**Dr Estelle Lazer (2020) The Pompeii Cast Project**

# The Pompeii Cast Project

## Background

The Pompeii Cast Project developed from the work of Estelle Lazer on the human skeletal remains of Pompeii. Lazer’s study of the bones of the Pompeii commenced in 1986 and has been published in articles, book chapters and a 2009 monograph, Resurrecting Pompeii.

The majority of the Pompeian skeletal sample was compromised by the fact that it had not been stored carefully. While some skeletons were still in situ in houses where they were found, most had been removed and were kept in ancient bath buildings on site that were not open to the public. The skeletons stored in the Sarno Bath complex had been mixed up and the individual elements had been separated or disarticulated. A smaller collection of individual skulls and long bones was later moved to the so-called female section of the Forum for an anthropological study. Since it was impossible to re-articulate the majority of the skeletons, Lazer separated the bones into piles of individual skeletal elements. Paired bones were separated into piles of left and right bones so that each skeletal element in a pile represented just one individual. The bones were then subjected to analysis, using modern forensic techniques for skeletal identification. These results could be further studied using statistics to characterise the sample of victims and establish who became victims. This was done to test the assumption that the people who failed to escape the eruption in Pompeii were the old, infirm, very young individuals and females. The suggestion that young healthy males were most likely to have survived the eruption was not supported by the study of the skeletal evidence. Analysis of the skeletal remains enabled commonly held views about the population to be tested. The assertion that young, healthy males were most likely to survive was not supported by the skeletal evidence. It appeared that there were roughly even numbers of each sex represented in the sample of victims at both Pompeii and Herculaneum. If the Pompeian sample were at all skewed, it was slightly towards those skeletons that had male attributes. Similarly, the skeletal evidence did not confirm the notion that the sample would be biased toward those that were old or extremely young. While establishing age-at-death is much more difficult than sex determination for adults, it appeared that a full range of ages was represented with the exception of very young individuals. Poor storage and the inability of untrained excavators to recognise infant bones as human may not fully account for the lack of babies and young children in the Pompeian collection as the well-excavated Herculaneum sample yielded a similar bias. One possible explanation is that the AD 79 populations at these two sites were not stable. It is important to note that the Pompeian and Herculaneum samples cannot be used to comment about infant mortality because victims of mass disasters reflect living populations and do not provide evidence about mortality rates.

While there are many disorders that do not present on bone, the skeletal record for both Pompeii and Herculaneum indicates that there was no apparent skewing towards individuals with pathology. It is possible to gain a little insight into the general health of the Pompeian victims from the skeletal evidence. Based on femur length, the stature of the Pompeians is consistent with that of other populations in Italy. This appears to be lower than that of the preceding and subsequent Italian populations any may reflect some stress during the growing years. The dental data suggest that there may have been some underlying health problems. The number of healed and healing injuries, however, reflects a certain robusticity in their immune systems.

The presence of age-related disorders, like hyperostosis frontalis interna (HFI) and diffuse idiopathic skeletal hyperostosis (DISH) suggests that individuals were surviving into old age. This challenges the view that is often presented by scholars, including physical anthropologists, that ancient people were shorter lived than their modern counterparts. The discovery of a significant number of cases of HFI is of particular importance because the incidence of its occurrence in the sample is comparable to that in a modern western population. This indicates that the sample was not only random and normally distributed but also that the Pompeian lifespan was similar with that of a modern western population. The adult victims whose skeletons were preserved in the volcanic debris reflect those individuals that not only survived the first few critical years of life but also lived long enough to succumb to older age-related disorders.

It would have been preferable if the Pompeian sample had not been disarticulated with the resultant loss of information. Lazer noticed bones emerging from the plaster casts on her first visit to Pompeii and considered that it would be valuable to X-ray the casts, which potentially contained complete skeletons, to test her results and build on her initial study of the human remains from Pompeii. Complete skeletons would provide much more reliable results for skeletal identification than samples of individual bone. Such a study would provide an opportunity to diagnose more pathological conditions as she was limited to diagnoses that could be made with certainty from just one bone. Bone only can respond to insult in a very limited number of ways; bone can be lost, new bone can be deposited or a combination of the two can occur. By looking at the patterns of change across a skeleton, a range of pathological conditions could be diagnosed. Unfortunately, the technology was not readily available to undertake a comprehensive study of the casts when Lazer started her work in Pompeii in the 1980s. This changed in the 21st century with the development of portable digital X-ray technology and CT scanning. The Pompeian casts are particularly challenging as they are very fragile and difficult to transport for study. Further, the plaster is very thick and is the same density as bone, which makes it extremely difficult to obtain readable results from X-rays. Not much work had been done prior to the Pompeii Cast Project to establish whether CT scans through the plaster would yield useable results.

## The Pompeii Cast Project

The Pompeii Cast Project was conceived at the end of the 20th century. This project aims to understand the human victims of the eruption of Mt Vesuvius in AD 79 through the use of medical imaging techniques and scientific analysis. There has been a long tradition of superimposing lives and personalities onto these victims of a mass disaster on the basis of circumstantial and presumptive evidence. The Pompeii Casts Project set out to challenge these myths and discover what can actually be known about these victims, ensuring throughout the process that they are given the respect they deserve as humans who were killed in a mass disaster nearly 2000 years ago.

The first opportunity to determine whether it was a viable project occurred in 1994 when Lazer and a team of specialists, including a radiologist, radiographers, an orthopaedic surgeon, a forensic dentist and an anatomist, were given permission to X-ray and CT scan the only cast that was ever made in resin. The results were extremely encouraging. The examination revealed an almost complete, fully articulated skeleton. Permission was granted to undertake the project in the 21st century but it only really began in 2013, when Dr Lazer and Associate Professor Kathryn Welch received a Classics and Ancient History faculty grant from the University of Sydney. The project further propelled by Lazer being made a consultant in 2015 for the Cast Restoration Project, which was undertaken as part of the Great Pompeii Project. This project involved the restoration and consolidation of 90 the 103 casts of victims that had been acquired to date. The large restoration project in Pompeii was being filmed for a documentary for the BBC, the Smithsonian Channel and Arte that was co-produced with the then Superintendency of Pompeii and Herculaneum. The documentary producers provided considerable financial assistance to the Pompeii Cast Project by bringing the team to Italy and building a shelter outside the walls of Pompeii at the southern end of the site near the amphitheatre so that a 16 slice CT scanner could be installed to study 16 casts. A portable digital X-ray machine was used to produce images of the skeletons of casts that could not enter the gantry of the CT scanner. The results of the first season of work were unexpected. A number of the casts that were made in the 19th and 20th centuries, not only did not contain full skeletons but also had unexpected inclusions that were inserted during the casting process or later restoration.

A second season was undertaken in 2017. Roberto Canigliula, a representative of Philips (Italy), organised access to a CT scanner at the Casa di Cura Maria Rosaria hospital in modern Pompei that produced much better resolution than the machine used in 2015. This season was also supported by a documentary filmed for Channel 5 in the UK. This was an experimental season to establish whether it would be possible to safely move casts off site to be CT scanned.

Also, in 2017, the University of Sydney and Pompeii Archaeological Park entered into a Memorandum of Understanding that recognised the importance of the Pompeii Cast Project and enabled the continuation of the project over a lengthy period of time.

Further field seasons in October 2018 and January 2019 were made possible through an Industry and Community Seed Funding grant from the University of Sydney. In these seasons, the team concentrated on X-raying casts that were in situ and embedded in pyroclastic material, were too fragile to travel, or in poses that wouldn’t permit entry into the gantry of a CT scanner.

In April 2019, the team X-rayed the thirteen casts in the so-called Garden of the Fugitives. This work was also supported by a documentary that was made for National Geographic.

To date, more than half of the 90 available casts have been studied by the Pompeii Cast Project team.

## The Pompeii Cast Project Team

While Lazer’s initial study of the human skeletal remains in Pompeii was carried out by one individual, it is much more common for archaeological projects to be undertaken by a team. This is essential for a multidisciplinary project, which requires a variety of specialist skills.

The Pompeii Cast Project is a multidisciplinary project with an international team of experts. It is important to appreciate that this project is only possible because of the wide range of expertise of the different team members.

**Dr Estelle Lazer** is co-director of the project. She is an archaeologist with specialist training in forensic techniques for skeletal identification. The project was devised to build on her initial research on the human skeletal sample of the Pompeian victims. Her contribution to the project involves research design, building and coordinating a team of experts, applying for permits from the Pompeii Archaeological Park to undertake research each field season, skeletal analysis and working on publications.

**Associate Professor Kathryn Welch** is co-director of the project. She is an ancient historian. Her contribution to the project includes placing the results of the research into the context of the broader Roman World, dealing with the bureaucracy associated with grant applications and the development of the Memorandum of Agreement with the Pompeii Archaeological Park and working on publications.

**Associate Professor Dzung Vu** is qualified as an orthopaedic surgeon, radiologist and anatomist. His contribution to the project includes technical input to ensure that the most useful angles of X-rays are taken, the interpretation of CT scans and X-rays and working on publications.

While it would be most desirable to CT scan all the casts, it is not possible as many of the victims are either embedded in pyroclastic material, too fragile to move to the bed of a CT scanner or are in poses that won’t fit into the gantry of a CT scanner. CT scans provide a series of X-ray slices that can be stitched together to produce three dimensional reconstructions of the skeletons encased within the casts, which can then be subjected to detailed studies in all directions. By comparison, X-rays, are hard to achieve through thick plaster and often provide distorted results due to the difficulties in obtaining suitable angles.

**Assistant Clinical Professor Manh Vu** is a specialist radiologist. His input to the project is essential as the interpretation of the CT scans and X-rays of the skeletons encased in the casts is extremely challenging. It is necessary to have team members with a good understanding of how X-rays are obtained and years of experience in reading X-rays. Many of the cases require discussion to ensure that the most reasonable interpretation is obtained.

**Dr Alain Middleton** is a forensic odontologist and clinical dentist with many years of experience in taking and interpreting dental X-rays. He has worked in extremely difficult conditions to identify individuals in mass disasters. While it is relatively easy to reconstruct jaws from CT scans, X-rays pose greater problems. As already mentioned, many of the X-rays are taken from less-than-ideal angles and Alain’s experience makes him the most appropriate person for their interpretation. In addition, as a clinical dentist, Alain is very knowledgeable about plaster and his knowledge is essential for establishing how the casts have been achieved and restored since they were made.

**Roberto Canigliula**, Philips HC SPA Italia, has provided access to CT scanners both on site and at the Casa di Cura Maria Rosaria hospital in modern Pompei and technical support. He has been responsible for the majority of the post processing of the CT scans that have been obtained and contributes to the publication of the results of the project. He has offered assistance in gaining access to newer CT scanners as the technology of medical imaging has improved.

**Stijn Luyck** is a digital X-ray engineer with vast experience in using the equipment for X-raying large animals across the globe. The portable digital X-ray equipment was specifically developed for veterinary purposes, for large animals that do not easily fit into a veterinary clinic.

The equipment that Stijn has used has improved over the years since the project commenced. For the last three seasons, Stijn has employed the most recent iteration of the SOUND SPRINT AIR that uses a Canon 810C panel and dedicated algorithms and anti-scatter software to remove the effects of secondary radiation. The X-ray source was a battery powered generator. This has less power than a generator with cables but had the distinct advantage of not needing hard wires that made it more suitable for use around fragile casts.  Our experimental work in October 2018 indicated that it was capable of providing good results.

**Dr Julia Ridder** is an equine vet with considerable experience in working with Stijn, X-raying horses. They are used to working quickly together as live animals are not always cooperative. Julia is also extremely agile and has amazing skill in compressing herself into tight corners and holding the X-ray plate still while the X-rays are taken.

**Oshry Chageg** and **James Buckman** were project photographers in the 2019 January season.

Though not part of the core team, there are other people without whom the Pompeii Cast Project could not be completed.

Our partners at the Pompeii Archaeological Park include: Professor Massimo Osanna, outgoing Director General of Pompeii, Greta Stefani, outgoing Director of Archaeology at Pompeii, Sara Masseroli, Annalisa Capurso, Alberta Martellone, Bruno De Nigris, and Dr Valeria Amoretti, physical anthropologist and Head of the Scientific Laboratory at Pompeii.

Documentary producer, **Elena Mortelliti**, who has facilitated funding for three of our field seasons. Apart from funding, working on documentaries ensures that the results of our research are regularly disseminated to a wide audience. These documentaries were commissioned from LionTV and Voltage TV.

This project has also received support from our school partners at Chester Hill High School and Chifley College as well as Academy Travel.

The project has benefitted from the assistance of Dr Francesco Cirillo, Head of Radiology, Casa di Cura Maria Rosaria hospital in Pompei, who generously gave the project access to CT scanners and his staff to undertake the 2017 field season.

## ****References for the Background to the Pompeii Cast Project****

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