



# Prehistory Society

OF ZIMBABWE  
NEWSLETTER

December 2013 | Issue 152

## Editorial

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This is my 20<sup>th</sup> edition of the newsletter as editor, a task I find to my surprise, I have been doing since 2007. When examining past issues, I am pleasantly surprised at the variety of articles that have been carried, especially regarding developments in Zimbabwean archaeology. The diversity of authors is also pleasing, although finding enough suitable content for each issue remains a challenge and is one reason why this newsletter is so greatly delayed. There is exciting news, not least regarding the formation of a professional society for Zimbabwean archaeologists and the publication of a long-awaited review of Zimbabwean archaeology.

I have delayed the promised article on National Monuments in favour of two others. The longest article focuses on the immense value of digital technology in rock art studies. I was fortunate to visit several rock art sites with the authors of the article, Anne and George Stoll, and was simply amazed at how much more art, and detail in the art, could be seen by using the software they discuss in their article below.

I am fortunate enough to own one of the cameras with the software already loaded and I cannot praise the difference it makes when I am recording a site. Being able to take a picture and then manipulate it digitally immediately, without lugging around a laptop is gratifying and useful. One is able to observe images in greater detail than the naked eye sometimes allows in addition to the fact that seeing these images allows the site to be recorded with greater accuracy than ever before. Added to this is the benefit I have of being able to take a picture and show it to visitors, highlighting details that may have escaped their eye. And best of all, the software is freely available and, in my experience, compares most favourably with any commercially available programs.

The second article deals with a serious issue facing Zimbabwean museums, galleries, archives and cultural institutions. Theft of artefacts and their eventual return is a global problem compounded in Zimbabwe by the lack of inventories and checks on collections. The seriousness of the problem has been recognised by the authorities and steps are being taken to ensure the loss from collections will become an unpleasant memory.

The year ahead promises much with regards to the development of archaeology in Zimbabwe, not least because of the anticipated exposure the region will enjoy due to the Pan-African Archaeology Congress, to be held in Johannesburg in July 2014. And of course Zimbabwe will be hosting the ASAPA conference in 2015 which will truly be an opportunity to showcase the many and great achievements in the discipline since 1980.



## **DStretch Image Enhancement at Nswatugi Cave, Matobo National Park, Zimbabwe**

ANNE Q. STOLL, photos by GEORGE STOLL

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Prehistoric painted sites abound in Africa - in fact, a solid case can be made that there is more painted rock art in sub-Saharan Africa than anywhere else in the world. The richness and variety of Africa's parietal art have dazzled observers for centuries. But there can be a problem. Not only is much of it found in remote locales, the images themselves have often faded through the ages. Once brightly painted panels can be too faint to see, or are smudged or covered with dust or lichen or sometimes, worse yet, have been defaced. This paper presents digital image enhancement using DStretch to demonstrate a technique for alleviating this problem.

At some point all rock art researchers bemoan faded pigment, especially those for whom fine-grained analysis of the images is essential to their interpretation of the art's symbolic meaning. Writing on the rock art of Cederberg in the western Cape province of South Africa, John Parkington laments that often images "are very difficult to see, partly because almost all of the paint has peeled off the rock surface, leaving little more than a ghost of the original images" (Parkington 2002:32). Yet he goes on to identify many subjects and themes with persuasive confidence.

Likewise, David Lewis-Williams devotes one whole book to a single panel of painted art, the so-called Linton panel (Lewis-Williams 2011). With his trademark clarity and flair, Lewis-Williams uses the details he observes in this panel to introduce his well-known interpretive structure for understanding all San rock art. We can't help but wonder - would these interpretations change if new images were revealed on familiar panels? If faded paint could somehow be visually restored, new details could be made bright?

Hundreds, if not thousands, of rock walls and caves in the Matobo Hills of Zimbabwe contain paintings made by long-gone San foragers of the Later Stone Age. While few would contest that the Matopos are "the world's last and greatest undiscovered artistic and cultural treasure," even dedicated Zimbabwean archaeologist Peter Garlake concedes that many of the images are "small, fragile, often faint and fragmentary" (Garlake 1995:7, 13). An accurate study of the art, he maintains, "can only be achieved through exact tracing of every detail of a large number of paintings, an arduous, uncomfortable and prolonged process" (Garlake 1995:44).

Although careful copies have been produced this way, modern preservation practice proscribes direct tracing. Elspeth Parry, who studied the rock art of the Matopos for many years, wrote, "[t]ouching the paintings accelerates deterioration, especially as many are extremely friable, the paint visibly standing proud from the rock and crumbling to dust at the lightest touch. For this reason the author and artist never touch or trace the images. It can be argued that over the years inestimable damage has been done by researchers in the name of science. Pressing onto an electrostatic material (such as tracing film) with pens and pencils will energize the film, loosening flakes, and can only be regarded as damaging." (Parry 2000:1). For her published analysis and interpretations, Parry relied on the drawings of the late Janet Duff, a scientific illustrator who was "trained to achieve absolute accuracy" (Parry 2000:x).

In our view a goal of "absolute" accuracy in rock art recording is unattainable, even hubristic. Striving for better data, however, cannot be faulted, especially that produced photographically without direct impacts to the paint. Recent advances in computer-aided digital image enhancement have certainly brought a higher level of image veracity within reach, as we will demonstrate.



Digital image manipulation is itself nothing new - useful programs have been readily available at least since the 1990s. Adobe Photoshop was created in 1988 and released in affordable form for Windows users in November, 1994. Photoshop today is reputedly the most popular photo enhancement tool in use worldwide (Schewe 2000:20) and has been effectively used to enhance and “renovate” digital images of damaged and vandalized rock art for publication (Werner 2012). Researchers attempting to resolve the visual tangle of pigment superimposition have also achieved some success by converting images to black, white and gray layers using Photoshop (Brady 2006). Adobe's target application, of course, is not specifically rock art research, and results vary greatly depending on the skill of the user.

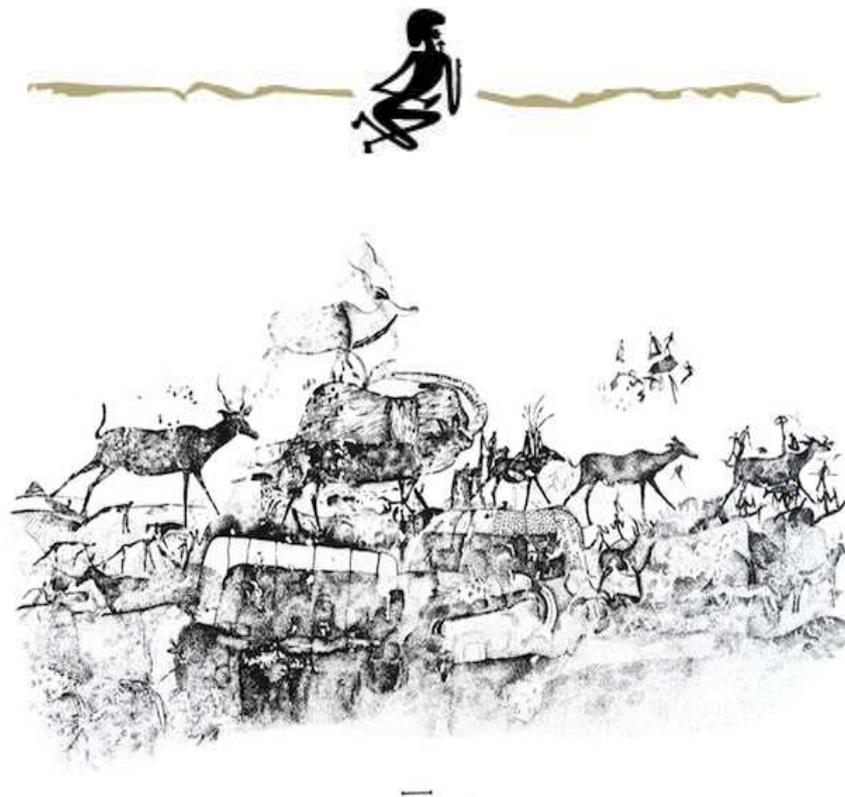
Powerful though it is, Photoshop no longer enjoys exclusive standing at the top for rock art image enhancement. DStretch, short for decorrelation stretch, is a digital imaging tool created specifically for use on rock art images. The program artificially highlights colours in RGB images by isolating colour spaces and statistically increasing - that is, stretching - the separation between different colour fields (Harman 2008). The program works especially well with art painted in red and when there is significant hue difference between elements within a panel. Stretching faint red or yellow images can produce striking results; black and white pigment can also be successfully enhanced.

DStretch was created as a plug-in to ImageJ, a public domain image processing program available as a free download from the United States government's National Institute of Health webpage. In just the few years since it was quietly launched at a meeting of the Society for California Archaeology in March, 2005, DStretch has been enthusiastically adopted by thousands of users in over thirty countries worldwide (Harman personal communication 2013).

DStretch has several distinct advantages over Photoshop when the two are compared. For one, DStretch, can be legally obtained free of charge - no small bonus compared to the current cost of Photoshop. Further, results obtained with DStretch can be easily replicated; an enhancement made using any of the 22 standard algorithm buttons can be consistently reproduced over time by different users without the steep learning curve Photoshop proficiency requires. DStretch is relatively user-friendly compared to the opaque symbols and commands of Photoshop. And most importantly, DStretch has now become truly portable. The plug-in has been installed in at least four off-the-shelf models of Canon camera, thereby creating a remarkable rock art detection tool, the DStretch camera.

Introduced at the American Rock Art Research Association annual conference in Del Rio, Texas in 2010, the DStretch camera was an overnight sensation. Instead of postponing enhancement or lugging a laptop to a remote site, a light-weight, battery-efficient DStretch camera can transform digital images on the spot. Nearly invisible pigment traces are highlighted and new elements can be added to formerly recorded panels. Archaeologists conducting rock art surveys in Australia and the American Southwest consider DStretch to be an indispensable field tool (Brady & Gunn 2012:632-633; Christensen, Dickey & Freers 2013:31) and others are joining in, as its advantages become more widely recognized.

High-resolution digital photographs of San rock art paintings in Nswatugi Cave, Matobo National Park, were taken by the authors on June 26, 2013 and DStretch was used to produce colour digital enhancements. Faint, nearly invisible image details were observed, particularly on the periphery of the main panel. To present these results in publication, the DStretch enhancements with the greatest contrast (CRGB and RGB0) were converted to black and white using Photoshop.



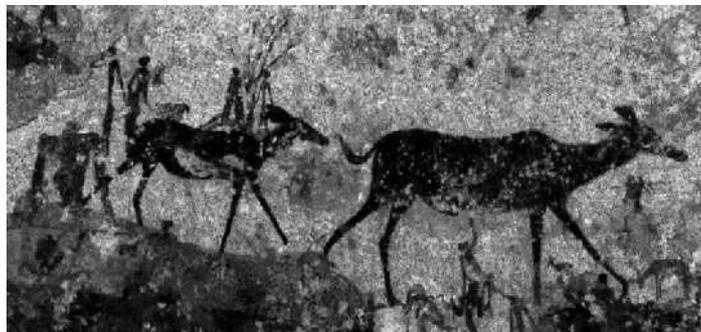
**Figure 1.** photo of Janet Duff's drawing of part of the main panel in Nswatugi Cave (as published in Parry 2000:104). The circled areas are shown in detail in the figures below.



**Figure 2.** Stoll photo (3438Tif) of the same panel as in Figure 1 in Nswatugi Cave, DStretch CRGB enhanced, followed by Photoshop conversion with RED emphasized.



**Figure 3.** Stoll photo (3438Tif) of same panel in Nswatugi Cave, DStretch CRGB with YELLOW emphasis. The identical image as in Figure 2 is here shown with yellow pigment highlighted, revealing many new details. At least two yellow animals appear, a possible kudu cow with lowered head above the kudu bull on the left side, and a large four-legged composite animal on the right. Additionally, a hook shaped form composed of yellow dots (possibly bees or termites?) is revealed below the kudu bull, as the outline of the forming (center right) emerges (these and other details are strikingly visible in the colour version of this image).



**Figure 4.** A close-up of the right center area of the panel in Figure 2 enhanced using DStretch CRGB. Close-ups of several portions of this complex panel from Nswatugi Cave are necessary to see these figures. The arm of the figure on the right appears to reach up to touch the belly of the kudu cow. On the left, the figure has two arms, one bent back to touch his face. Might the gestures of these figures have important interpretive meaning?



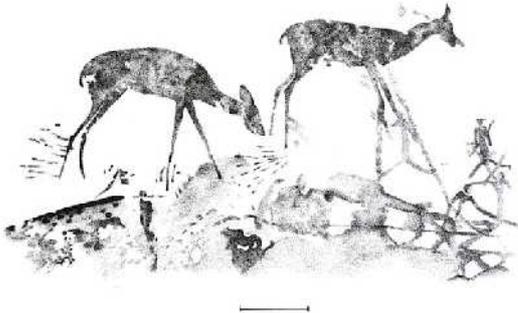
**Figure 5.** Detail from center right drawing of Nswatugi Cave (Figure 1)



**Figure 6.** Same area of panel, photographed and enhanced using DStretch.

Figures 5 and 6 show a comparison between a precision drawing and an enhanced digital image of a small group of figures from the main panel at Nswatugi Cave. Many possibly important new details are revealed; the rectangular shape near the center of this group can now be seen as four connected humans, perhaps lying shoulder to shoulder or beneath a single blanket with their heads

protruding. In the human figure above this quartet, details of feet and hair or headdress are now visible. Formerly blurred pigment is resolved into staffs or arrow shafts, heads, limbs, and additional human figures, several assuming the so-called trance posture. This added level of resolution could change the interpretation of this grouping.



**Figure 7.** Photo of Janet Duff's drawing of a portion of the panel in Nswatugi Cave depicting two duiker (published in Parry 2000, pg.26).



**Figure 8.** DStretch (RGB0) enhancement of the same area of the panel in Nswatugi as Figure 7. Several hidden figures appear beneath the right-hand duiker. Note also the fine lines above and between the animals.

These two figures (Figures 7 and 8) present a comparison of the drawing of “Nswatugi Cave duiker” (Parry 2000:26) with the DStretch version of the same two animals. As with the previous images, new details are visible. At least two additional standing figures can now be seen, and what seems an amorphous mass below the right-hand duiker is



resolved into a four-headed rectangle. The now-visible human figure directly above this and touching the rear legs of this duiker might be the source of the sprayed lines seen in both the drawing and the photo. A series of previously unseen vertical lines appear between the two duiker.

These enhanced images do not purport to resolve everything of interest in this panel. In fact, the intensely over-painted dado of red pigment, shown in part in Figure 2, described by Walker as common on the lower walls of large painted rock shelters in the Matopos (Walker 1994:119), was not successfully differentiated by DStretch. Duff's trained eye picked out shapes that DStretch failed to register due to a lack of separation within the red hue.

In their article on the role of digital technology in rock art research, Brady and Gunn reviewed DStretch along with Adobe Photoshop (Brady & Gunn in McDonald & Veth 2012). The authors respond to Lewis-Williams' argument that manual tracing of motifs is still crucial to rock art recording by stating that,

Although subjectivity still exists in the use of image-enhancement techniques, we believe that these techniques can reduce the degree of subjectivity inherent in a drawing or sketch, as well as assisting in interpreting an image. Sketching and detailed on-site drawings remain an important part of a recording methodology, especially in the context of superimpositions and colors. However, we would advocate that rather than choosing one technique or another, researchers combine sketching/drawing with digital photography and computer enhancement as a mean of obtaining a more comprehensive understanding of an image or panel” (Brady & Gunn 2012:630-631).

We accept that combining techniques is an intelligent compromise in an ideal world. However, if limited time or resources prompt the selection of one technique over others, we assert that DStretch must be the first choice. Our examples unequivocally show that DStretch reveals faint, nearly invisible details in painted rock art panels. Undoubtedly, programs and methods will improve in the future but as of today, every serious rock art researcher should include this type of digital image enhancement in their methodology.

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### **Stolen Artefacts Returned to the National Gallery, 2013**

The National Gallery of Zimbabwe is proud to officially unveil the artifacts that were retrieved and brought back from Europe after they had been stolen in 2006. The works arrived from Germany on the 3rd of October 2013. The unveiling was held in the North Gallery on Thursday 10th of October at 1100hrs at the National Gallery of Zimbabwe.

On 6 June 2006 the Gallery was confronted with a very daring daytime theft of six ethnographic objects. These pieces included four Headrests /Mutsago which are from Zimbabwe and of Shona origin and two masks which are the Makonde masks from Tanzania which were acquired by the Gallery in 1964.

The director of the National Gallery, Doreen Sibanda, thus advised by the deputy director of the National Museums and Monuments of Zimbabwe, Traude Rogers, contacted the Museum Security Network. It was decided to publish information about this theft, accompanied by photographs <http://www.museum-security.org/>. The theft was reported to local Zimbabwean police and to Interpol in Lyon, France.

Five months later, beginning of November 2006, an American collector of African antiquities contacted the website because someone had offered him objects that looked very similar to those published on the site. The collector was advised to get in touch with his local police. It appeared that the stolen Zimbabwean objects were offered by a resident of Poland who tried to evade being charged by the police by claiming the objects had belonged to his father who had worked in Zimbabwe during the Rhodesian era. The story was proved false. The Polish police performed a great job and managed not only to recover the stolen objects but also arrested the person who had offered these objects for sale. He turned out to be the very same person who had committed the crime in Harare.

### **Formation of Zimbabwean Professional Archaeologists Society**

Paul Hubbard

Secretary, ZAPARD

There have been several attempts since 1980 to create a professional society for archaeologists who work in Zimbabwe. Thus, it was with a real sense of anticipation that colleagues from all over Zimbabwe travelled to Masvingo on September 28, 2013 for a meeting solely intended at creating such a society using a constitution, code of ethics, code of conduct crafted at a previous meeting in 2007 but never actualised.

The meeting, kindly and ably hosted by Great Zimbabwe University was attended by 24 colleagues, enough for a quorum and to create the Association. The council for the period 2013-2015 includes Gilbert Pwiti (Chairman), Paul Mupira (Vice Chairman), Paul Hubbard (Secretary), Munyaradzi Manyanga (Treasurer) and Genius Tevera and Petronella Katekwe (Members).

The Association aims to foster a greater role for archaeology in present and future Zimbabwean society through research, publication and integration of a wider audience with archaeological activities and knowledge. Membership is open to all professional researchers interested in Zimbabwe's past.

For more information, including details on how to apply to join the society, please contact the Secretary on [hubcapzw@gmail.com](mailto:hubcapzw@gmail.com)



## New Publications on Zimbabweanist Archaeology

Chirikure, S., Manyanga, M., Pikirayi, I. & Pollard, M. 2013. New Pathways of Sociopolitical Complexity in Southern Africa. *African Archaeological Review*.

Much is known about the economy and spatial organization of Zimbabwe culture entities of Mapungubwe, Great Zimbabwe and Khami but less in terms of their origins and relationship with each other. Based on little tangible evidence, it is believed and widely accepted that the societies based at Mapungubwe (AD 1220 - 1290), Great Zimbabwe (AD 1300 - 1450) and Khami (AD 1450 - 1820) rose, developed and eclipsed in tandem. A recent reexamination of the relationship between these settlements and related ones using local ceramics, imported artefacts, stone architecture and Bayesian modelling suggests this may not have been the case. The synthesis proffered revelations which temper the widely accepted assumption that sociopolitical complexity in southern Africa began in the Shashi-Limpopo Valley before anywhere else in the region. Firstly, there are numerous Zhizo and Leopard's Kopje sites that predate Mapungubwe but contain prestige goods and stone structures dating from the late first millennium AD. Secondly, material culture studies and modelled radiocarbon dates indicate that Great Zimbabwe evolved out of Gumanye while Khami, like Mapungubwe, may have developed out of the Leopard's Kopje. In fact, Great Zimbabwe was already a place of importance when Mapungubwe collapsed. Thirdly, Khami and Great Zimbabwe overlapped for over a century, before the latter buckled. Therefore, the evolution of sociopolitical complexity in southern Africa may have followed trajectories that are different from what the current understanding implies.

Chirikure, S., Pollard, M., Manyanga, M. & Bandama, F. 2013. A Bayesian chronology for Great Zimbabwe: re-threading the sequence of a vandalised monument. *Antiquity* 87:854-872.

Great Zimbabwe is one of the most iconic sites in southern Africa and indeed the world, but like so many famous monuments it has suffered from the attention of early excavators who have destroyed key categories of evidence. Chronology is crucial to understanding the development of the various elements of Great Zimbabwe and its relationship to other important regional centres such as Mapungubwe. A number of radiocarbon dates are available, however, and in this study they have been combined with the limited stratigraphic information and with datable imports to provide a Bayesian chronology of the site and its structures. Construction of the stone walls probably began at the end of the twelfth or beginning of the thirteenth century

AD, reaching its peak in the fourteenth and fifteenth centuries, although occupation continued up to at least the sixteenth and probably into the seventeenth century AD. These results indicate that occupation at Great Zimbabwe must have overlapped with that at Mapungubwe, and argue for a polycentric model of sociopolitical complexity in this region of southern Africa during that crucial formative period.

Koleini, F., Prinsloo, L.C., Schoeman, M.H., Pikirayi, I. & Chirikure, S. 2013. Characterization of the corrosion layer on iron archaeological artefacts from K2 (825 - 1220 AD), an archaeological site in South Africa. *Studies in Conservation* 58 (3): 274-282.

A study of the composition and phase distribution of the corrosion layers on three ferrous objects, excavated at K2 (Bambandyanalo), an archaeological site in South Africa, was conducted. The objective of the study was to obtain information that can contribute to conservation procedures to be performed on the iron artefacts from this site. Examination of cross sections by means of energy-dispersive X-ray spectroscopy coupled to a scanning electron microscope, X-ray powder diffraction (XRD), and micro-Raman spectroscopy revealed the same corrosion composition and structure for all the objects under study, namely an internal layer adjacent to the metal surface with ghost inclusions and an external layer containing quartz grains. The study also revealed that the presence of magnetite, maghemite, and lepidocrocite within the internal layer is the only difference between the chemical compositions of iron corrosion products within the two layers. The results also made it possible to retrace the corrosion history during burial and long-term storage.

Manyanga, M. & Katsamudanga, S. (eds). 2013. *Zimbabwean archaeology in the Post-independence era*. Harare: SAPES books.

Thirteen chapters include a review of stone age studies (Foreman Bandama), rock art studies (Siyakha Mguni and Ancila Nhamo), forager and farmer interactions in the Shashi-Limpopo Basin (Munyaradzi Manyanga, Gilbert Pwiti & Shadreck Chirikure), a review of ceramics (Ezekia Mtetwa, Munyaradzi Manyanga & Innocent Pikirayi), Faunal studies (Plan Shenjere-Nyabezi, Gilbert Pwiti & Munyaradzi Manyanga), Pre-colonial Mining and Metal Working (Shadreck Chirikure, Thomas Thondlana & Foreman Bandama), Application of Geographic Information Systems in Zimbabwean Archaeology (Seke Katsamudanga & Tendai Musindo), the Stone Building Cultures of Southern Africa (Gilbert Pwiti, Russell Kapumha & Webber Ndoro), an investigation into the vaNyai, Rozvi and Torwa (Lesley Hatipone Machiridza), burial studies (McEdward Murimbika) and audiovisual recording and dissemination of archaeological knowledge in Zimbabwe (Forde Storaas, Seke Katsamudanga & Godhi Bvocho).

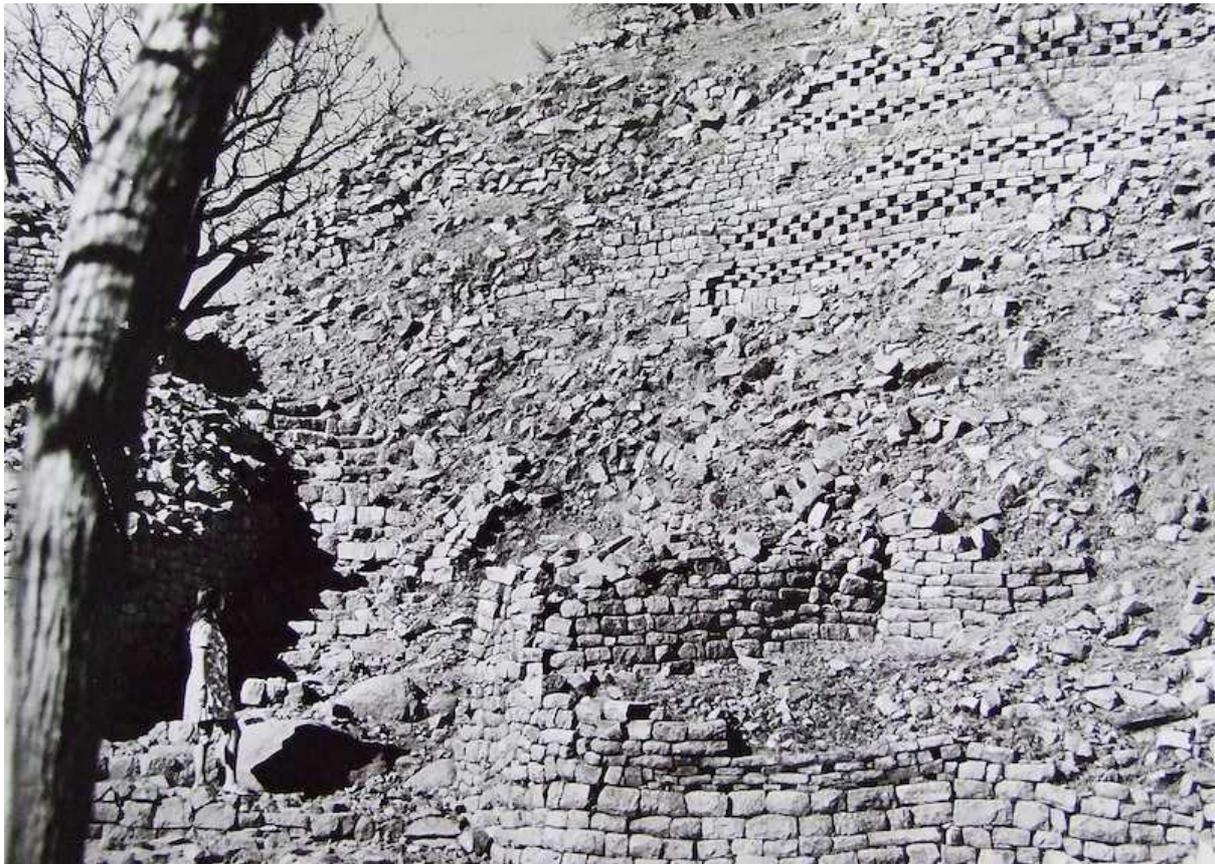


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#### TAIL ENDER



This is the Hill Ruin at Khami, near Bulawayo taken in the 1970s by the Rhodesia Ministry of Information. Recent visitors to the site will fully appreciate the amount of restoration and rebuilding accomplished by National Museums and Monuments of Zimbabwe and their partners since the year 2000. An outstanding commitment to the preservation of Zimbabwe's heritage.