



Press release

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Will a footprint rewrite the history books?

The Oldest American: footprints from the past

Scientists have unearthed human footprints in central Mexico which they claim are around 40,000 years old, shattering previous theories on how humans first colonised the Americas.

The researchers hope that their preliminary findings will eventually help shed light on one of the most contentious debates in American history: who was there first and how did they get there?

An international team of geoarchaeologists, led by Dr Silvia Gonzalez from Liverpool John Moores University (LJMU), finally completed dating the footprints, found in 2003, earlier this year.

The footprints were found in an abandoned quarry by Dr Gonzalez, Professor David Huddart (LJMU) and Professor Matthew Bennett (Bournemouth University) in September 2003 and have been subsequently studied by a multinational team of scientists.

The first stage of their research focused on analysing 269 footprints, both animal and human, found close to the Cerro Toluquilla volcano in the Valsequillo Basin, near the city of Puebla, 130 km southeast of Mexico City.

Further sites in the area with footprints have been identified in the Valsequillo Basin. Now thanks to the award of £212,000 from the Natural Environment Research Council, Dr Gonzalez and her research team will be able to carry out more extensive investigations to corroborate their initial findings and also calculate the height, pace and stride of the human population present 40,000 years ago. Such research would also give a better understanding of the relationship that these early Americans had with megafauna, such as mammoths, camels and other large animals.

Dr Gonzalez explained: "The footprints were preserved as trace fossils in volcanic ash along what was the shoreline of an ancient volcanic lake. Climate variations and the eruption of the Cerro Toluquilla volcano caused lake levels to rise and fall, exposing the Xalnene volcanic ash layer."

The geoarchaeologist suggests that the early Americans walked across this new shoreline, leaving behind footprints that soon became covered in more ash and lake sediments. The trails became submerged when the water levels rose again, so preserving the footprints.

Now as hard as concrete, the Xalnene ash is used locally as a building material. Dr Gonzalez and her research team were able to see the footprints without carrying out any excavation as quarry workers had already removed



between 2-3metres of lake sediments that had been deposited on top of the volcanic ash.

The team's findings pose serious challenges to considered wisdom on the settlement of the continent.

Dr Gonzalez, working as part of the Natural Environment Research Council's 'Environmental Factors in the Chronology of Human Evolution and Dispersal (EFCHED) research programme, said: "We think there were several migration waves into the Americas at different times by different human groups."

This debate has been running for more than a century. The traditional view – known as the Clovis First Model – is that settlers crossed the Bering Straits, from Russia to Alaska, at the end of the last ice age – around 11,500 to 11,000 years ago. Evidence for this theory comes from Clovis Points – tools used to hunt mammoths and mastodons – found from many locations in the American continent.

The discovery of human footprints in the Valsequillo Basin of Central Mexico challenges this model, providing new evidence that humans settled in the Americas as early as 40,000 years ago.

Professor David Huddart (LJMU) explained: "Most early human occupation sites in the Americas date to the latest Pleistocene or Ice Age, between 10,000 and 12,500 years ago. The existence of 40,000 year old human footprints in Mexico means that the 'Clovis First' model of human occupation can no longer be accepted as the first evidence of human presence in the Americas."

Dr.Gonzalez continued: "New routes of migration that explain the existence of these much earlier sites now need urgent consideration. Our findings support the theory that these first colonists may perhaps have arrived by water rather than on foot using the Pacific coast migration route."

The Mexican Footprint research is vitally important for the study of the settlement of the Americas as it provides extensively validated data that directly challenges current theories on the peopling of the Americas. It also re-confirms the importance of Central Mexico as one of the most important areas for the study of early human occupation.

The footprints were mapped and scanned using laser technology and have been reproduced at the University of Bournemouth using rapid proto-typing technology, allowing excellent visualisation. This technology has been used to produce physical models of the footprints with sub-millimetre precision.

Ancient human and animal prints are a rarity due to the special conditions required for their preservation. The discovery of the Valsequillo Basin footprints is an important addition to the global archive of human prints.



The prints have been preserved through the application of technology normally associated with the design of new consumer products. Professor Bennett says 'that footprint preservation has been possible through the fusion of modern design technology with archaeology, allowing 40,000 year old footprints to be brought to life in London.'

The discovery is being launched at the Royal Society Summer Exhibition which open on 4 July 2005 (4-7 July, 6-9 Carlton House Terrace, London SW1Y 5AG), where the footprints will be available for the press to examine both at the Exhibition and the press launch.

Ends

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Press launch:

2pm Monday 4 July 2005, Foreign Press Association, 11 Carlton House Terrace, London SW1Y

Speakers:

- Dr Silvia Gonzalez, Liverpool John Moores University. Geoarchaeology, Quaternary Geology
- Professor Matthew Bennett, Bournemouth University. Quaternary Geology, Laser scanning techniques and GIS
- Dr Tom Higham, Oxford Radiocarbon Laboratory. Accelerator Mass Spectrometer Radiocarbon Dating

Photo opportunity:

3.30pm, Monday 4 July 2005, Royal Society Exhibition, 7 Carlton House Terrace, London SW1Y 5AG

Notes to editors

For further information on the footprints research, including how the footprints were dated, and mapped, visit www.mexicanfootprints.co.uk

The Valsequillo footprints are just one aspect of the human evolution and environmental research of Dr Gonzalez' team as part of the UK's Natural Environment Research Council's Initiative, Environmental Factors in the Chronology of Human Evolution and Dispersal. The research is also supported by Mexico's Instituto Nacional de Antropología e Historia (INAH).

Classifying the footprints

By laser scanning the footprints, Professor Matthew Bennett and Dr Xavier Velay from the University of Bournemouth, were able to create 3-d images and models of the footprints. The actual footprints remain *in situ* in the

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Mexican quarry. The 3-d models allowed the researchers to categorise the footprints according to their size and shape. Approx. 60% of the prints are human, with 36% of the human prints classified as children's because of their size. Several short trails of footprints are visible in some parts of the quarry and it is estimated that the adult humans were between 117 and 190 cm tall.

The footprints are indisputably human because they have some unique characteristics, including:

- pedal arches, where foot bones form two perpendicular arches that normally meet the ground only at the heel and ball of the foot. These arches are found only in humans
- where it is possible to see toe impressions, there is a non-divergent big toe (or hallux) which is about twice the size as its adjacent toe
- the fact that they have deep heel and ball impressions, encircled by the typical 'figure of eight' contours
- they fall within the size range for modern *Homo sapiens*.

Dating the footprints

The Valsequillo Basin has been the focus of much, and sometimes controversial, archaeological research during the last 40 years. Previous attempts to date the basin's sediments and animal bones have had variable and controversial results, with finds dated from around 9,000 to 35,000 to even 200,000 to 600,000 years ago.

There have been significant advances in dating techniques since the controversial excavations at the Valsequillo Basin during the 1960s. Dr Gonzalez and her team used the following techniques to date the human footprints and the sediments above and below these trace fossils:

- Accelerator Mass Spectrometer radiocarbon dating (AMS) was carried out on mollusc shells and organic balls at the Oxford Radiocarbon Accelerator Unit (ORAU) by Dr.Tom Higham and Dr.Chris Bronk Ramsey.
- Electron Spin Resonance (ESR) on a mammoth molar found at the Barranca Caulapan in the Valsequillo Basin by Professor Rainer Grün at the Australian National University, Canberra.
- Optically Stimulated Luminescence Dating (OSL) on sediments and the Xalnene Ash by Dr.Jean-Luc Schwenninger at the Oxford Luminescence Laboratory.
- Argon-Argon dating on the Xalnene Ash and overlying lava was carried out by Dr Simon Kelley, Open University.
- Uranium series dating on animal bones from the Valsequillo Gravels by Dr. Alistair Pike at Bristol University.



The results of the extensive dating programme indicate that the human and animal footprints preserved in the upper part of the Xalnene Ash are older than 40,000 years.

The Valsequillo footprints research team

Principal Investigator:

- Dr Silvia Gonzalez, Liverpool John Moores University. Geoarchaeology, Quaternary Geology, Tephrochronology.

Collaborators:

- Professor David Huddart, Liverpool John Moores University. Quaternary Geology, Tephrochronology.
- Professor Matthew Bennett, Bournemouth University. Quaternary Geology, Laser scanning techniques and GIS
- Dr Marta Mirazon Lahr, Cambridge University. Craniometric database
- Professor Alan Cooper formerly of Oxford University. Ancient Human DNA extraction.
- Dr Phillip Endicott, Henry Wellcome Ancient Molecules, Oxford University. Ancient DNA extraction of Mexican Paleoamerican populations
- Dr Tom Higham and Dr Chris Bronk Ramsey, Oxford Radiocarbon Laboratory. Accelerator Mass Spectrometer Radiocarbon Dating.
- Dr Jean-Luc Schwenninger, Oxford University. Optically Stimulated Luminescence Dating.
- Dr Angela Lamb and Professor Melanie Leng, NERC Isotope Geoscience Laboratories, British Geological Survey. Palaeoenvironmental Reconstructions and Stable isotopes studies from sediments
- Professor Sarah Metcalfe and Dr Rhiannon Stevens, Nottingham University, Palaeoenvironmental reconstructions of lake sediments using isotopes in sediments and bones.
- Prof. Rainer Grün, Australian National University. Electron Spin Resonance Dating of teeth.
- Dr Alistair Pike, Bristol University. Uranium Series Dating of human and megafaunal bones.
- Dr Simon Kelley, Open University. Argon-Argon dating of the Xalnene Ash and lava.

Mexico:

- Drs José Concepción Jiménez-López and Jose Antonio Pompa Instituto Nacional de Antropología, (INAH) Mexico City, Craniometrics from the Preceramic Collection.
- Dr Alfonso Rosales-Lopez and Leticia Sanchez Garcia, Instituto Nacional de Antropología e Historia, (INAH), La Paz, Baja California Sur, Archaeology and Craniometrics from Pericue Populations.
- M. I. Alberto Gonzalez-Huesca, Geophysics Institute, Mexico City. Geochemistry of the Xalnene Ash.