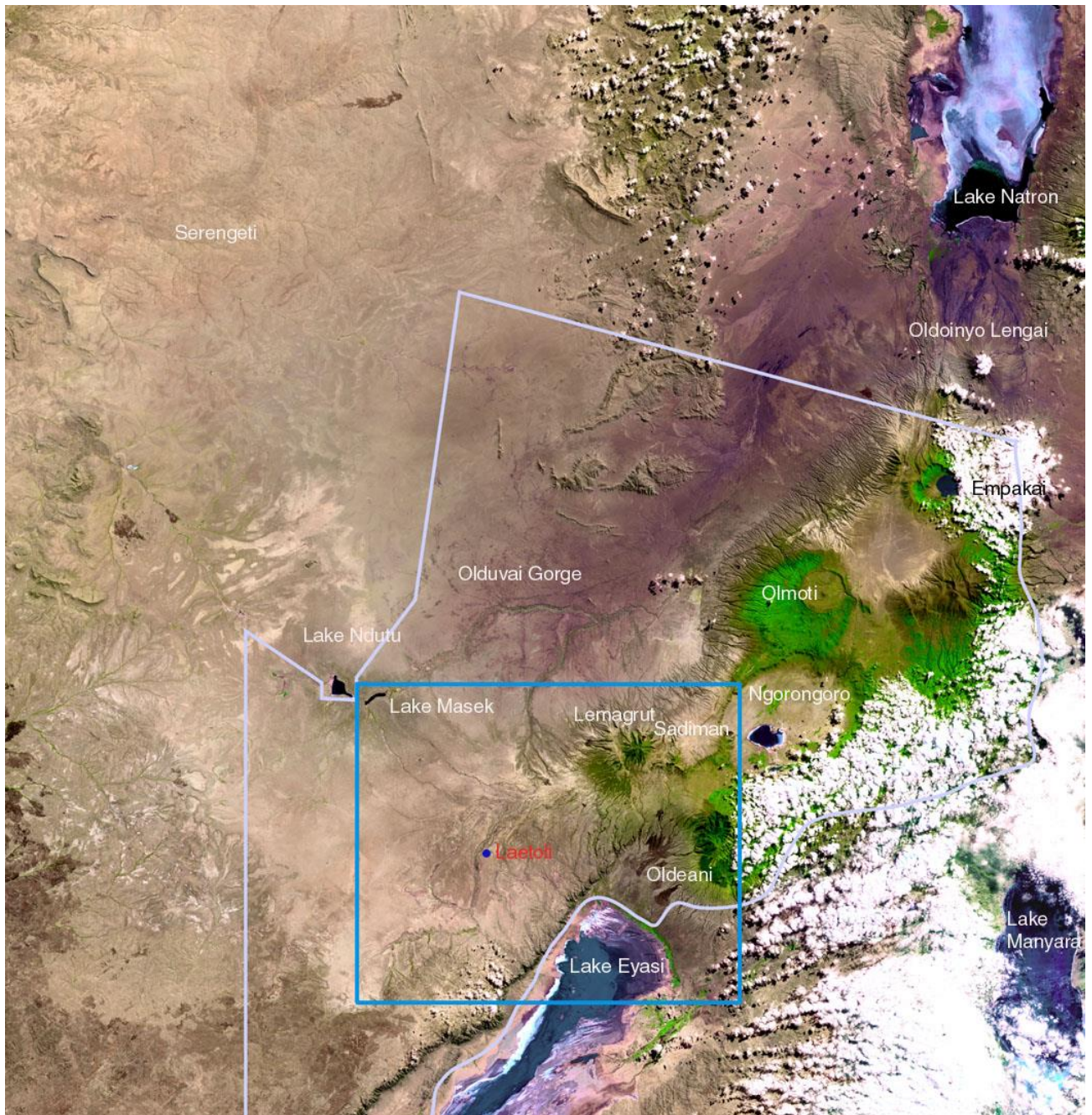


The Laetoli Conservation Project

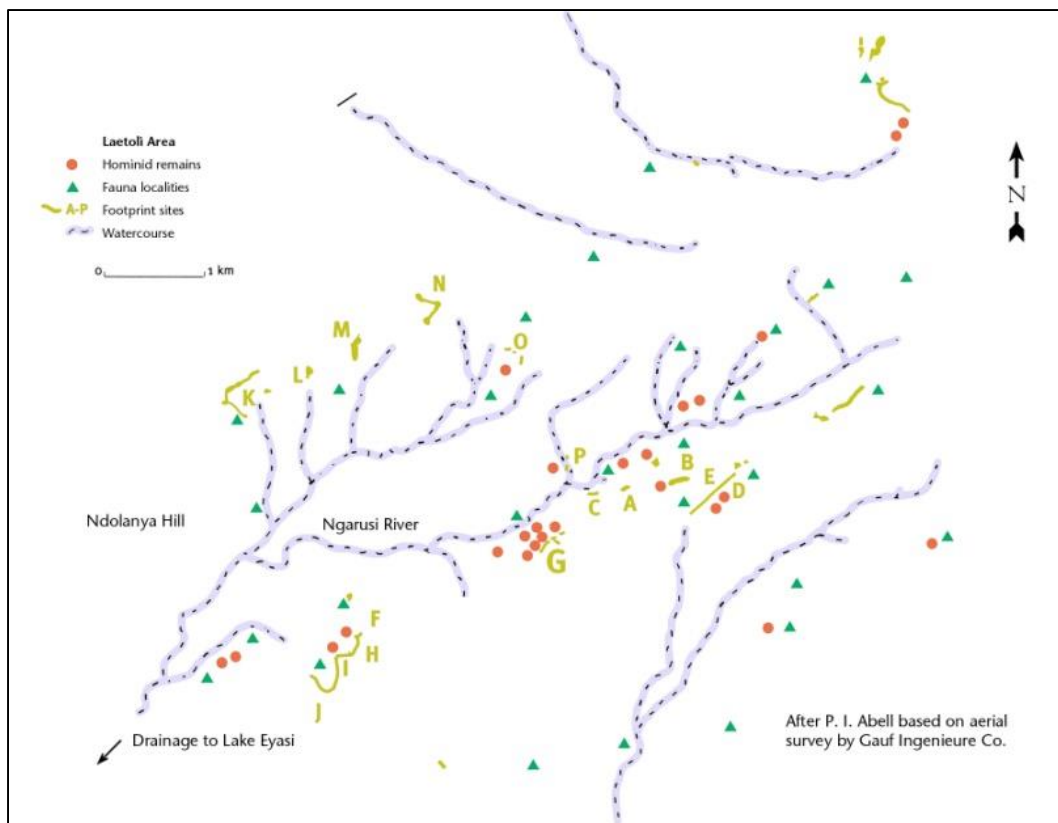
A visual summary

*A Collaboration of the Tanzanian
Department of Antiquities and the Getty
Conservation Institute (1993-1998)*

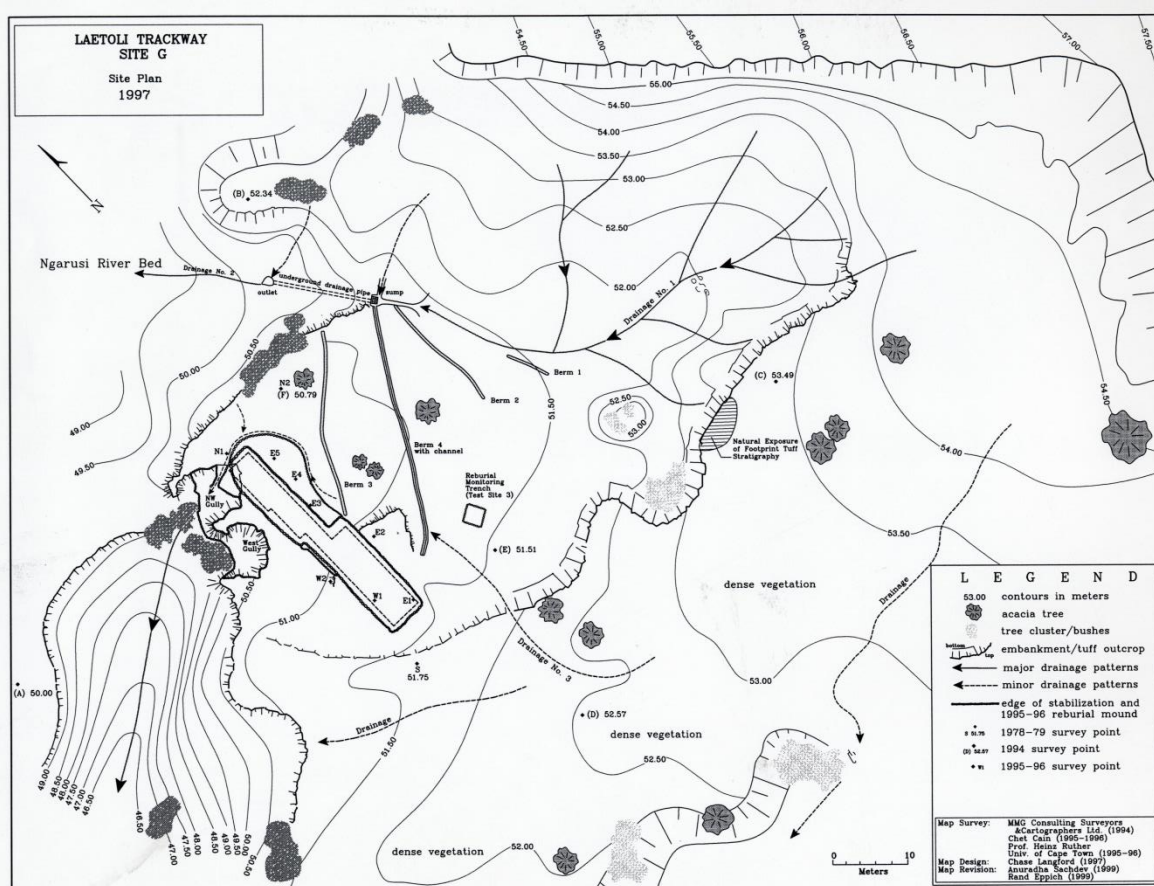




Landsat satellite image showing the Laetoli area (in box) and Olduvai Gorge within the boundaries of the Ngorongoro Conservation Area. “Laetoli” marks the approximate location of Site G



Regional map of Laetoli area showing animal track exposures; site G marks the location of the hominid trackway



Plan of site G showing reburied trackway, landscape features, and drainage interventions

1978-1991 Discovery, excavation, reburial, and tree growth

Following discovery in 1977, Mary Leakey and her team began excavating the 3.6 million-year-old fossil hominid trackway (Site G) at Laetoli in northwest Tanzania in 1978. By the end of the 1978 season, two parallel tracks of hominid footprints had been uncovered over a distance of approximately 20m, up to a fault that cut diagonally across the trails. Excavation continued south of the fault line in 1979 and revealed more prints. The combined excavations yielded a trackway extending over a distance of 27m. After the trackway was photographed, molded and cast, and documented photographically and photogrammetrically, it was reburied for its protection under a mantle of soil capped with lava boulders.

After the reburial of the trackway in 1979, the site gradually began to re-vegetate in the absence of any maintenance or monitoring of the site. The loose reburial fill and the lava boulder capping provided an environment conducive to germination and growth of vegetation. By 1985, when Tim White and a palaeoanthropological team working at Olduvai Gorge visited the site and took photographs, some acacia trees had reached a height of over 2m. This was the first time concerns were raised that root growth was damaging the footprints. Occasional grass fires, common in the region and seen in the photos taken at the time, will have contributed to the germination of acacia seeds over these years of abandonment. The site remained in this condition until 1992 when the problem began to be addressed.



1985. The reburied trackway, after a grass fire, overgrown with acacia trees (arrow indicates buried trackway with boulder capping). (Photo Tim White).

1992 Initial Investigation

In 1992 the Tanzanian government invited the Getty Conservation Institute (GCI) to conduct a preliminary condition survey of the trackway and assess the feasibility of undertaking a conservation project. In July, the Tanzanian Department of Antiquities (DoA) cleared the 1979 reburial overburden from a 3 x 3m trench on the southern portion of the trackway for this purpose. Prior to clearing, all acacia trees growing on the trackway had been roughly pruned and were later cut to approximately 10cm above the surface. The assessment revealed a fragile and weathered tuff surface, penetrated and disrupted by acacia tree roots. Following the assessment, the trench was reburied by Department of Antiquities staff with the excavated fill material and 2 layers of geotextile fabric as a marker, then capped with volcanic boulders as in the original reburial.



Members of the Getty Conservation Institute and the Tanzanian Antiquities Unit inspecting a cleared 3x3m area of the trackway.



Close-up of an acacia tree growing on the Footprint tuff.

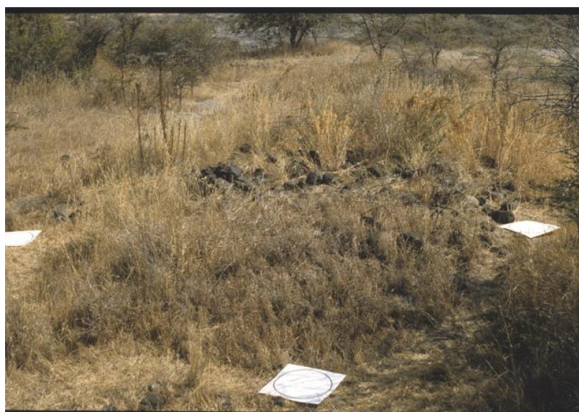


1979 photograph of footprint G1-25 (left) compared to the footprint in situ during the 1992 inspection.

1993 Assessment of Condition

In 1993 the Getty Conservation Institute entered into a formal collaborative agreement with the Tanzanian government to jointly undertake the conservation of the trackway. The purpose of the first campaign in July 1993 was to conduct a full condition assessment and field testing in order to plan a conservation program for the site. The 1992 trench was re-excavated and the condition of the tuff and footprints was recorded. East of the trackway, Test Site 3 was established and used to test herbicides for killing acacia trees and for evaluating geotextiles as a root deterrent under reburial conditions. Off-site tests were also carried out on exposed tuff surfaces to determine the most appropriate materials for consolidating fragile tuff and to assess the feasibility of taking a new mold of the trackway.

The full condition assessment confirmed the fragile nature of the tuff and led to the unanimous decision, endorsed by the Consultative Committee, that reburial was the most appropriate long-term conservation strategy for preserving the trackway. The testing also indicated that taking a new mold of the trackway surface might endanger the footprints.



The southern portion (foreground) of the buried trackway as it appeared at the start of the 1993 campaign.



The 3 x 3m trench was excavated to the surface of the Footprint Tuff. Only footprints G1-25 and G2/3-21 were fully excavated.



Partially excavated footprints. G2/3-21 (arrow) penetrated and damaged by an acacia root.



Close-up of print G2/3-21 showing root penetration.

1993 Testing and inventory



Flowers and seeds of *Acacia seyal*, the predominant acacia on the trackway



Biobarrier, a geotextile studded with herbicide nodules to inhibit root growth, was installed in the Test Site 3 trench.



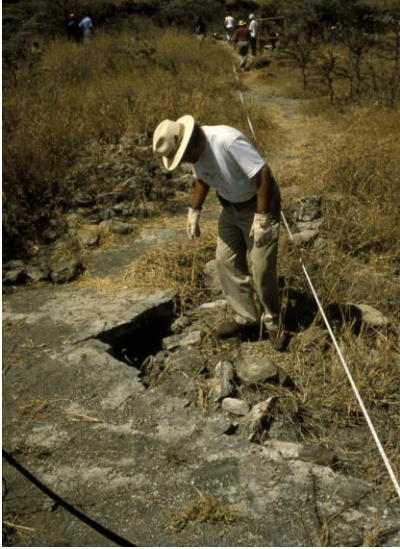
All vegetation growing on the trackway was identified, inventoried and photographed beginning in 1993.



Ring-barking acacia tree and applying herbicide to acacia stump at Test Site 3 to determine best method of killing the trees.

1994 Site Stabilization and Molding & Casting

The 1994 season at Laetoli was aimed at stabilizing the site by reducing erosion from rain water, killing the trees growing on and adjacent to the trackway in preparation for the 1995 conservation campaign, and making new molds and casts from the existing 1979 casts of the trackway. Treatment of trees with herbicide took place in May 1994. Erosion control measures, gully stabilization and molding and casting followed in July 1994. Prior to the 1994 campaign, the site was disturbed by unknown persons, who removed materials used in the 1993 reburial. The disturbance was investigated and the burial was reinstated.



NW gully at the northern end of the trackway prior to cleaning (left) and partially cleared of rocks and debris (right) for stabilization



Re-attachment of four collapsed blocks, from left: fallen blocks placed on ledge near where they were found; placement of blocks in original position; re-attachment using fiberglass geo-rods and epoxy adhesive.



Gully stabilization near completion. Boulders were used to stabilize gully and prevent further erosion and loss of tuff.



Site work in 1994 included treatment by direct application to the stump with herbicide (Round Up) of 150 trees on and near the trackway.

1994 Molding & Casting



1979 cast being prepared for molding (above). A new master silicone rubber mold was made from the 1979 cast. At left, mold has been partially peeled away from cast; adjacent is fiberglass shell for storing mold.



One of the completed casts of the southern part of the trackway.



Wooden shelving was constructed in the Olduvai storage for the molds and casts.

1995-1996 Conservation Campaigns

The first major conservation campaign took place in July-August 1995. The nine-week campaign involved re-excavation, conservation, documentation, scientific study, and reburial of the southern 10m of the trackway. It was here that the best preserved footprints were found in 1979. Excavation revealed 29 hominid footprints and numerous hipparion, lagomorph and carnivore prints. Thirty-eight acacia trees were found growing within the 10 x 4.5m trench. Four of the hominid prints were damaged by root growth.

In a three-month campaign in 1996, the remaining 20 meters of the middle and northern trackway was excavated, conserved, documented and reburied according to the methodology established for the 1995 season. Excavation of this section revealed 23 hominid footprints with discernible morphology, 18 hipparion prints, and over 145 lagomorph prints. Thirty-six acacia trees that had grown since 1978 were inventoried within the excavated trenches. The hominid prints in the northern trackway were not as well preserved as those in the south due to natural weathering and erosion of the volcanic tuff prior to their original excavation in 1978. Two prints at the northern end of the trackway were lost to erosion of the shallow 1978 reburial mound by surface run-off.

Conservation activities involved removal of all stumps and roots from the tuff wherever possible and filling voids in the tuff left by extracted roots with a mixture of acrylic dispersion and fumed silica. Stump that could not be removed were injected with a dilute solution of pentachlorophenol to discourage termite activity and prevent fungal rot. A dark stain in and around the hominid and hipparion tracks was observed and later identified as Bedacryl, which was applied in 1978 and 1979 to strengthen the tuff prior to molding. The consolidant was removed from only two prints since further removal was deemed to pose a risk of loss of the underlying tuff layer.

Additional polyester casts and silicone rubber molds were made of existing 1978-79 casts; a cast of the southern part of the trackway was patinated for use in the Dar es Salaam Museum. An archival epoxy master cast was made and transferred to the Dar es Salaam Museum for permanent storage. Photogrammetry was undertaken of the hominid prints and the hipparion trails.

To protect the trackway and mound from continued erosion caused by surface water run-off, two additional berms were constructed in 1996 east of the trackway to divert run-off away from the trackway into the Garusi river bed north of the site. The West gully was stabilized similar to the NW gully.

To monitor conditions in the reburial mound in the future, a 2 x 2 m facsimile trench at Test Site 3 was similarly reburied and test objects were placed on the surface as indicators of the buried environment in the future.

Under separate permit from the Department of Antiquities, a three-member team consisting of one geologist and two anatomists conducted a re-study of the taphonomy, morphology and gait of hominid prints in 1995 and 1996. The results of the study were intended to be published and made available to the palaeoanthropological community.

To involve the local Maasai community in the protection of the site, meetings were held with Maasai elders from nearby villages to discuss the importance of the site. This initiative led to a ceremony attended by the local communities in which the trackway was blessed by the traditional religious leader, the Oloiboni, to enhance its value to the Maasai. Two local Maasai guards were permanently posted to the site by the DoA.

1995 – 1996 Conservation campaigns



1995. General view of Site G, looking northwest. White shelter canopy marks the location of the trackway.



1995. The southern part of the trackway before clearing vegetation from burial mound (acacia trees had been cut and killed in 1994).



1996. The northern part of the trackway before clearing vegetation from burial mound (acacia trees had been cut and killed in 1994).

1995 – 1996 Excavation



1995. Team members excavating southern part of trackway to a level just above the Footprint Tuff.



1995. Team members excavating southern part of trackway down to the Footprint Tuff; some stumps still in situ.



1996. Early stages of excavation of the northern part of trackway under protective shelter (roots and stumps flagged).



1996. Excavation and documentation of northern trackway; sand filled footprint socks were made to mark and protect the prints during work.

1995 – 1996 Roots in situ



1995. Roots of acacia trees during initial stages of excavation of southern portion of trackway.



1995. Excavated southern portion of trackway prior to removal of acacia stumps and roots and before removal of fill from individual footprints.



1996. Roots and stumps of acacia trees (with orange flags) during initial stages of excavation of northern trackway.



1996. Close-up of print G1-19 in northern trackway prior to root removal. Note cracking pattern and weathered tuff surface.

1995 – 1996 Excavation



1995. Excavating 1979 fill from hominid prints G1-35 and G2/3-29. Field cast replicated from 1979 original was used to guide the re-excitation.



1995. Excavation of fine sand grains from prints.



1996. Excavation of final layer above Footprint Tuff; stumps of trees still in situ.



1996. Print G2/3-9 as re-excavated in 1996 (left) with photo of same print from 1978 excavation.



1996. Excavating final layer of fill above footprint Tuff using wooden scalpels and air puffers.



Excavation tools.

1995 – 1996 Root Removal



1995. Portrait of acacia stump on southern trackway. All tree stumps on the trackway were inventoried and photographed before removal.



1995. Tree growth was especially dense on the southern end of the trackway where there is greater moisture accumulation. Tree stumps were left in situ during excavation in order to assess and document their root growth.



1995. Consolidating tuff disrupted by lateral root growth prior to removal of root.

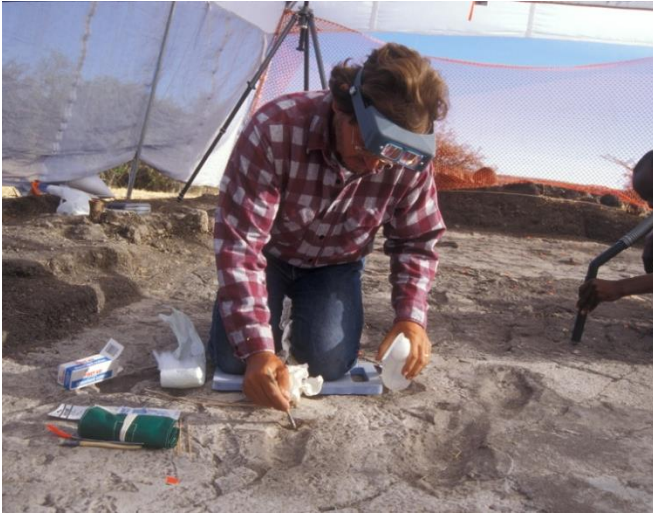


1995. Preparing to remove acacia stump by cutting through lateral roots with a mini rotary saw.



1995. Removing cut stump from trackway

1995 – 1996 Conservation



1995. Removing Bedacryl from footprints G1-26 by brushing with acetone.



1995. Removing Bedacryl from hominid print G2/3-25 by poulticing with acetone.



1996. Consolidating fragile tuff in the graben near Fault 1 of the middle part of trackway.



1996. Re-attachment of disrupted tuff on northern trackway.



Treatments of prints and trackway surface was recorded on acetates sheets overlaid on Polaroids.



1996. Close-up of consolidation of tuff where disrupted by acacia root penetration.

1995 – 1996 Documentation



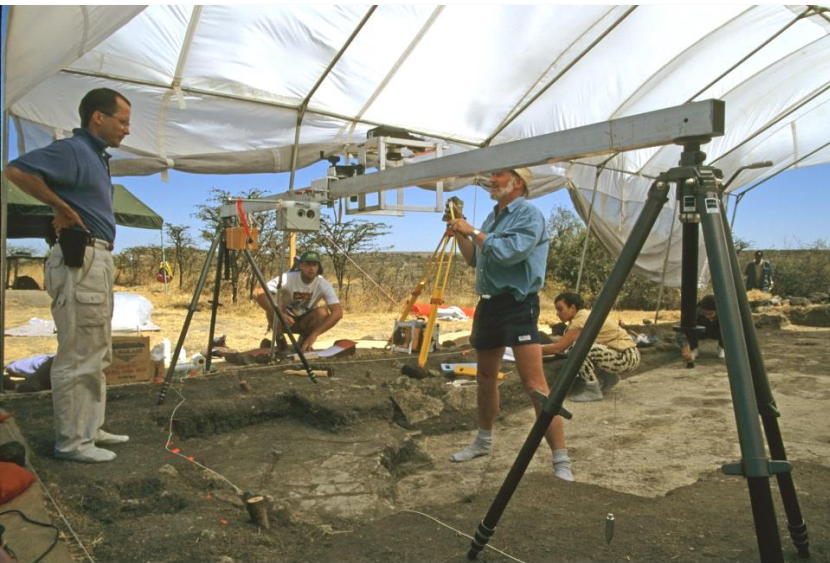
1995. 8 x 10 Polaroid camera was used to obtain photos of the prints for condition recording in the field.



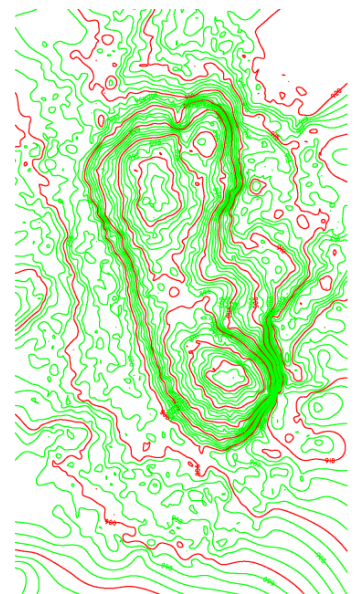
Recording condition of prints after final excavation on acetate sheets overlaid on Polaroids.



Comparing excavated prints with field casts and 1978 photos as part of the record of condition.



Set-up for photogrammetric capture of prints and trackway. B&W glass plates were developed in camp.



Photogrammetric plot of G1-37

1995 – 1996 Scientific re-study of the trackway



Members of the Laetoli Consultative Committee established to review and advise on the project. (Shown: Mary Leakey, Desmond Clarke (UC Berkeley), Webber Ndoro (University of Zimbabwe), Biram Joof (UNESCO). (Not shown: Neville Agnew and Martha Demas (GCI), Donatius Kamamba and Simon Waane (DoA), Daniel Ndagala (Ministry of Culture), Victor Runyoro and F. Mkunyi (NCA).



Scientific re-study team (Craig Feibel, Peter Schmid, and Bruce Latimer) examining hominid prints on southern trackway.



Peter Jones, Bruce Latimer and Mary Leakey comparing hominid footprints and cast on southern trackway.



Scientific re-study team (Craig Feibel, Peter Schmid, and Bruce Latimer) comparing 1978 documentation of hominid prints with re-excavated southern trackway.

1995 – 1996 Community involvement



Oloiboni, Birikaa Ole Kereto, conducting blessing ceremony at site.



Mary Leakey with local Maasai women at blessing ceremony.



Oloiboni, Birikaa Ole Kereto, with Neville Agnew and Mary Leakey as Godfrey Olle Moita presents roasted goat following ceremony



Tanzanian press interviewing Mary Leakey; videotaping by GCI.



Maasai meeting with DoA, GCI, Ngorongoro Conservation Area officials and Endulen officials after blessing ceremony.

1995 – 1996 Community outreach



Donatius Kamamba explaining trackway to local schoolchildren.



A miniature replica of the reburial was made to explain the reburial process to press and local visitors.



Families from Endulen visiting site.



Maasai site guardians.



A copy of the cast of prints was presented to Endulen school teachers for their instructional use.

1995 – 1996 Site stabilization



1996. Accumulation of water behind berm in rainy season, prior to completion of drainage plan.



1996. Site-wide drainage was implemented to direct rainfall away from the trackway to the gully north of the site.



1996. West gully was stabilized in a manner similar to the NW gully.

1995 – 1996 Monitoring



1995. Location of monitoring trench east of southern part of trackway (under shelter).

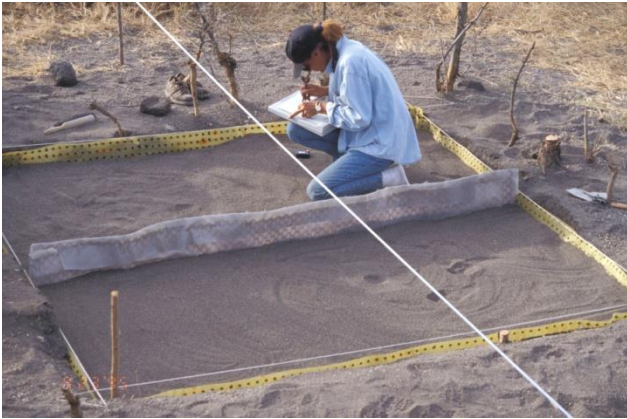


1995. Monitoring reburial trench at test Site 3 with test objects in place, prior to reburial.



1995. Detail of indicator objects in trench (triangle carved in tuff, cotton fabric, geotextile, treated stumps and tuff block with various treatments).

1995 – 1996 Monitoring



1995. Monitoring trench partially reburied; the trench was divided in two parts for re-excitation purposes.

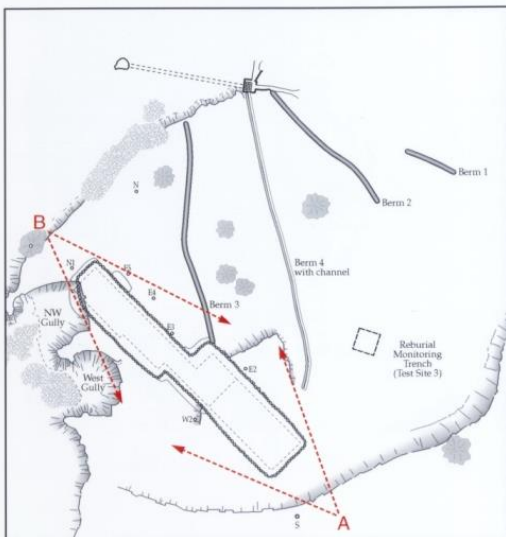


1995. Monitoring trench with Biobarrier 2 and Enkamat layers; acacia trees growing near the trench were pruned but not killed.



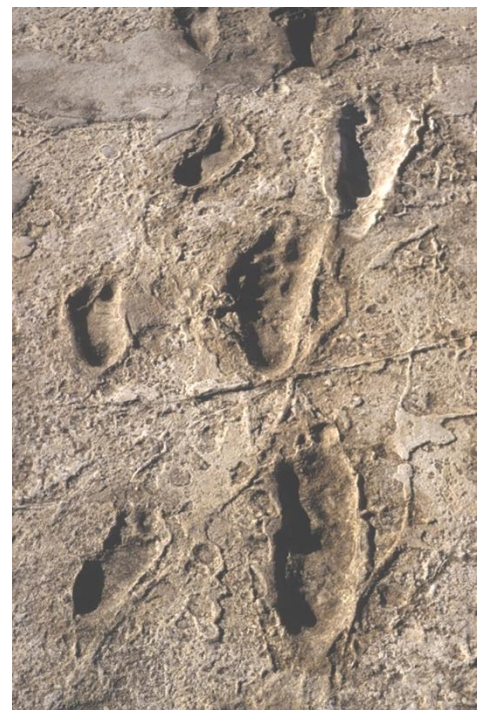
1995. Monitoring trench completed with boulder capping.

LAETOLI TRACKWAY MONITORING
Photo datum points A and B

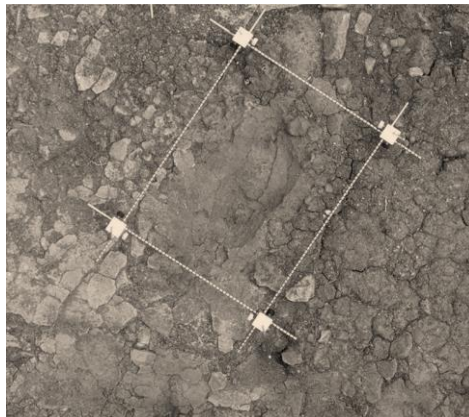


1997. Example of the long-term photographic monitoring protocols established for the site, to be carried out on a quarterly basis by staff from Olduvai Gorge. Protocols included recording and removal of selected vegetation and maintenance of stabilization measures implemented on site.

1995 Trackway and hominid prints after re-excitation



Southern trackway after final excavation in 1995; the northern third of the trackway transitions abruptly to a very weathered tuff.



Print G1-34 in the well preserved tuff; print G1-31 in the weathered tuff at the northern end of the southern trackway.

1996 Trackway and hominid prints after re-excitation



1996. Northern and middle trackway after final re-excitation. Sand-filled cotton bags mark location of prints; graben in middle trackway (foreground).



1996. Northern trackway after final re-excitation. Weathered tuff on the northern trackway makes it difficult to discern prints.



1996. Print G1-24 with 1979 cast.



1996. Print G1-2.

1995 – 1996 Reburial



1995. All materials used in the reburial were sieved at their source to remove organic material, especially seeds of acacia



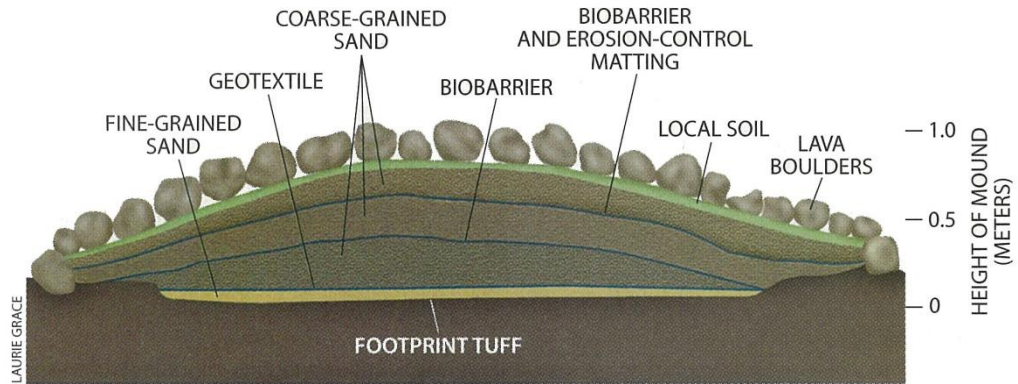
1995. Placing first layer of fine-sieved sand on Footprint Tuff.



1995. Reburial of southern trackway at different stages of the layering process.



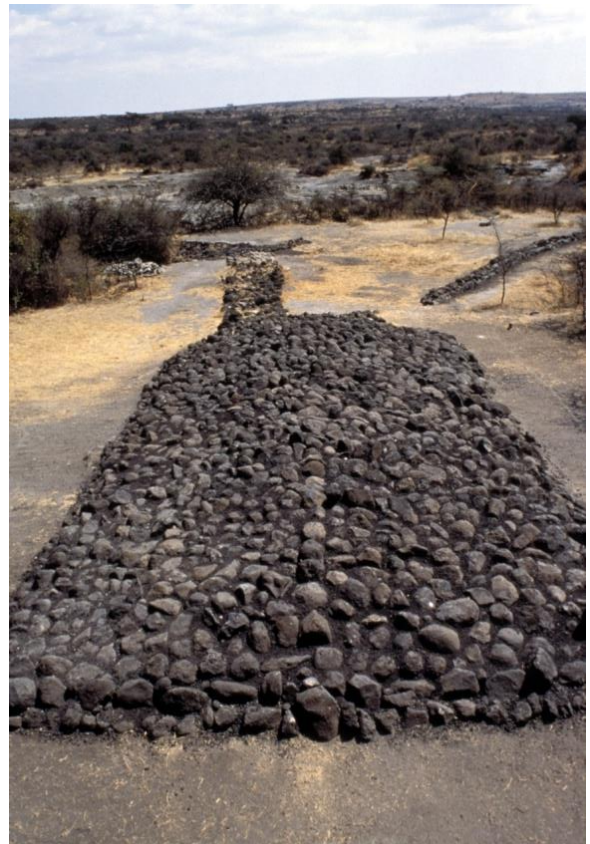
1995 – 1996 Reburial



Schematic stratigraphy of reburial mound protecting trackway.



Partial profile of reburial stratigraphy: Layer 3, Biobarrier, Enkamat, Layers 4 and 5, and lava boulders.



Reburial of southern trackway at completion in 1995.

1997-1998 Exhibition at Olduvai Museum



Laetoli room of the Olduvai Museum before renovation and installation of new exhibit



Laetoli room after renovation and installation of exhibit, which includes panels on the significance and scientific study of the hominid footprints; history of discovery; and conservation of the trackway.



A cast of the best preserved prints of the southern trackway is the focal point of the Laetoli exhibit.



Looking from Laetoli room toward the adjacent Olduvai room.



A panel on Mary and Louis Leakey was newly designed for the exhibition; the Olduvai room re-created and updated existing exhibits on Olduvai Gorge.



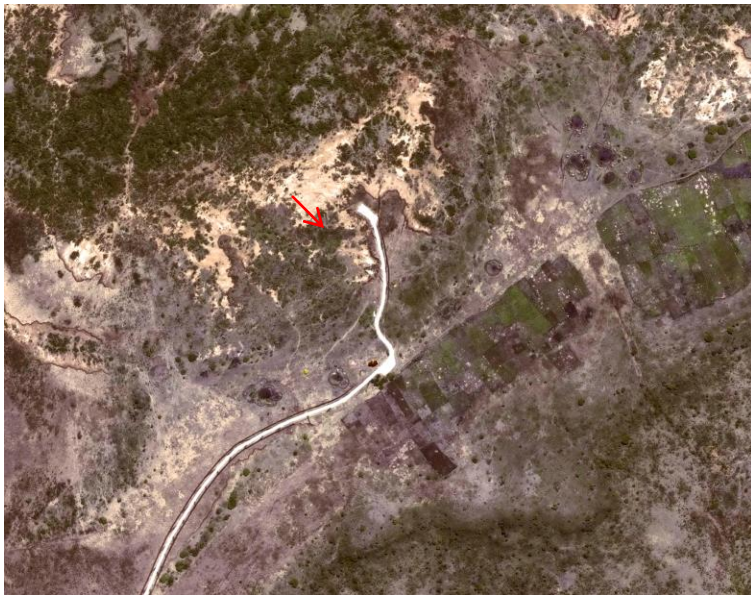
A third room (the Orientation room) was added to the original building in which panels were installed that highlight the cultural heritage of Tanzania and the Ngorongoro-Serengeti region.



Widespread grass fire at site G in 1998



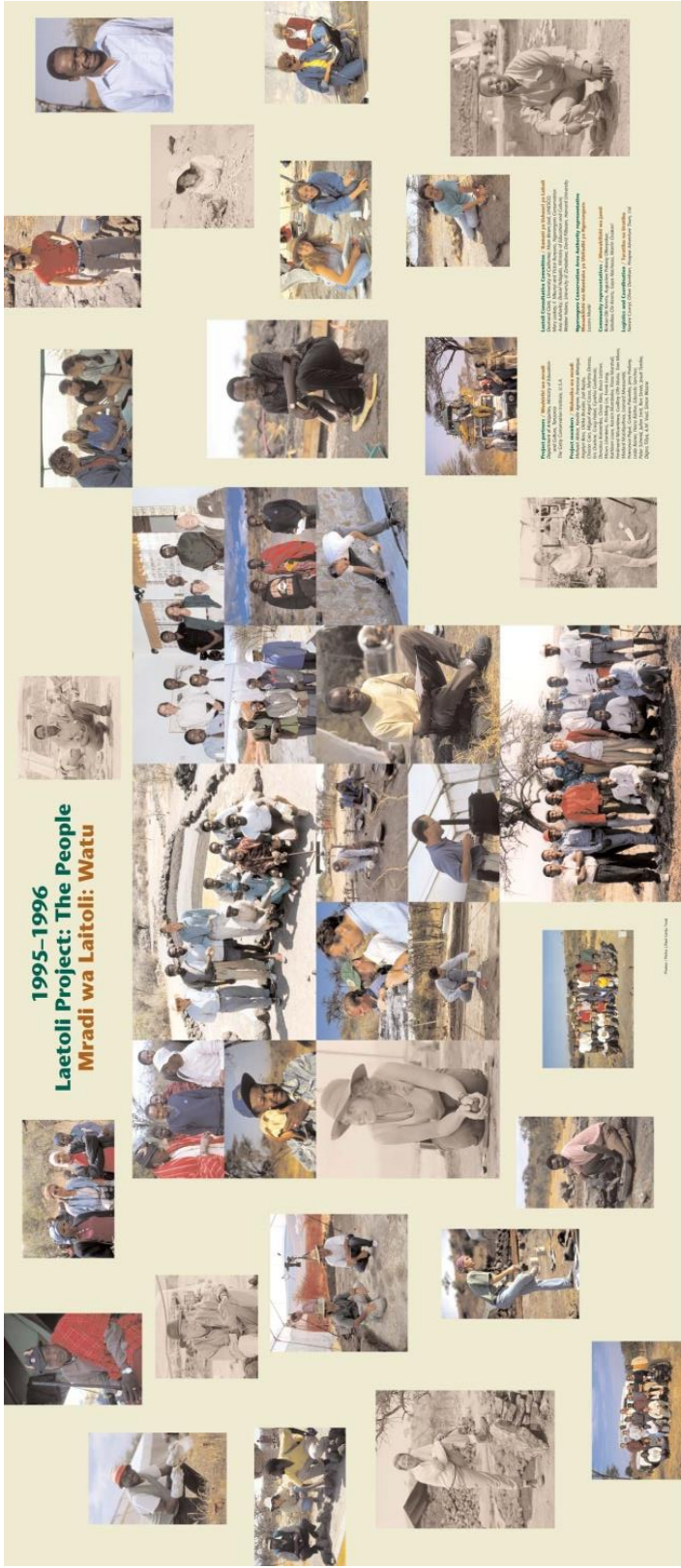
Reservoir building for Maasai cattle in Ngarusi region, Dec 2000



Satellite image. Laetoli hominid trackway, site G, Ngarusi region. June 3, 2009 (arrow marks trackway). Developments include increased agricultural activity, a road to site and construction of a parking area and an exhibition hall at the site.



**1995–1996
Laetoli Project: The People
Miradi wa Laetoli: Watu**



Project Management

DoA: Simon Waane, Director and Donatius Kamamba, Conservation Architect
 GCI: Neville Agnew, Associate Director, Programs, and Martha Demas, Project Manager

PALAEO-ANTHROPOLOGICAL RE-STUDY

-Craig Feibel
Visiting Assistaant Professor
Rutgers University

-Bruce Latimer
Curator/Dept Head
Physical Anthropology
Cleveland Museum of
Natural History

-Peter Schmid
Professor,
Anthropological Institute
and Museum, University
of Zurich-Irchel

ARCHAEOLOGY

-Fiona Marshall
Associate Professor
Dept. of Anthropology
Washington University

-Francesca Alhaique
-Chester Cain

-Lisa Hildebrand
PhD candidates
Dept. of Anthropology,
Washington University

CONSERVATION

-Angelyn Bass
Research Fellow,
-Francesca Pique
Conservation Specialist

-Leslie Rainer
Senior Fellow
GCI

-Jerry Podany
Head Conservator
-Eduardo Sanchez
Assistant Conservator
Dept of Antiquities
Conservation, J. Paul Getty
Museum

-Jesuit Temba and Digna Tillya
Conservators, DoA

DOCUMENTATION

-Gaetano Palumbo
Documentation Coordinator,
GCI

-Heinz Ruther
Head, Dept of Surveying and
Geomatics

-Ulrike Russeler and Julian Smit
PhD candidates
University of Cape Town

-Tom Moon, Frank Long, and
John Lewis
Photographers

Pedro Celedon
Videographer

SCIENTIFIC ANALYSIS

-Joel Bujulu
Former Sr Principal
Research Officer
Tropical Pesticide
Research institute

-Po Ming Lin
Geotechnical Consultant

-Eric Doehne
Associate Scientist, GCI

FIELD ASSISTANCE & LOGISTICS

-Godfrey Olle Moita
Conservation Assistant,
-Ferdinand Mzambwa
Technician, DoA

-Moses Lilambero
Technician

-Ozias Kileo
Archaeologist,
DoA

-Hoopoe Adventure
Tours (field camp)