

# FELSSO

## Finite Elements with Laser Scanning for mechanical analysis of Sculptural Objects

It is difficult, even for conservation experts, to predict how the large stone sculptures will react to, and whether they may be damaged by, conditions of display, handling and transit. Currently, decisions are made on the basis of experience and the "best guess" of how the sculpture might behave. It is against this background that the FELSSO project was conceived; the aim of the project is to provide museums and collections with a computer-based tool that will allow the probable outcome of proposed actions to be analytically predicted before such decisions are made.

FELSSO is a collaborative research project of twelve months' duration that is being financially supported by the Arts and Humanities Research Council and the Henry Moore Foundation. The principal team members are Dr. Angela Geary (Senior Research Fellow in Cultural Heritage Visualisation, SCIRIA, University of the Arts London), Dr. John Harrison (Senior Lecturer in Rock Mechanics at Imperial College London) and Mr. Derek Pullen (Head of Sculpture Conservation, Tate).

An opportunity arose to use Henry Moore's travertine stone *Large Arch* as the principal subject for the FELSSO study. The Arch, once displayed in Kensington Gardens, was dismantled due to its structural instability, and to date no method has been found to determine whether the sculpture can be safely reconstructed and, if so, how this might be best achieved. The use of the Arch as a subject is an exciting and unique opportunity that will allow us to show how modern data acquisition and analysis methods can help solve the very real conservation challenges involved in redisplaying this spectacular sculpture. The Henry Moore Foundation have generously agreed to fund the additional costs of specialist 3D scanning services required for the large-scale Arch.

The FELSSO project is using advanced phase-shift 3D laser scanning technology to capture detailed 3D surface geometry data of sculptures, with these data then being converted into computer models of the original object that are then subjected to Finite Element Analysis (FEA). FEA is a mature technology that is widely used in engineering to calculate the strength of structures such as buildings, bridges and aircraft. FELSSO will apply FEA techniques to sculptural artifacts, and thereby allow accurate modelling of the probable impact that different handling or display scenarios may have on the sculpture in question.

The project aims to deliver a detailed practical strategy, based on FEA, for the future physical conservation and redisplay of the sculpture. In addition, the 3D data captured from the sculpture will be applied in a variety of ways, including the computer aided manufacture of a scaled facsimile for display and educational purposes, and 3D models for virtual display and web based access.



The complete 3D dataset captured from the fibreglass Arch at RHS Wisley



Scanning Henry Moore's fibreglass Arch at RHS Wisley



The travertine Arch stone blocks are moved in preparation for scanning at Kensington Gardens