

Routledge
Taylor & Francis Group

Journal of Community Archaeology & Heritage

ISSN: 2051-8196 (Print) 2051-820X (Online) Journal homepage: https://tandfonline.com/loi/ycah20

Local people's interpretations of the hominin footprints at Laetoli, Tanzania

Elgidius B. Ichumbaki, Marco Cherin, Fidelis T. Masao & Jacopo Moggi-Cecchi

To cite this article: Elgidius B. Ichumbaki, Marco Cherin, Fidelis T. Masao & Jacopo Moggi-Cecchi (2019): Local people's interpretations of the hominin footprints at Laetoli, Tanzania, Journal of Community Archaeology & Heritage, DOI: 10.1080/20518196.2019.1594035

To link to this article: https://doi.org/10.1080/20518196.2019.1594035


Published online: 24 Mar 2019.


Submit your article to this journal


Article views: 21


View Crossmark data

Full Terms & Conditions of access and use can be found at
https://tandfonline.com/action/journalInformation?journalCode=ycah20

JOURNAL OF COMMUNITY ARCHAEOLOGY & HERITAGE
https://doi.org/10.1080/20518196.2019.1594035

Routledge
Taylor & Francis Group

Check for updates

Local people's interpretations of the hominin footprints at Laetoli, Tanzania

Elgidius B. Ichumbaki [a], Marco Cherin [b], Fidelis T. Masao[a] and Jacopo Moggi-Cecchi [c]

[a]Department of Archaeology and Heritage Studies, College of Humanities, University of Dar es Salaam, Dar es Salaam, Tanzania; [b]Department of Physics and Geology, University of Perugia, Perugia, Italy; [c]Department of Biology, University of Florence, Florence, Italy

ABSTRACT

In 1976 and 2014, scientists reported hominin footprints in Pliocene volcanic deposits at Laetoli, north-eastern Tanzania. They hypothesized that the footprints belong to the extinct hominin species *Australopithecus afarensis*. Not only have the footprints shaped scientists' understanding of human biological evolution, but they have also placed Laetoli and Tanzania on the world's paleoanthropological studies map. However, there have been different interpretations of who made these footprints. Opinions of the scientists on the footprints are widely documented, yet narratives of Maasai (local people living around Laetoli) have never been investigated. This paper documents the perceptions of Maasai on what these footprints are, and to whom they belong. We report that concepts related to the nature and genesis of the footprints and who made them form part of the Maasai's history. Finally, we suggest that for sustainable footprints preservation, local narratives about footprints be integrated into scientific interpretations of the site.

KEYWORDS

Laetoli; Maasai; footprints; hominids; community archaeology

Introduction

The Plio-Pleistocene site of Laetoli is located in north-eastern Tanzania within the Ngorongoro Conservation Area (NCA). In particular, the site is situated on the high flanks of the Eyasi Plateau forming the divide between Olduvai Gorge and Lake Eyasi watershed at the southern edge of the Serengeti Plains (Figure 1). The whole region of Laetoli and nearby vicinities provides a long sequence of Plio-Pleistocene volcanic and sedimentary deposits overlying Precambrian metamorphic rocks. All these rocks are rich in archaeological and paleontological cultural heritage that inform about human biological and cultural evolution (Hay 1987). Laetoli's paleontological and paleoanthropological significance has been known since the mid-1930s (Reck and Kohl-Larsen 1936; Kohl-Larsen 1943). However, the site became famous during the late 1970s following the discoveries of hominin footprints by Mary Leakey and her co-workers (Leakey et al. 1976; Leakey 1987). The footprints were attributed, not without controversy (Clarke 1979; Tuttle et al. 1990; Harcourt-Smith 2005), to *Australopithecus afarensis* (White and Suwa 1987), i.e. the only hominin taxon found to date in the Upper Laetoli Beds (Harrison 2011).

The three tracks of hominins and other vertebrates, dating from 3.66 million years ago, dominate the studies at Laetoli. There are more than 50 scientific papers published to date, mainly analysing the track-makers' morphology, alleged taxonomy, biomechanics, and so forth. Furthermore, there are limited studies on the archaeological and paleontological importance of the site (Masao et al. 2016 and references therein). For instance, studies that followed earlier discovery by Mary Leakey

CONTACT Elgidius B. Ichumbaki ichumbaki@udsm.ac.tz

© 2019 Informa UK Limited, trading as Taylor & Francis Group

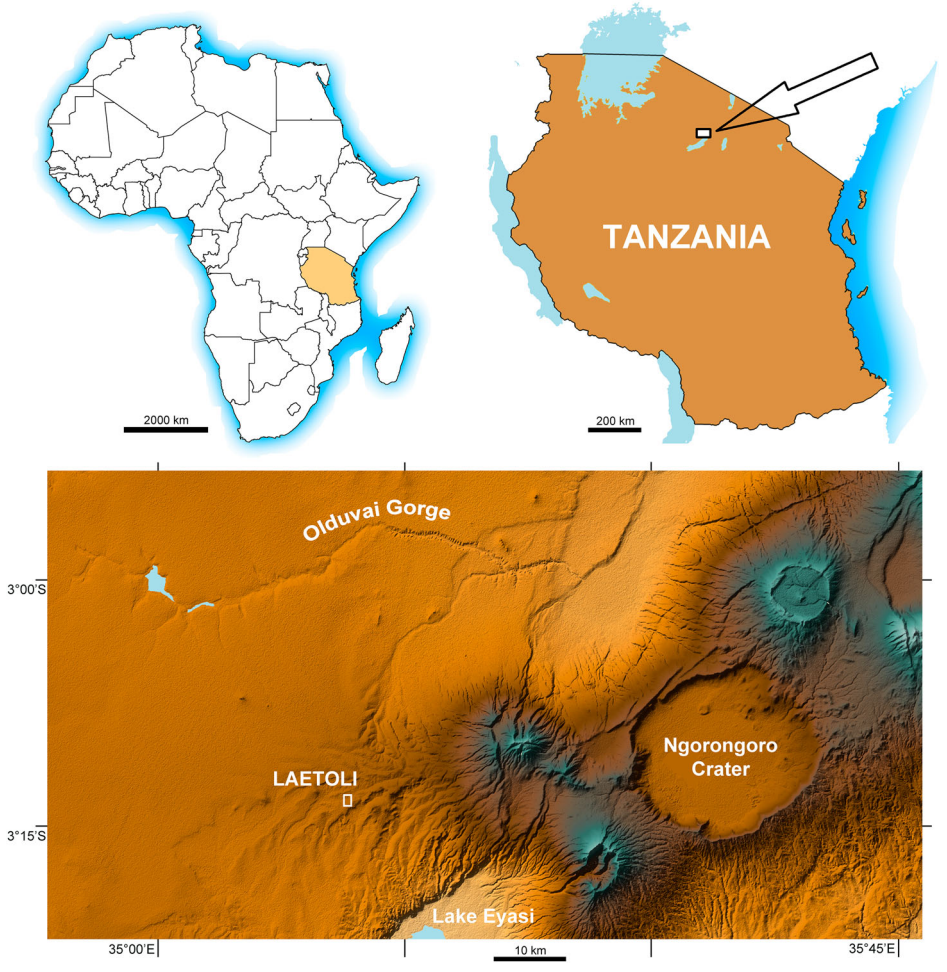


Figure 1. A map of Africa, Tanzania and Ngorongoro Conservation Area Showing the Location of Laetoli.

and colleagues focused on Laetoli's geology (Hay 1987; Ndessokia 1990), hominid remains (Day, Leakey, and Magori 1980; Leakey 1987), further interpretation of the hominid footprints (Clarke 1979; Meldrum et al. 2011) as well as challenges regarding the footprints' protection (Musiba et al. 2012). These studies inform that the distribution of archaeological remains of Laetoli are not as rich or diversified as that of the Laetoli's nearby site of Olduvai Gorge. However, the study of the palaeontological collections from the Laetoli stratigraphic succession (Lower and Upper Laetolil, Ndolanya, Naibadad, Olpiro and Ngaloba Beds, from bottom to top; Harrison 2011), has contributed significantly to a broader understanding of the evolutionary history of African hominins. The studies at Laetoli have also assisted in understanding hominids and their associated paleoenvironments (Ndessokia 1990; Harrison 2011; Meldrum et al. 2011; Musiba et al. 2012). Similarly, alongside archaeological and paleontological studies, there has been a consideration of the footprint-bearing tuff's description, geologic history, geochronology and cementation mechanisms (Tuttle et al. 1990; Barker and Milliken 2008; Deino 2011; Harrison 2011). These geological studies inform us that Laetoli footprints occur in 10 sublevels of the so-called Footprint Tuff, a 15–20 cm-thick level of laminated ash corresponding to the lower part of Tuff 7 in the Upper Laetolil Beds stratigraphic sequence (Hay 1987).

This summary indicates that subsequent to Mary Leakey's discovery, other scholars have extensively studied Laetoli's geological, archaeological and paleontological features. Regrettably,

however, such studies rarely engaged local communities (Maasai people). Scientists interpreted what they considered to be their discoveries without considering the ideas from the Maasai. In some cases where Maasai were engaged, some local community members had to comply with what they were told to do and how to do it. Lack of local community engagement at paleontological sites is not the case at only Olduvai Gorge (Mehari and Ryano 2016) and Laetoli. It is a major bottleneck for the eastern Africa region, particularly the lift valley that has produced incontrovertible evidence for human biological and cultural evolution. Whereas there is a growing recognition of the importance of community-based research in unravelling the human past, few initiatives, if any, are noted at paleontological sites in Africa. Although one would expect community engagement in research to take place at sites such as Olduvai Gorge with close to a century of research history, academic publications rarely integrate people's views and perceptions about the scientific discoveries (Mehari and Ryano 2016). At another paleontological site of Turkana in Kenya, there are at least investments in resolving local communities' social problems related to health, education, and water (http://www.turkanabasin.org/about/outreach/). For nearly 15 years, scholars from across the world have conducted over 10 workshops to discuss current issues in the fields related to human evolution at Turkana but none of those workshops have considered unravelling communities' views about the discoveries made, so far. The same failure to explore local community's interpretation of scientific discoveries also exists at other sites such as Afar, Middle Awash and Konso in Ethiopia. Indeed, local community engagement in research and conservation initiatives at paleontological sites remain minimal.

We understand that heritage scholars and archaeologists continue to debate the questions of what the concept of 'local community' means and how archaeology and heritage researchers can ensure community engagement (Schmidt 2017; Leeuw, Cameron, and Greenwood 2012; Stoecker 2009; Chirikure and Pwiti 2008). However, a recent study from north-western Tanzania provides some clues on how to successfully engage the local community (Schmidt 2017). Schmidt suggests that researchers can realize engagement of local people in producing knowledge through various strategies – both directly and indirectly. These initiatives include forming a local committee to document heritage, performing heritage works such as gathering shrine construction materials and reconstructing the shrine, as well as building roads to ensure that the heritage sites are accessible. Above all, members of the community represent the project to the broader public and continue to encourage one another not to lose hopes and interests in the heritage projects (Schmidt 2017, 7).

Peter Schmidt's observations challenge Hughes' (2008) comment that community archaeology and heritage studies foster possessiveness, parochialism and activists' agendas. We agree with Schmidt's (2017) conclusion that considering community engagement as activists' agenda overlooks the local community's deep commitments toward heritage conservation and management. It is not our intention to undermine or overlook the role of scientists in producing knowledge about the footprints at Laetoli. What we maintain instead is that the Maasai have not been co-producers of the knowledge and scientists have not acknowledged their contributions equally (Mehari and Ryano 2016). Considering that the Maasai have been living within the Ngorongoro landscape for centuries, and because the Ngorongoro landscape has shaped their history, one could reasonably expect that all interpretations of material culture within the landscape make use of their local knowledge. Unfortunately, available literature provides little credit to the contribution of Maasai in unravelling the history of Laetoli, as if their contribution is only passive.

In this paper, we argue that the Maasai living within the vicinities of Laetoli (and the nearby paleontological site of Olduvai Gorge) have remained outside the knowledge production community. Regrettably, some local Maasai who co-worked with the Leakeys and colleagues and researchers who followed Leakey provided their views about the discoveries, but their contributions were ignored. That is, the Maasai narratives about footprints and other fossilized bones remained rarely considered. To paraphrase Innocent Pikirayi's argument, previous palaeontologists and archaeologists working at Laetoli did not recognize local people's voice, which could probably provide some insights in interpreting the discovered 'treasures' (Pilkirayi 2011, 104–105). Instead, both local and international

researchers working at Laetoli alienated their scientific studies from the Maasai in whose motherland these archaeological and paleontological cultural heritage are found. Such a tendency of excluding local Maasai in paleontological and archaeological research projects has been reported at the nearby site of Olduvai Gorge (Mehari and Ryano 2016). Following this neglect of Maasai perspectives, it is not surprising that the exclusion of local people experienced at Olduvai Gorge extends to Laetoli as well. Therefore, we discuss how the local voices on scientific interpretations have been neglected at Laetoli and how their consideration to newly discovered footprints helped in furthering our thinking about the features. Before turning to a description of the Laetoli footprints (both new and old), a brief explanation of the Maasai community in Tanzania serves to place our topic in a social context.

The Maasai community in Ngorongoro

Historians and linguists maintain that the Maasai emerged as a distinct group beginning in the seventeenth century when they settled in the low-lying plains of central and southern Kenya (Amin, Willets, and Eames 1987). From the eighteenth century, the Maasai developed a livestock-based economy and the pastoral ethic (McCabe 2003; Spear 1993) which they are commonly identified with today. During the late eighteenth and nineteenth century, the Maasai expanded their territories, taking the Crater Highlands of Ngorongoro (Galaty 1993). The Maasai of Tanzania are a Nilotic ethnic group that is historically known to inhabit the north-eastern part of the country. They are semi-nomadic and pastoral because they live by herding cattle, goat and sheep. Meat, milk and blood of their domestic stocks are what made a good meal for the Maasai (Århem 1989) until three decades ago when their livelihood diversified to include agricultural products. Diversification of livelihoods among the Maasai of Ngorongoro responded to the increasing population, reduction in grazing area, livestock population fluctuation, and modernization which brought with it the monetary economy (McCabe 2003).

The Maasai community is organized into male age-groups, members of whom together pass through initiations to become warriors and then elders. This Maasai cultural aspect is relevant for the context of the current study because it links closely with their interpretation of the footprint makers. According to Århem (1989), the Maasai gender and age-set system permeates every aspect of their lives including political organization, social division of labour and the whole cycle of the man's life. While a thorough discussion of the Maasai age-set systems has appeared in voluminous publications, for the purpose of this paper we concentrated on one group: *ilmurani* – the warriors. We pay attention to this group because local people at Laetoli attach the newly discovered footprints to the warriors.

Warriors is a special respected age-set group among the Maasai for they represent a military force of the local community. They are responsible for taking care of the society. It is this group, which protects the life and livestock of the community, carries out stock raids and also fights enemies. Because of this special task, warriors have restrictions on what they eat. For instance, a warrior can neither drink milk from his own or father's herds, nor drink the milk alone. They are also prohibited from drinking honey mead, chewing tobacco or eating vegetable foods. Furthermore, warriors cannot eat meat that women have already seen and handled. The warriors are supposed to consume vast amounts of meat so that they become energetic. They are also required to eat *motori* – a particular soup made from meat boiled with fat and a mixture of herbs from a certain tree, to which the blood from a slaughtered animal is also added. These two meals, meat and *motori*, are the special meals for the warriors in order to make them grow big, fat and strong. From the local community's perspectives, it was some of these warriors that made the Laetoli footprints.

Nevertheless, it is notable that there had not been any formally planned research project designed to investigate Maasai's narratives on the footprints and other fossil bones and hominids reported at the Laetoli site. The narratives we report here are ones that we encountered accidentally after the footprint's discovery. In this article we present these narratives, and how we consider them to be

important for the site's sustainability. Before that discussion, however, we present the footprints of Laetoli; both old and new.

The footprints of Laetoli and their importance

The outstanding significance of Laetoli for understanding human biological evolution emerged in the 1970s, thanks to the discovery of some important paleontological remains such as the holotype and other remains of *Au. afarensis* (Leakey et al. 1976; Johanson, White, and Coppens 1978), and of the earliest bipedal hominin tracks in the world (Leakey and Hay 1979; Leakey and Harris 1987). Mary Leakey and collaborators found this remarkable evidence in 1976 at Site G (Locality 8). Seventy human-like tracks arranged in two parallel trails are reported at Laetoli Site G. They are taken to refer to three individuals (G1, G2, G3) of different body size: the smallest individual, G1, walked side by side on the left of the largest individual, G2, while the intermediate-sized individual, G3, superimposed its feet over those of G2 (Leakey 1981).

After Mary Leakey's discovery, scientists have reported mammal, bird and insect tracks in 18 sites (labelled from A to R) out of 33 total paleontological localities in the Laetoli area (Leakey 1987; Musiba et al. 2008; Harrison and Kweka 2011). Until recent years however, the only incontrovertible evidence of hominin footprints has been that from Site G.

Two of the authors (Ichumbaki and Masao) discovered the new hominin footprints at Site S in 2014 (see Figure 2) while undertaking a Cultural Heritage Impact Assessment. The assessment aimed at providing recommendations on measures to mitigate adverse impact as the Government was



Figure 2. A part of the footprints reported from Site S. Photo: Raffaello Pellizzon.
Source: eLife (doi: 10.7554/eLife.19568.001), licensed under CC BY 4.0.

proposing to build a field museum in Laetoli. The area of maximum impact was subjected to cadastral mapping into 225 m^2 each numbered alphanumerically. Of the total number, only 62 grids found in Site G Locality 8 were earmarked for excavation. With the assistance of the local Maasai, excavation of these grids, which only made two per cent (2%) of the area to be impacted, continued to and beyond the footprint tuff. We reached the pits with hominid footprints after conducting excavation at 34 trenches of two by 2 m. As excavation continued in other grids, we recorded features which later came to be interpreted as hominid footprints. Consequently, we unearthed 13 hominin tracks associated with tracks of other vertebrates and rain droplets in three test-pits (Masao et al. 2016). We ascribed all footprints to a single individual trackway, with an estimated total length of 32 m and trending SSE to NNW. Following the code used for the Site G prints (Leakey 1981), Masao et al. (2016) named the new individual as S1. A single track referable to a second individual (S2) was discovered in the SW corner of the southernmost test-pit.

Leakey and her colleagues' discovery of hominin footprints at Laetoli Site G in 1976 was a most remarkable event in the history of human palaeontology. It took nearly 40 years before discovery of similar features at Site S, located about 150 m south from Site G (Masao et al. 2016). Leakey and colleagues', and Masao and fellows' discoveries play two important roles in understanding the biological evolution of our lineage: symbolic and scientific. For the former, Laetoli footprints, from the global point of view, represent the earliest preserved tracks of our hominin ancestors. Indeed, these features are one of the major evocative pieces of evidence symbolizing humanity's long and wondrous evolutionary journey. More broadly, Laetoli footprints and other paleoanthropological discoveries from East and South Africa provide incontrovertible evidence on the biological evolution of humankind across thousands of millennia. However, Laetoli footprints are unique in representing the earliest direct evidence of bipedalism among our primitive ancestors (Leakey and Harris 1987). Unlike fossil bones, footprints offer clues on foot soft-tissue anatomy, thus allowing inference on early hominin walking patterns. The exquisitely preserved Laetoli footprints provide direct information on the anatomy of the foot arch, the position of the big toe in relation to the axis of the foot, and the form and depth of heel impressions. The footprints also provide information on the stride length and footfall pattern, and even the locomotor behaviour of track-makers walking on wet volcanic ash some 3.66 mya (e.g. Charteris, Wall, and Nottrodt 1981; 1982; Tuttle 1987; Tuttle et al. 1990; Schmid 2004; Raichlen et al. 2010; Crompton et al. 2012; Hatala et al. 2013; Hatala, Demes, and Richmond 2016).

Moreover, fossil footprints also allow us to infer information on body size, which strictly correlates to foot/footprint size. Masao et al. (2016) estimated the stature and body mass of the five Laetoli track-makers (G1, G2, G3, S1 and S2). The results are of great importance because they allow us (1) to confirm unequivocally that *Au. afarensis* was a species characterized by a wide morphological variation (the difference in height between the smallest and the largest individual at Laetoli is more than 50 cm), probably related to sexual dimorphism (e.g. morphological difference between males and females in a given population), and (2) to make some inference on the social structure and reproductive strategy of *Au. afarensis*, which we hypothesize to be a sexually dimorphic polygamous species similar to the living gorilla (Masao et al. 2016).

Involvement of local communities in research and conservation activities at Laetoli

The interests of Maasai to engage in the research and conservation initiatives at Laetoli is probably as old as the research activities themselves, dating back to the 1930s. For instance, during the early years of research, a few Maasai living close to Laetoli worked with Louis and Mary Leakey at Olduvai Gorge. Because of their curiosity and desire to see their history documented, they convinced the Leakeys to extend their research project to Laetoli. A local Maasai named Sanimu reported the presence of Laetoli to the Leakeys and asked them to visit the site. Louis Leakey documents the role of this Maasai in reporting Laetoli when he says:

> He [Sanimu] stayed around for several days and joined us regularly when we went fossil hunting, showing great interest in everything we were doing […]. He asked whether I would like to know about another site where he had

> seen similar fossils not far from where he was living […]. Sanimu suggested that he go home on foot and return in about ten days' time bringing with him samples of the fossils […]. True to his word, when he returned he brought with him in a little bag some pig and antelope teeth, all of them heavily fossilized and some embedded in a hard rock matrix. (Leakey 1974, 50)

Leakey's comment indicates that Sanimu wished to see the fossilized bones at Laetoli documented and studied similarly to what was taking place at Olduvai Gorge. Furthermore, Mary Leakey confirms the Maasai's willingness and interest to see their pasts studied when she says 'when we left [Laetoli] in 1975, the local population indicated their willingness to look after our camp, so we left it standing' (Leakey 1984, 171). This willingness suggests the Maasai's desire to see research continuing at Laetoli. Regrettably, the Leakey's research team did not engage local Maasai in their research activities at Laetoli. Lack of community engagement by then can be explained at two levels: either the research team lacked experience in engaging local people in research activities or, the team considered local Maasai to miss experience in undertaking paleontological surveys and excavations. Thus, during her various expeditions in the 1970s and 1980s, the Leakeys engaged three Kenyans whom they worked with at Olduvai Gorge namely Ndibo Mbuiko, Kitetu Itumanga and Kibebo Kimeu. Other local people who were engaged especially in identifying animal tracks as recognized by their tribes – Msukuma and Hadza – are not Maasai (Leakey 1984, 175).

After Leakey's serious fieldwork research at Laetoli, several other research projects followed especially between the 1980s and 1990s. These projects aimed to reconstruct Laetoli's ecomorphology, taphonomy and paleoecology (Kaiser 2000; Kaiser, Bromage, and Schrenk 1995; Musiba 1999) as well as efforts to preserve footprints trail (Musiba et al. 2012; Agnew and Demas 1998). Regrettably, with the exception of trail preservation initiatives by the Getty Conservation Institute – GCI, the other research projects implemented at Laetoli did not engage Maasai in their geological and paleontological investigations.

Whereas we appreciate the scientific contributions summarized above as well as the social contribution of Leakey and colleagues to the Maasai, including medical assistance and transporting some members injured by animals to the hospital at Enduleni (Leakey 1984, 171), we also argue that they neglected ideas and perceptions of local Maasai such as Sanimu. Thus, since then, nothing regarding local perceptions of the heritage found within the vicinity of the site (fossil bones and footprints) has been incorporated in paleontological discourses. In a few cases where contributions of Maasai in interpreting the discoveries at Laetoli appear, they are in the Leakeys' biographies, autobiographies and acknowledgement sections of various publications (Mehari and Ryano 2016). Certainly, the scientists who have worked at Laetoli regarded local Maasai as 'passive participants' who knew nothing as far as the palaeontology of the area is concerned.

The involvement of local Maasai in both interpretation of the discoveries and the conservation and management of the site has been minimal. Since the footprints were reburied in 1979, no local monitoring and maintenance strategy have been put in place. Such site protection strategies that the Maasai could implement would result in arresting conservation challenges especially due to growing acacia and other trees, and trespassing of livestock (Feibel et al. 1996). Involvement of the local Maasai was easy and cheap when compared to depending on Government conservators. Due to the site's inaccessibility particularly during the rainy season, antiquities' officers either from the nearby site of Olduvai Gorge or the main office in Dar es Salaam could not manage to visit and oversee the site on regular basis. Verbal communications between one of us (Ichumbaki) and Maasai who were employed to provide security to the site confirmed that conservators from the Tanzanian Antiquities department visited the site only when they came with foreign researchers or accompanying one of the top leaders from the Ministry of Natural Resources and Tourism. This scenario placed Laetoli in the hands of the local Maasai who also (based on our observations) spend much of the days looking after their cattle. Consequently, acacia and other trees grew on top of the footprints, livestock continued to trespass the trackway and flowing rainwater continued to erode the footprint tuff. To remedy these problems (to save at least some of the remaining footprints) the

Government of Tanzania and partners incurred costs that could have been avoided by engaging the local Maasai. Martha Demas and Neville Agnew emphasize this observation when they say:

> […] the present six-year [1992-1998] project of conservation was a consequence of the fact that simple maintenance was overlooked. Removal of acacia seedlings and prevention of erosion of the northern end of the site would have obviated the need for a long and expensive program of conservation. (Demas and Agnew 2008, 69–70)

To avoid the same problem, ensuring participation of local Maasai was the case during the joint efforts by the Getty Conservation Institute (GCI) and Government of Tanzania to conserve and document the footprint trails in the 1990s. Among others, the project aimed at implementing the following works: (1) documenting and monitoring the conditions of footprints; (2) tuff stabilization and re-adhesion treatments; (3) root removal and/or reduction, and (4) addressing the drainage patterns to allow run-off of water that was pooling in the track-way vicinities. During this project's implementation, local Maasai were involved in two capacities: providing site security and offering ritual blessing to the track-ways. For the former, the Government recruited two Maasai guards from the nearby village of Essere in 1995 and there were initiatives to employ them permanently. Duties of these guards included:

(1) Restricting livestock from entering the site boundaries;
(2) Limiting site visitation to those with permission from authorities – NCA and Antiquities;
(3) Keeping register of all visitors' names and accompany those visitors on site at all times;
(4) Visiting and inspecting the site to maintain daily visible presence;
(5) Maintaining drainage systems for freely flow of water without pooling within track-way. and
(6) Regularly reporting to both Antiquities and NCA on-site visits, observations of conditions including disturbances and other problems observed at the site.

To strengthen this desire, the Government even built a house on the hillside south of the site aimed at providing accommodation to both guards and the Government conservator. The house was furnished with a toolkit for cleaning and maintenance of the site, 50-gallon drum for collection of water and visitors' logbook (Demas and Agnew 2008, 68).

Although the GCI and the Government of Tanzania involved the local Maasai in providing site security and offering ritual blessing to the trackways, we credit neither of these processes as intentional community engagement. Instead, they responded only to the situation as they observed it. Analysis of reports on the 1990s conservation projects reveals two reasons as to why the local people were engaged. First, the Maasai were engaged because they have continuously maintained their traditional ways of life depending on cattle herds. A team of conservation experts thought of engaging the Maasai because if they were not aware of the conservation project, they would graze their cattle on and around the trackway site. Grazing cattle around the site could cause erosion of the reburial mound, and the destruction of the systems of berms and drains for diverting the surface runoff (Agnew and Demas 1998, 54). Second, the majority of the local people had noticed the intensive conservation activities and they were curious of the conservation materials such as Biobarrier used in the footprint reburial. Thus, the team engaged the Maasai for they feared that they would steal the Biobarrier materials. Arguably then, engagement of Maasai at this time was not because are important stakeholders with the hominid's footprints. Instead, they were engaged because they were supposed to keep their cattle away from the trackway and not to re-excavate the trackway to get the Biobarrier. Agnew and Demas justify this analysis when they say:

> The Maasai were the only people with a regular presence in the region, which is set aside for their use by the NCA and not open to public access. They were indeed curious about the going-on, but ultimately their interest focused on grazing cattle, access to water and, opportunistically, any materials being tested on site particularly geosynthetics, which were frequently removed after the team's departure. (Demas and Agnew 2006, 67)

The hominid footprints at site S and community interpretation of the features

The excavations conducted at Laetoli in 2014 engaged a number of assistants from within and outside the Laetoli area (Figure 3). The persons involved included experienced excavators trained at Olduvai Gorge and the local Maasai from within the vicinities of Laetoli and beyond (Figures 4 and 5). Three reasons are attributed to engaging the local Maasai: to raise public awareness on the proposed site museum; create job opportunities which could result in acceptance at the local level, and also harness the local labour. Since the assessment involved excavating 62 grids within a period of one month, and following the nature of the Laetoli tuffs (which are indeed hard to dig through), five trenches were excavated simultaneously. Four people, i.e. three local Maasai and one experienced excavator recruited from Olduvai Gorge, attended each trench. Two of us (Ichumbaki and Masao) supervised all the concurrently-excavated trenches.

The participating Maasai were from both within the Laetoli community and the nearby vicinities of Essere and Enduleni. Whereas Mr. Simon Matalo, the elder Maasai who has been working with researchers at Laetoli, was responsible for organizing some youths from Essere and Laetoli, the councillor of the Enduleni ward assisted in recruiting other youths from close to the camping area at the Roman Catholic Church in Enduleni. With the exception of three locals who were women, the remaining were men but all engaged in excavation equally gender notwithstanding. All the Maasai from the Laetoli area depended on themselves for daily utilities (water, foods, etc.), so they had frequent movements between the site and their homes. Going home to get food and water or briefly move to where their cattle and goats were herded was part of the normal daily routine.

None of the group members expected the first footprints at the site. Thus, we called one another to converge at the site of discovery. After discussing the findings for about half an hour, the group leaders called upon each member to go back to his/her trench to continue with their duties. Surprisingly, after some time, one of the group leaders (Ichumbaki) noted that more than half of the Maasai workers had left the site without reporting as they had done previously – we noted later that they had gone to inform their elders about the discovery. About an hour later, Ichumbaki and Masao noted Simon Matalo followed by some of the 'absconded' workers and two community elders running



Figure 3. Some of the crew at two of the excavated trenches at Laetoli. Photo: Raffaelo Pellizzon.



Figure 4. Some of the Local Maasai from Laetoli exposing footprints at site S. Photo: Marco Cherin.



Figure 5. A local Maasai from Laetoli exposing animal footprint at Site S. Photo: Marco Cherin.

towards the site of discovery. The group did not speak to any non-Maasai until they had seen the exposed footprints.

They talked in their Maasai language, Maa, and they seemed to be happier than any other time that the team leaders worked with them. A paraphrased interpretation of what these Maasai talked about was narrated by their elder to be '[…] We got Him! We have heard about him for so long, but finally, He is here! *Lakalanga!*' Mzee[1] Simoni Matalo informed one of us (Masao) that he deserves promotion to the highest academic rank. He insisted that even if the globe will not recognize his contribution to the academic world, the Maasai will always remember him for discovering the *Lakalanga*. Furthermore, Mzee Simoni informed the team that all the workers deserved an award for they had made a wonderful discovery, i.e. the discovery of *Lakalanga* whom they have been looking for, for years without success. He then left and his face indeed showed happiness. After an hour or so, Mzee Matalo came back with an energetic goat, which he ordered must be slaughtered and grilled at the site to celebrate the discovery of *Lakalanga*. The major question here is this: who is *Lakalanga* to the Maasai community and what is the connection between the discovered footprints and *Lakalanga,* and between *Lakalanga* and the Maasai community? Although we give initial answers to this question, strongly recommend an ethnographic study to further document the narratives regarding who *Lakalanga* is.

For the purpose of understanding who *Lakalanga* was, we asked some members recruited locally to work as excavators. Additional inquiries on who *Lakalanga* is involved elders from outside the research team at Laetoli and in the nearby villages of Essere and Enduleni. Because this inquiry happened organically based on an opportunity presenting itself, we did not follow any formalized standards. Instead, it was a face to face questioning of who *Lakalanga* is, administered by one of us (Ichumbaki). Outside the local research team (the Maasai recruited as excavators), the conversations engaged five, four and seven elders from three villages namely Laetoli, Essere and Enduleni respectively. For both inquiries with the local team and with the elders from Laetoli, Essere and Enduleni, no voice recording that was undertaken. Instead, Ichumbaki took notice of the conversations presented in the next paragraphs.

Despite not being a formally organized ethnographic research, inquiries indicated that the name *Lakalanga* is engraved in the narratives of the Maasai community of Laetoli and the nearby villages. Narratives of the Maasai in Laetoli and nearby villages explain *Lakalanga* as the Maasai saviour. The conversations with the five members of the Laetoli community, four elders from Essere and seven elders from Enduleni confirmed their knowledge of stories of *Lakalanga*. Informal discussions with some local research collaborators and the 16 Maasai elders gave general understanding of who *Lakalanga* is. According to the Maasai elders and the youths we worked with at Laetoli, *Lakalanga* was a Maasai who was born during the war when a nearby community was killing Maasai. The Maasai were defeated but it remained in their heart that they would get revenge. To succeed in avenging, they recruited newly born children to assist them in fighting their enemies. These 'hoped future saviours' were isolated from the community and raised in far places where they could not interact with any community members except elders who were teaching them fighting techniques.

Lakalanga ate meat, blood and milk only. His daily routine was eating and exercising to prepare himself for fighting the enemy. At the age of about 15–20 years, *Lakalanga* wanted to go and fight in order to liberate the Maasai community. The elders refused to allow him for they thought he was still not energetic enough to fight the enemies. Instead, the elders insisted he continue eating meat and blood so that he would grow bigger and bigger. Consequently, *Lakalanga* grew bigger than any other member of the society. He was so big that whenever he walked, his footprint left markers on the ground. The current Maasai in Laetoli have such narratives and these stories are part of their history. The youths are being told to be energetic and be ready to defend their families same as *Lakalanga* did. Thus, noting that the prints discovered measured relatively larger than their own prints, confirmed their oral history that *Lakalanga* – the hero warrior – existed.

The Maasai's interpretation of the footprints at site S and connecting these features with their hero *Lakalanga* is neither unique nor surprising. There are several similar scenarios from across the world

where local people associate footprints with gods and heroes. For instance, in about 450 BC, the great historian Herodotus reported that footprints situated along the banks of the Tyras River in Moldavia are associated with gods and heroes visualized as giants (cited in Meyor and Sarjeant 2001). Similarly, writing in the third century AD, Philostratus reports footprints from the Gallipoli Peninsular in north-eastern Turkey believed to belong to a great hero-athlete from the Trojan war as he jogged around (cited in Meyor and Sarjeant 2001, 148). In these two examples and as it is argued elsewhere (Meyor and Sarjeant 2001) people from across the world where footprints are found are curious about these features and always seek explanations on who made these footprints. In due course, local communities have developed rational speculations and imaginations on to whom these footprints and trackways belong. In most cases, the footprints, trackways and fossil remains (of both hominids and other animals – both extinct and extant) are attributed to heroes, gods, demons, mythological animals and birds as well as familiar game and fowl (Meyor and Sarjeant 2001; Psihoyo 1994; Sarjeant 1995).

Accordingly, the Maasai at Laetoli have similar perceptions with the Laetoli footprints but such concerns have not been noticed accordingly. One learns from documents that for several conservation and research seasons at Laetoli, Maasai are only credited for performing ritual practices. For instance, they conducted a spiritual ceremony during the conservation project conducted by the Getty Conservation and the Government of Tanzania in the 1990s (Demas and Agnew 2006; Demas and Agnew 1998). This ceremony, which has been referred to as 'ritual blessing' of the trackway, received a memorable attendance from officials of the government in Tanzania, local people and scientists. The ceremony was followed by discussions of the significance of footprints alongside their conservation strategies. What these practices meant and why they were held at Laetoli has not been investigated.

The Maasai's narratives about the stature of *Lakalanga* marked the first attempt to interpret the discovery from a local perspective and compare the features. Subsequent analysis of features proved that the track-makers at Site S were significantly robust (Masao et al. 2016). Our aim here is not to compare scientific interpretations of the finds with who local Maasai consider the footprint makers were. What we want to say is that the Maasai of Laetoli have deep-time rooted perceptions of who could have made the Laetoli footprints. Whether these narratives are accurate or not, they are likely to influence local Maasai to make them feel responsible in conserving and managing the features. More importantly, the contribution of local Maasai in protecting Laetoli footprints and fossils began in 1935. The Laetoli Maasai want the site known and protected and are at the forefront to make sure that fossils of Laetoli are documented and established. Mary Leakey confirms this argument when she writes:

> […] Our interest in the area [of Laetoli] had been aroused by a visiting Maasai who had joined us at the Olduvai camp and taken part in collecting fossils and artefacts. He informed us that he knew of an area [Laetoli] with similar fossil bones to the south of Olduvai, and to convince us, he went on foot to Laetoli and returned with a number of bones and teeth. The specimens were clearly fully fossilized and we decided to visit the area [Laetoli]. The Maasai acted as our guide and led us to Laetoli by a circuitous route via Lake Ndutu and the Inselberg of Naibadad. (Leakey 1987, 2)

Surprisingly, although Leakey acknowledges the Maasai's initiative to inform her about the site, bringing some bones to convince her to visit the site and guiding the team to Laetoli, she did not go further to tell about the feelings of local people about several discoveries made at Laetoli. She acknowledges local Maasai had (and still have) interests in understanding their pasts but she did not cultivate into these interests and include them in scientific publications. Instead, she solicited advice from officers from the Antiquities office in Dar es Salaam even on matters that could have been handled locally. For instance, instead of using the name Laetolil (i.e. the local name of *Scadoxus multiflorus*, plant species growing extensively in the area), at the request of what she calls Tanzania authorities, she dropped 'l' maintaining that Laetolil is not a correct rendering of the vernacular word (Leakey 1987, 2).

Indeed, the Maasai and particularly those around Laetoli have a strong attachment to the footprints and the entire landscape. Because of this attachment, if actively involved, they could play

an important role in protecting these unique hominin tracks. Opting to involve the local people would also serve to protect the features throughout the year, including during the rainy seasons when the area cannot be reached with vehicles. The Maasai could be engaged in protecting the Laetoli footprints in several strategies. These strategies include:

a) Developing programmes that directly result to their engagement in site protection. For instance, these programmes would be calling regular meetings to discuss various issues concerning site protection;
b) Publishing a pictorial book with images that illustrate the footprints, their importance, how they deteriorate if not taken care of, measures to protect them as well as the benefits resulting from this protection. This type of a book should target school children and there could be competitions regarding reading and interpreting footprints and the related images of the Laetoli footprints;
c) The NCA develop guidelines that require researchers working at Laetoli to directly engage few representatives of local community and fully explain to them what the research is all about including giving feedback whenever research outputs such as publications are produced;
d) Compose a song or use other popular means that will awaken the community to value their sites as well as develop interest in engaging to all activities aimed at ensuring sustainability of the site.

Conclusion

The overall myths of the Maasai community of Laetoli is that the footprints we discovered and especially the large ones (S2) belong to a warrior by the name of *Lakalanga*. The legendary *Lakalanga*, like many other warriors within the Maasai people, occupies a unique position among the community because had the collective role of protecting life and livestock. The Maasai warriors can enter into any house, demand milk (food) and stay anywhere within the community. Because of their roles in ensuring the security of the society, they deserve the right to be taken care of by the entire community. It is because of their roles that the restrictions on slaughtering cattle unless there is a special occasion does not apply to the warriors. Instead, they need to eat meat and *mutori* so that they become energetic and hence be able to fight against enemies. Because the Maasai warriors are highly respected by the entire community and because locals are attributing the footprints to the warriors, there is every possibility that the local Maasai at Laetoli will join initiatives to preserve the footprints.

However, to be able to achieve the above-desired outcome, researchers and authorities should recognize engagement of Maasai in paleontological and archaeological research projects at Laetoli as well as footprint conservation and management as their (Maasai) important basic right. Informing them about the proposed or planned research and conservation activities at the area as well as employing them as labourers is not enough. Instead, they should be empowered to become knowledge producers and co-producers. Engaging the Maasai to co-produce knowledge of the footprints and other fossil remains of Laetoli is important for three main reasons. First, inclusion of Maasai knowledge is likely to increase the diversity of understanding about the discoveries made in the landscape. Second, engagement of Maasai implies respect to them for they are the custodian of the landscapes within which scholars conduct research; and, third, their local knowledge about the ecology and ecological processes taking place is extensive than what scholars or researchers have. Furthermore, the research conducted at Laetoli aim to produce knowledge of which Maasai are the beneficiaries of such outputs for some of the results affect their lives and livelihoods. Ignoring co-producing the intended knowledge with Maasai have had negative impacts in previous research projects at nearby site of Olduvai Gorge and Laetoli. Whereas these impacts include destruction of some establishments at Olduvai Gorge (Mehari and Ryano 2016), frequent removal of the geosythentics from the trackway (Demas and Agnew 2006) denotes the same effects at Laetoli. Engaging the Maasai in research and conservation projects at Laetoli will not only reduce threats emanating from local people, instead, it will increase the link between them (Maasai) and their history.

Note

1. Mzee (Wazee in plural) is a noun in the Swahili language which means an old male. It generally refers to an aged person, who needs both respect and assistance from the all members of the community. Among the Maasai community, Wazee (elders) or ilpayan (in Maa) have economic, political and spiritual powers. Kaj Århem (1989, 2) argues that 'Wazee' among the Maasai exert control over warriors, women and children as well as the power to maintain social order within the community.

Acknowledgements

The authors are thankful to Maasai community for accepting to work with our team at Laetoli and provide their perceptions on the discoveries made at the site. Also, we are grateful to the entire team that worked at Laetoli Site S in 2014 and 2015: A. Barili, G. Boschian, D. A. Iurino, S. Menconero and G. Manzi for the scientific contribution; R. Pellizzon for photographs; P. Blasi, M. Lombardi, G. Peter, L. Quattrini, B. Zamagni, A. Songita and his assistants for the field work. Whereas E. Ichumbaki and F. Masao's research was funded by the University of Dar es Salaam, M. Cherin and J. Moggi-Cecchi was funded by the Italian School of Paleoanthropology, the Italian Ministry of Foreign Affairs and International Cooperation and the Italian Embassy in Dar es Salaam. E. Ichumbaki acknowledges the support of Gerda Henkel Foundation (AZ 10/BE/17) during the writing of this paper. The Department of Antiquities and Ngorongoro Conservation Area Authority both under the Ministry of Natural Resources and Tourism are acknowledged for issuing permits to conduct research at Laetoli. We appreciate constructive comments from anonymous reviews and the editor, Suzie Thomas without of which the paper would not be in this shape.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by Gerda Henkel Foundation: [Grant Number AZ 10/BE/17] and 'Italian School of Paleoanthropology: [Grant Number ARC-001613].

Notes on contributors

Elgidius B. Ichumbaki is a Senior Lecturer in Heritage Studies at the University of Dar es Salaam, Tanzania where he also obtained his BA (Culture and Heritage) and MA (Archaeology). His doctoral degree completed in 2015 was obtained via a sandwich model at Roskilde University (Denmark) and the University of Dar es Salaam. Currently, Ichumbaki coordinates the *Urithi Wetu* (Our Heritage, www.urithiwetu.org) project which aims at researching, preserving, promoting and ensuring sustainable utilization of heritage assets in Tanzania.

Marco Cherin is a vertebrate palaeontologist at the University of Perugia, Italy. His research interests include the systematics, phylogenetics, paleoecology, chronology, and functional morphology of Neogene-Quaternary terrestrial and marine mammals from Europe and East Africa. Since 2010, he has been directing the education and research activities of the University of Perugia School of Palaeoanthropology in the archaeological and paleontological sites of Olduvai Gorge and Laetoli, Tanzania. He is currently co-director of the Tanzania Human Origins Research (THOR) project.

Fidelis T. Masao is an archaeologist at the University of Dar es Salaam, Tanzania. His research interest centres on paleoecology, chronology, and rock arts of East Africa. Since 1990, he has been directing both research projects at Olduvai Gorge and also training to local and international students. Recently, Masao started working at Laetoli and at a newly reported Stone Age Site of Khusumayi. He is also co-director of the Tanzania Human Origins Research (THOR) project together with Marco Cherin.

Jacopo Moggi-Cecchi is an associate professor of Anthropology and Paleo-anthropology at the University of Florence, Italy. Since 1989 he has been conducting research in South Africa. His research activities are related to the study of the most ancient phases of human evolution and the origin of man in South Africa, where since 2006 he has been working on excavation activities in Pleistocene sites. In Italy, he carries out research on ancient Italian populations. He is the author of numerous scientific publications, to a large extent in international journals. He has ongoing research activities in collaboration with institutions in Italy, France, England, the USA and South Africa.

ORCID

Elgidius B. Ichumbaki http://orcid.org/0000-0001-9841-1753
Marco Cherin http://orcid.org/0000-0003-4291-4372
Jacopo Moggi-Cecchi http://orcid.org/0000-0001-5055-8369

References

Agnew, Neville, and Martha Demas. 1998. "Preserving the Laetoli Footprints." *Scientific American* 279 (3): 44–55.
Amin, Mohamed, Duncan Willets, and John Eames. 1987. *The Last of the Maasai*. Nairobi: Camerapix Publishers International.
Århem, Kaj. 1989. "Maasai Food Symbolism: The Cultural Connotations of Milk, Meat, and Blood in the Pastoral Maasai Diet." *Anthropos* 84 (1/3): 1–23.
Barker, Daniel S., and Kitty L. Milliken. 2008. "Cementation of the Footprints Tuff at Laetoli, Tanzania." *The Canadian Mineralogist* 46: 831–841.
Charteris, Jack, James C. Wall, and James W. Nottrodt. 1981. "Functional Reconstruction of Gait from the Pliocene Hominid Footprints at Laetoli, Northern Tanzania." *Nature* 290: 496–498.
Charteris, Jack, James C. Wall, and James W. Nottrodt. 1982. "Pliocene Hominid Gait: New Interpretations Based on Available Footprint Data from Laetoli." *American Journal of Physical Anthropology* 58: 133–144.
Chirikure, Shedrack, and Gilbert Pwiti. 2008. "Community Involvement in Archaeology and Heritage Management: An Assessment From Case Studies in Southern Africa and Elsewhere." *Current Anthropology* 49: 469–485.
Clarke, Ronald J. 1979. "Early Hominid Footprints from Tanzania." *South African Journal of Science* 75: 148–149.
Crompton, Robin H., Todd C. Pataky, Russell Savage, Kristiaan D'Août, Matthew R. Bennett, Michael H. Day, Karl Bates, Sarita Morse, and William I. Sellers. 2012. "Human-like External Function of the Foot, and Fully Upright Gait, Confirmed in the 3.66 Million-Year-old Laetoli Hominin Footprints by Topographic Statistics, Experimental Footprint- Formation and Computer Simulation." *Journal of the Royal Society Interface* 9: 707–719.
Day, Michael H., Mary D. Leakey, and Cassian C. Magori. 1980. "A New Hominid Fossil Skull (L.H. 18) from the Ngaloba Beds, Laetoli, Northern Tanzania." *Nature* 284: 55–56.
Deino, Alan L. 2011. "40Ar/39Ar Dating of Laetoli, Tanzania." In *Palaeontology and Geology of Laetoli: Human Evolution in Context Vol. 1*, edited by Terry Harrison, 77–97. New York: Springer.
Demas, Martha, and Neville Agnew. 1998. "Preserving the Laetoli Footprints." *Scientific American* 279 (3): 44–55.
Demas, Martha, and Neville Agnew. 2006. "Decision Making for Conservation of Aachaeological Sites: The Example of the Laetoli Hominid Trackway, Tanzania." In *Of the Past, for the Future: Integrating Archaeology and Conservation*, edited by Neville Agnew, and Janet Bridgland, 64–72. Los Angeles: The Getty Conservation Institute.
Demas, Martha, and Neville Agnew. 2008. "Site Security, Monitoring and Maintenance." In *Conservation and Documentation of the Laetoli Footprints: The 1996-1997 Field Seasons and the 1998 Olduvai Museum Exhibition Report*, edited by Donatius M. K. Kamamba, 68–70. Dar es Salaam: African Image Productions Ltd.
Feibel, Creig S., Neville Agnew, Bruce Latimer, Martha Demas, Fiona Marshall, Simon Waane, and Peter Schmidt. 1996. "The Laetoli Hominid Footprints: A Preliminary Report on the Conservation and Scientific Restudy." *Evolutionary Anthropology* 4: 149–154.
Galaty, John. 1993. "Maasai Expansion and the new East African Pastoralism." In *Being Maasai: Ethnicity and Identity in East Africa*, edited by Thomas Spear, and Richard Waller, 61–86. London: James Currey.
Harcourt-Smith, William E. H. 2005. "Did *Australopithecus Afarensis* Make the Laetoli Footprint Trail? New Insights Into an old Problem." *American Journal of Physical Anthropology* 126 (S40): 116.
Harrison, Terry. 2011. "Hominins from the Upper Laetolil and Upper Ndolanya Beds, Laetoli." In *Paleontology and Geology of Laetoli: Human Evolution in Context Vol. 2*, edited by Terry Harrison, 141–188. New York: Springer.
Harrison, Terry, and Amandus Kweka. 2011. "Paleontological Localities on the Eyasi Plateau, Including Laetoli." In *Palaeontology and Geology of Laetoli: Human Evolution in Context Vol. 1*, edited by Terry Harrison, 17–45. New York: Springer.
Hatala, Kevin G., Brigitte Demes, and Brian G. Richmond. 2016. "Laetoli Footprints Reveal Bipedal Gait Biomechanics Different From Those of Modern Humans and Chimpanzees." *Proceedings of the Royal Society B* 283: 20160235.
Hatala, Kevin G., Heather L. Dingwall, Roshna E. Wunderlich, and Brian G. Richmond. 2013. "The Relationship between Plantar Pressure and Footprint Shape." *Journal of Human Evolution* 65: 21–28.
Hay, Richard L. 1987. "Geology of the Laetoli Area." In *Laetoli: A Pliocene Site in Northern Tanzania*, edited by Mary D. Leakey, and Jack M. Harris, 23–47. Oxford: Clarendon.
Hughes, David M. 2008. "Comment on Community Involvement in Archaeology and Cultural Heritage Management: An Assessment from Case Studies in Southern Africa and Elsewhere." *Current Anthropology* 49 (3): 478–479.
Johanson, Donald C., Tim D. White, and Yves Coppens. 1978. "A new Species of the Genus *Australopithecus* (Primates: Hominidae) From the Pliocene of Eastern Africa." *Kirtlandia* 28: 1–14.

Kaiser, Thomas. 2000. "Proposed Fossil Insect Modification to Fossil Mammalian Bone From Plio-Pleistocene Hominid-Bearing Deposits of Laetoli (Northern Tanzania)." *Annals of the Entomological Society of America* 93: 693–700.
Kaiser, Thomas, Timothy Bromage, and Friedmann Schrenk. 1995. "Hominid Corridor Research Project Update: New Pliocene Fossils Localities at Lake Manyara and Putative Oldest Early Stone Age Occurrences at Laetoli (Upper Ndalonya Beds), Northern Tanzania." *Journal of Human Evolution* 28: 117–120.
Kohl-Larsen, Ludwig. 1943. *Auf den Sporen des Vormenschen*. Stuttgart: Strecker und Schröder.
Leakey, Louis S. B. 1974. *By the Evidence: Memoirs, 1932-1951*. New York: Harcourt Brace Javanovich.
Leakey, Mary D. 1981. "Tracks and Tools." *Philosophical Transactions of the Royal Society, Biological Sciences* 292: 95–102.
Leakey, Mary D. 1984. *Disclosing the Past*. Garden City, NY: Doubleday.
Leakey, Mary D. 1987. "Introduction." In *Laetoli: A Pliocene Site in Northern Tanzania*, edited by Mary D. Leakey, and Jack M. Harris, 1–22. Oxford: Clarendon Press.
Leakey, Mary D., and Jack M. Harris. 1987. *Laetoli: A Pliocene Site in Northern Tanzania*. Oxford: Clarendon.
Leakey, Mary D., and Richard L. Hay. 1979. "Pliocene Footprints in the Laetolil Beds at Laetoli, Northern Tanzania." *Nature* 278: 317–323.
Leakey, Mary D., Richard L. Hay, Garniss H. Curtis, Robert E. Drake, Mary K. Jackes, and Tim D. White. 1976. "Fossil Hominids from the Laetoli Beds." *Nature* 262: 460–466.
Leeuw, Sarah, Emilie S. Cameron, and Margo L. Greenwood. 2012. "Participatory and Community-Based Research, Indigenous Geographies, and the Spaces of Friendship: A Critical Engagement." *The Canadian Geographer* 56 (2): 180–194.
Masao, Fidelis T., Elgidius B. Ichumbaki, Marco Cherin, Angelo Barili, Giovanni Boschian, Dawid A. Iurino, Sofia Menconero, Jacopo Moggi-Cecchi, and Giorgio Manzi. 2016. "New Footprints from Laetoli (Tanzania) Provide Evidence for Marked Body Size Variation in Early Hominins." *eLife* 5: e19568.
McCabe, Terrence J. 2003. "Sustainability and Livelihood Diversification among Maasai of Northern Tanzania." *Human Organization* 62 (2): 100–111.
Mehari, Asmeret G., and Kokeli P. Ryano. 2016. "Maasai People and Oldupai (Olduvai) Gorge: Looking for Sustainable People—Centred Approaches and Practices." In *Community Archaeology and Heritage in Africa: Decolonizing Practice*, edited by Peter R. Schmidt, and Innocent Pikirayi, 21–45. London: Routledge.
Meldrum, Jeffrey D., Martin G. Lockley, Spencer G. Lucas, and Charles M. Musiba. 2011. "Ichnotaxonomy of the Laetoli Trackways: The Earliest Hominid Footprints." *Journal of African Earth Science* 60: 1–12.
Meyor, Adrianne, and William A. S. Sarjeant. 2001. "The Folklore of Footprints in Stone: from Classical Antiquity to the Present." *Ichnos: An International Journal for Plant and Animal Traces* 8 (2): 143–163.
Musiba, Charles M. 1999. "Laetoli Pliocene paleoecology: A reanalysis via morphological and behavioural approaches." PhD Diss., University of Chicago.
Musiba, Charles, Audax Z. Mabulla, Medard Mutakyahwa, Fidelis T. Masao, Victor Runyoro, Jeong Yul Kim, Manuel Dominguez-Rodrigo, et al. 2012. "Tanzania and the Outstanding Universal Value of its palaeoanthropology: Approaches at Laetoli and Lessons learned." *UNESCO World Heritage Papers* 33: 115–125.
Musiba, Charles M., Audax Z. Mabulla, Marie Selvaggio, and Cassian C. Magori. 2008. "Pliocene Animal Trackways at Laetoli: Research and Conservation Potential." *Ichnos* 15: 166–178.
Ndessokia, Prosper N. S. 1990. "The mammalian fauna and archaeology of the Ndolanya and Olpiro Beds, Laetoli, Tanzania." PhD Diss. Berkeley: University of California.
Pilkirayi, Innocent. 2011. *Tradition, Archaeological Heritage Protection and Communities in the Limpopo Province of South Africa*. Addis Ababa: OSSREA.
Psihoyo, Louie. 1994. *Hunting Dinosaurs*. New York: Rondom House.
Raichlen, David A., Adam D. Gordon, William E. H. Harcourt-Smith, Adam D. Foster, Wm. Randall Haas, Jr. 2010. "Laetoli Footprints Preserve Earliest Direct Evidence of Human-Like Bipedal Biomechanics." *PLoS ONE* 5: e9769.
Reck, Hans, and Ludwig Kohl-Larsen. 1936. "Erster Berblick über die Jungdiluvialen Tier- und Menschenfunde Dr. Kohl-Larsen's im Nordöstlichen Teil Des Njarasa-Grabens (Ostafrika) und die Geologischen Yerhältnisse des Fundgebietes." *Geologische Rundschau* 27: 401–441.
Sarjeant, William A. S. 1995. "Footprints in the Sands of Time." *Geoscience Canada* 21 (2): 77–87.
Schmid, Peter. 2004. "Functional Interpretation of the Laetoli Footprints." In *From Biped to Strider: The Emergence of Modem Human Walking. Running, and Resource Transport*, edited by D. Jeffrey Meldrum, and Charles E. Hilton, 49–62. New York: Springer.
Schmidt, Peter R. 2017. *Community-based Heritage in Africa: Unravelling Local Research and Development Initiatives*. New York: Routledge.
Spear, Thomas. 1993. "Introduction." In *Being Maasai: Ethnicity and Identity in East Africa*, edited by Thomas Spear, and Richard Waller, 1–18. London: James Currey.
Stoecker, Randy. 2009. "Are we Talking the Walk of Community-Based Research?" *Action Research* 7 (4): 1–20.
Tuttle, Russell H. 1987. "Kinesiological Inferences and Evolutionary Implications from Laetoli Bipedal Trails G-1, G-2/3, and A." In *Laetoli: A Pliocene Site in Northern Tanzania*, edited by Mary D. Leakey, and Jack M. Harris, 503–522. Oxford: Clarendon Press.

Tuttle, Russell H., David M. Webb, E. Weidl, and Michael Baksh. 1990. "Further Progress on the Laetoli Trails." *Journal of Archaeological Science* 17: 347–362.

White, Tim D., and Gen Suwa. 1987. "Hominid Footprints at Laetoli: Facts and Interpretations." *American Journal of Physical Anthropology* 72: 485–514.