlines this point, and also comments on it (Fig. 9).

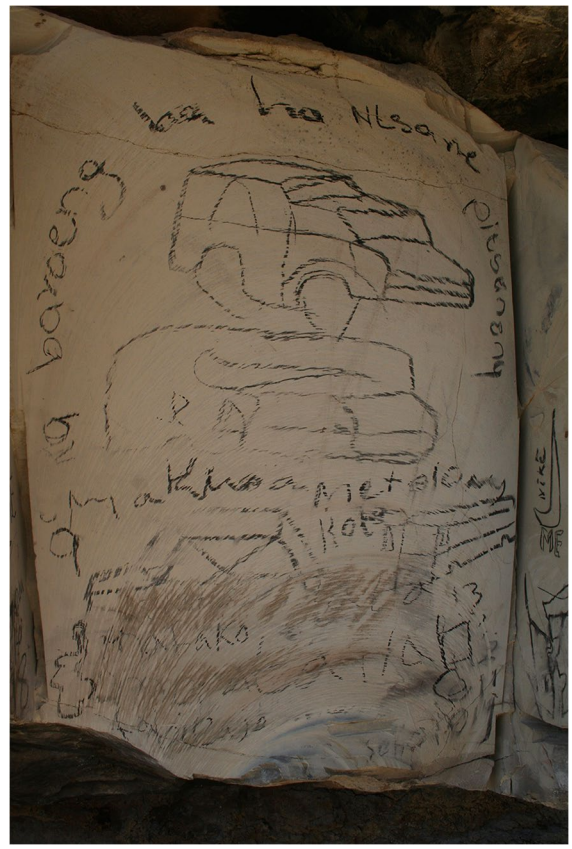

Fig. 9 Charcoal drawings and graffiti created at ARAL 254 after removal of a fine-line rock art panel from the site. The inscription around the top of the images of what seem to be at least three 4WD vehicles reads "At the place of the Bushmen of Ha Ntsane Pitsaneng," Ha Ntsane being the name of the village immediately above ARAL 254. The phrase in the middle (*Makhoa Metelong kote*, more correctly *Makhooa Metolong kote*) translates as "White people all over Metolong." Other charcoal drawings, not shown here, included the logos of a professional South African sports team and several clothing labels

Estimating Significance

The Metolong Authority was clear from the outset of our work that it wished for some of the rock art found at Metolong to be "saved" by physically removing it from the shelters in which it was located ahead of the flooding that the dam would bring about. We discuss below how (and how far) this goal was achieved and with what degree of success in terms of the eventual safekeeping of the removed panels.

A pre-condition of removal involved establishing the artistic and archaeological significance of Metolong's rock art panels and determining the practicality of removing them from the rock face. To do this, we first produced a brief qualitative description of the content of every rock art panel at every site. We then graded the panels in terms of the condition of the surviving images and their perceived academic value. Only fine-line paintings belonging to a tradition associated with San hunter-gatherers and two "Type 3" images at ARAL 254 that belong to a different, if allied, nineteenth-century tradition (Blundell, 2021; Mallen, 2008) were initially considered as potential candidates for removal. This was because we wished to consult with local communities regarding rock art traditions of Basotho origin after gathering further information about the sites concerned during our living heritage surveys in 2011 and 2012. In the event, those consultations did not lead us to alter our selections. In fact, the most extensive and best-preserved examples of Basotho rock art present at Metolong were all at ARAL 252, which was not, in the end, flooded. The only other two sites to survive the reservoir's creation—ARAL 250 and 251—also retain images of Basotho origin,

and all three sites have, as indicated above, been used by local initiation schools.

Given that there is no point in removing paintings if they are so badly deteriorated that they are unrecognizable, the condition of the images was the first, and perhaps ultimately the most important, attribute that we considered when estimating significance. We qualitatively assessed preservation quality in terms of six grades: Poor, Poor-Fair, Fair, Fair-Good, Good, and Excellent. Some of the individual panels consisted of 80 images, and assigning a single status to each panel was not always feasible. Hence, "Poor-Fair" meant that the panel in question included some paintings of poor quality and others of a fair one, not that the condition of the panel as a whole lay somewhere between "poor" and "fair" in terms of its overall state of preservation. However, where we graded panels as simply "Poor," "Fair," "Good," or "Excellent," it means that all the paintings in them were of a similar condition. Of 92 panels with fine-line or Type 3 art, 12 were judged to contain at least one painting in good or excellent condition. It was these 12 panels that we then considered further for potential removal.

The second criterion used to estimate significance involved examining the characteristics of the rock surface, principally whether its contours lent themselves to removal and whether any obvious cracks or faults were present. In removing rock art panels, the risk of breaking the paintings is usually quite high. Other risks may need to be considered concerning the health and safety of those undertaking the removal, for example, the possibility that parts of the rock-shelter may collapse while work is underway (Henry, 2007). For this reason, we excluded the removal of two panels before engaging the specialist services of AMFRA Maintenance Services, an engineering company with prior experience in removing rock art panels in the Free State province of South Africa (Anderson, 2008). This left us with ten panels from eight different sites. One panel came from each of ARAL 170, ARAL 172, ARAL 173, ARAL 175, ARAL 180, two from ARAL 258, and three from ARAL 254 (see Supplementary Online Material).

Given the small number of paintings with which we were left at the end of this exercise, considerations of wider academic or archaeological value did not need to be entertained. However, it is worth noting that the panels selected included examples of shaded polychrome eland and human figures—both widespread (and thus representative) elements of wider Maloti-Drakensberg San rock art—as well as two much more unusual motifs, namely, paintings of ostriches at ARAL 258 and the Type 3 images at ARAL 254.

Removal and Safekeeping

The many practical and ethical problems surrounding the removal of painted panels from sites in southern Africa indicate that this is not something to be undertaken lightly or without good reason (Henry, 2007; Loubser, 1994). It is particularly important to acknowledge the responsibilities associated with the long-term, safe curation of such panels and to develop a plan for implementing those responsibilities. It is also necessary to consider the well-established fact that the beliefs of the artists and their community informed both the choice of sites at which people painted and their placement of specific panels and images at particular places within those sites (e.g., Lewis-Williams & Pearce, 2004, pp. 180–181). Once removed from this context, paintings unavoidably lose an important dimension of their significance and meaning. That said, in extreme cases where the alternative is certain destruction, removal for salvage purposes may nevertheless be viewed as the lesser evil and has, in fact, been undertaken sporadically in southern Africa for over a century precisely for that reason (Hollmann & Msimanga, 2008; Lewis-Williams, 1988).

In the Metolong case, one of us (Frans Prinsloo of AMFRA Maintenance Services, a specialist rock- and concrete-cutting team) visited the area in March 2010 and assessed the feasibility of removing the panels we had previously identified. One immediate difficulty was that only at one site (ARAL 175) could the appropriate equipment be brought down by 4WD vehicle. This meant that the equipment had to be carried by hand to the other sites, thereby increasing the time commitment and costs involved. Except at ARAL 175, the same considerations meant that the removed panels had to be carried by hand to the nearest vehicle access point. Concerns were also expressed about the viability of removing panels at ARAL 258 because of the badly exfoliated nature of its rock surface. Another worry related to the roof stability at ARAL 254, which immediately raised

questions about the feasibility of removing all the panels we had identified there.

Removal of the rock art panels took place over eight days between April 23 and 30, 2012. This later summer period was ideal for our work because of a reduced likelihood of heavy rains and because it was too early for frost, thus ensuring that the rock was in as warm and dry a state as possible. As things turned out, the unstable nature of the rock at ARAL 254 did indeed make it impossible to remove the central of the three panels there, and removal of one panel at ARAL 180 proved impossible to achieve within the budgetary constraints under which we were operating.

The procedures used followed those described in detail by Hollmann et al. (2017) at the Clanwilliam Dam, South Africa, and consisted of six different stages: protection of the painting; support of the rock face prior to cutting; the cutting itself; removal from the rock face; and transportation away from the site. We successfully removed six panels of rock art from their parent rock-shelters (one each from ARAL 170, 172, 173, and 175, and two from 254), in all cases without damaging the paintings.

All the panels were first rephotographed and then sealed with a protective layer of drawing paper. This was fixed to the shelter wall with adhesive tape and covered with soft canvas to prevent the cutting dust from getting under the paper (Fig. 10a). The AMFRA team used a combination of scaffolding and acro-props to support both the area to be removed and, where necessary, the surrounding rockshelter roof (Fig. 10b–f). An angle grinder was then used to cut around the area to be detached (Fig. 11c). Smaller drills and angle grinders were sufficient to remove the two smaller panels at ARAL 170 and 173, but ARAL 175 and 254 also required the use of a hydraulic wire saw (Fig. 10d). For the latter, the prior incisions needed to extend to a depth of 150–200 mm into the rock surface so that the wire could cut far enough behind the painting and thus prevent the fracture of its surface. At ARAL 172, however, cracks prevented the panel from being removed in this manner. Instead, it had to be reinforced by drilling holes and filling them with a binding agent before the rock art could be removed (Supplementary Online Material).

As soon as the interior wire-cut incision crossed the bottom perimeter cut line below the paintings, the panels were presumed to be physically separate from the rock face and could be gradually moved away by lowering the supporting props (Fig. 10e). Due to the risk of slipping, the panels were moved by hand onto a bed of wood, cardboard, and foam on the floor of the shelter (Fig. 11a), and the protective covering of drawing paper reapplied. Removing the paintings from the rockshelter wall was, however, only the first part of the process. Safely transporting them in a rugged gorge environment that afforded virtually no vehicle access raised even greater challenges. However, with a wealth of local knowledge within our team, effective solutions were readily found. This was especially the case at ARAL 175 and 254, both of which involved the removal of extremely heavy slabs of sandstone that had to be moved down steep slopes to the valley bottom. At ARAL 175 this was accomplished by strapping the panel to a foam-lined wooden sledge and sliding it along the ground (Fig. 11a), whereas the still heavier panels from ARAL 254 remained fixed to the scaffold frame used during the removal, which allowed up to eight people to support its weight (Fig. 11b). In the case of ARAL 175, it was possible to bring a 4WD vehicle to the base of the gorge to collect the painting, but at ARAL 254—from which the two largest panels were removed—there was no road or track. We therefore used an ox-drawn cart to transport the panels about 2 km to the nearest point to which a vehicle could gain access (Fig. 11c).

The panels were initially stored in a secure temporary location at a private storage facility in Roma, about 30 min drive from the Metolong sites. Before they could be boxed up, they were left to dry for 4 weeks. During this period, we constructed custom-made storage boxes, the largest of which measured $1.23 \times 1.22 \times 0.41$ m (Fig. 11d). These were made from 18 mm marine plywood, protected by calcium carbonate-buffered 20 gsm sulfur and acid-free tissue paper, 25 mm non-toxic closed-cell SPX polyethylene foam, and 3 mm polyethylene sheeting.

In undertaking the removal of these panels, we were conscious of the threatened status of much of Lesotho's rock art and the widespread lack of understanding of its broader historical and cultural significance (cf. Jolly, 2012). We therefore tried to avoid a situation in which our removal of specific panels might create the false impression that rock art is a commodity with financial value, thereby encouraging efforts to extract panels elsewhere. For these reasons, we made sure to undertake a process of public consultation with local communities, building on

Fig. 10 Removal of rock art from ARAL 175: (**a**) protection of rock art; (**b**) rock face support; (**c**) angle grinder cutting; (**d**) hydraulic wire cutting; (**e**) lowering of rock art away from the rock face; (**f**) the panel is safely on the rock-shelter floor

the extensive outreach program that we initiated at the beginning of our work at Metolong. These consultations explained why panels were being removed and reinforced the importance of avoiding damage to surviving rock art images along the Phuthiatsana or elsewhere in Lesotho. That said, however, our intervention could only go so far in addressing the perception that removal constituted a net loss of heritage as opposed to other forms of salvage archaeology that we undertook (King & Nic Eoin, 2014).

While the Metolong Authority was keen to ensure the removal of the best-preserved and archaeologically most important rock art panels within the dam's catchment, arrangements for post-removal care were left unclear. As of 2012—and even now—Lesotho had yet to complete the building of a functioning National Museum. Thus, no facility existed within

Fig. 11 Transportation of rock art panels and temporary storage: (**a**) the ARAL 175 panel after removal strapped to a foam-lined wooden sledge; (**b**) carrying ARAL 254 Panel B using a scaffoldframe; (**c**) moving the ARAL 254 panels from the ox cart to a 4WD vehicle; (**d**) the ARAL 170 panel inside its custom-made conservation box (photographs Jess Meyer)

which the panels that we removed could be conserved. Given the understandably strong feeling that they should nevertheless remain in the country, we therefore recommended the construction of appropriate heavy shelving and chemically stable wooden storage containers lined with polyethylene foam and acid-free tissue paper to maintain them in suitably cool, dry conditions and free from direct contact with the environment. After their initial removal to the storage unit in Roma, a second supposedly temporary storage location was provided by the Department of Culture in October 2013, in a nearby tourist facility. However, the initial inspection of the building in question showed that it did not meet the requirements of museum-grade storage nor the recommendations that we had repeatedly communicated since making our initial rock art removal proposal (Arthur & Mitchell, 2009a, 2009b). There was, however, little choice but to move the six panels to this location for a limited time under the assurance that adequate renovations would be carried out.

Following consultation with South African colleagues at RARI and the Department of Archaeology, Iziko Museums, Cape Town, we proposed that clear responsibility for the custodianship of the panels, including an appropriate annual budget, needed to be established as a pre-condition for ensuring their long-term security and conservation. We also reiterated our recommendations for assigning a secure building in well-maintained condition, complete with controlled access, installation of humidity and temperature monitoring and control devices, and dedicated custodial staff. Additionally, we noted that local communities had been promised that the panels would be kept close to where they had originally existed and that they would be able to view them free of charge. This undertaking was linked to plans to construct a heritage center near the Metolong Dam at Ha Makoanyane, for which a feasibility study was carried out in 2009, although this has yet to materialize. Notwithstanding the enormous sums of money poured into major development projects such as the Metolong Dam experience here underlines the difficulty of securing funding and resources sufficient for all aspects of heritage conservation.

Discussion

Having set out each of the various elements in our approach to mitigating the impacts of the Metolong Dam on the surrounding rock art, we now evaluate how far that approach met our initial goals and how far they might be usefully translated to other dam contexts elsewhere in Lesotho. Our approach had four main elements: (1) to record as comprehensively as

possible all of the rock art within the area affected by construction and flooding; (2) to maximize the research potential of the art above and beyond its mere documentation; (3) to establish the significance of the art and of the sites at which it occurred for those living in the area today; and (4), pursuant to the request of the Metolong Authority which commissioned our work, to remove selected panels of rock art for safekeeping elsewhere.

To tackle the first and second of these objectives, we identified all known rock art sites within the Metolong catchment, adding one more site to those previously known to bring their total to 29. We systematically and fully documented all these sites and their art, using standardized record forms and a combination of digital photography and tracing. We simultaneously took advantage of the fact that, regardless of how many panels might ultimately be extracted for potential storage and display, the vast majority of Metolong's art was doomed to be destroyed. This removed the consideration that ethical concerns generally impose elsewhere on destructively sampling paintings for pigment analysis or other forms of scientific study. Having factored in these possibilities from the start, we undertook the most comprehensive program of pigment characterization and direct dating (using the AMS radiocarbon technique) yet carried out in southern Africa. The results obtained from these archaeometric investigations demonstrate the radiocarbon-dating potentials of carbon black pigments in unraveling the chronology of fine-line hunter-gatherer art within the region (Bonneau et al., 2017, 2020). Simultaneously, they cast new light on the variety of coloring materials and paint recipes that the painters employed and show the considerable diversity obtaining within just a small fraction of the wider landscape (Bonneau et al., 2014, 2021). In terms of the art's content, which we have reported in detail elsewhere (Mallen et al., in press), we have shown that while most paintings belong to the fine-line San tradition, other traditions are also present. Significantly, these include the first colonial era Type 3 paintings (Mallen, 2008) known outside the Nomansland region of South Africa's Eastern Cape Province and the first formal identification of rock art (principally in the form of horses, human figures, vertical marks, and ochre smears and handprints) assignable to recent and contemporary Basotho communities (Mallen et al., in press). With respect to our third objective—the significance of the art for those living at Metolong today—we were able to establish that the last two of these image categories—and quite likely many of the others as well—are associated with initiation ceremonies for male adolescents. Additionally, we were able to show that some painted sites were being used by both male and female initiation schools, that at least one site (ARAL 180) held other strong historical associations, and that a level of concern existed about how removing paintings—or leaving them to be destroyed—would dislocate people from their heritage.

Forging a team of experts that worked together in a coordinated and collegial fashion was central to the accomplishments of these objectives. Specialist rock art researchers are rare in southern African archaeology. Only a small number of those working in the field—especially in the contract or CRM sector—have the requisite knowledge and experience to document rock art and interpret it to a high standard. Previously in Lesotho, CRM work undertaken ahead of dams has either submerged rock art within the remit of generalist practitioners (for example, Phase IB of the Lesotho Highlands Water Project; Kaplan, 1995), or involved assigning it and other forms of archaeological material to different individuals from different institutions, often working at completely different times (for example, on Phase IA of the same project; Kaplan & Mitchell, 2012; Loubser, 1993; Mitchell et al., 1994). Precisely the same held for the CRM work undertaken ahead of the construction of the Southern Perimeter Road some 40 years ago (Mitchell et al., 1994; Parkington et al., 1987; Smits, 1992). The efficiency and intellectual value gained by a more collaborative and joined-up approach that promotes dialog between those working on rock art and those focusing on other archaeological resources are self-evident. In the case of Metolong, this allowed us to build in intensive sampling for pigment composition and chronometric dating right from the start, scheduling this to dovetail with recording the art via photography and tracing. What might have remained an exercise in salvage archaeology thus became a research-driven undertaking, with a strong commitment to publishing its results rather than leaving them in contract archaeology's gray literature. It is therefore heartening to see aspects of this approach being applied, in some cases by former members of our MCRM field-team, in the context of ongoing CRM

mitigation work at Polihali, the focal point of Phase II of the Lesotho Highlands Water Project (Forssman et al., 2020). More broadly, our work at Metolong adds methodological insights into how rock art can be incorporated into a more holistic form of heritage management via a joined-up landscape approach that seeks to document multiple senses of how a place may be lost and altered. While it is apparent in work undertaken at the Fourth Cataract of the Nile in Sudan (e.g., Kleinitz & Näser, 2012), it is not yet evident elsewhere in Africa. Situating "rescue" or "contract" archaeology operations within a broader sphere of research and other non-profit-making structures benefits both the quality of knowledge production and the ethical basis on which that knowledge is produced and disseminated to the communities alongside whom, and ultimately for whom, we work (Arthur et al., 2011; King et al., 2020).

We had less success with our fourth objective largely because of difficulties in reconciling the dam builder's wish to have as many high-quality panels as possible removed ahead of impoundment with a lack of commitment to then provide for their secure storage or eventual display. It seems evident that the principal motivation here was the perception of rock art as visually striking and esthetically attractive, unlike finds from Stone Age archaeological excavations, let alone intangible cultural heritage, the funding for which was sourced separately from our relationship with the Metolong Authority. The salvage of rock paintings was therefore easy to understand and support, while also (literally) illustrating the overall efforts made to mitigate the dam's impact. As a result, we found ourselves compelled to engage in efforts to maximize the removal of the rock art panels, albeit with a limited budget, even though those funds might, in our view, have been better spent elsewhere. More fundamental, however, was the falling through of plans to develop a local heritage or tourism center at Metolong itself where those panels might have been displayed, even though discussions with local communities had originally envisaged this. The result has been that the community concerns that we registered during our living heritage work were not heeded and that the panels, which were removed in logistically challenging circumstances, have now been consigned to storage in inadequate conditions for several years. Both aspects of the situation draw attention to the ethical dilemmas that arise where archaeologists work (or are perceived to work) directly for developers and to the ethical necessity of engaging more fully with those (e.g., local communities) affected by what they do (King & Arthur, 2014; King et al., 2021; Nic Eoin et al., 2013).

While moving more slowly than originally anticipated (Mitchell 2006), it seems to us virtually certain that demands for water in South Africa will only grow in the future and that the Lesotho Highlands Water Project will be extended further than its current three major dams. Wherever future dams are constructed, including smaller reservoirs for stockpiling water or generating electricity for the country's own use, they will certainly impact Lesotho's archaeology negatively. Damage to and loss of rock art sites will be part of this. Thinking more broadly, water and greener energy will equally be in demand across much of the continent, especially as populations continue to grow and the climate becomes more unpredictable. Confronting these challenges, the lesson of Metolong is threefold. First, to mitigate the destructive impact of development projects on rock art sites requires an approach that is integrated, coordinated, and planned from the start as documentation and research oriented. Second, even when no direct link seems apparent between those who made that art and those who now live near it, sites may still hold relevance for present-day communities. Moreover, as Metolong shows, other artistic traditions that may have previously been overlooked are being generated today. It follows that mitigating impacts on rock art and other forms of more recognizable archaeological resources demands—for both academic and ethical reasons—a commitment to both documentation and engaging in dialog with the living cultural heritage and wishes of local communities. And, finally, fieldwork is but the tip of the iceberg, and those who commission it must also commit to funding the storage of what is found and removed and to building the requisite capacity (in terms of personnel and infrastructure) to achieve this. The "three Rs" of reading, writing, and arithmetic have traditionally been viewed as fundamental to elementary education. Their archaeological equivalents—recording, researching, and (where essential and possible) removing (with suitable provision for long-term after care by way of storage, display, and curation)—are similarly elemental when mitigating the impacts of development projects on rock art in CRM contexts in Africa and beyond.

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