#### Innovative Roof System for Low-cost Housing



Prof Anne Fitchett and Dr Ryan Bradley School of Civil and Environmental Engineering University of the Witwatersrand Jennifer.Fitchett@wits.ac.za;

# Low-cost Housing and Climate

- Cost of construction of good insulation
- Most systems are too hot in summer and too cold in winter
- Unaffordable for low-income households to use air-conditioning and space heating
- Ideally a house that is cool in summer and warm in winter



## Vaulted Masonry Structures

Used in many ancient buildings

- Pantheon in Rome
- Many structures in the Middle East
- Mosques in North Africa
- Traditional building in North Africa

These structures use baked brick or earth construction



## Stabilised Earth

Locally sourced soil with a cement or lime stabiliser

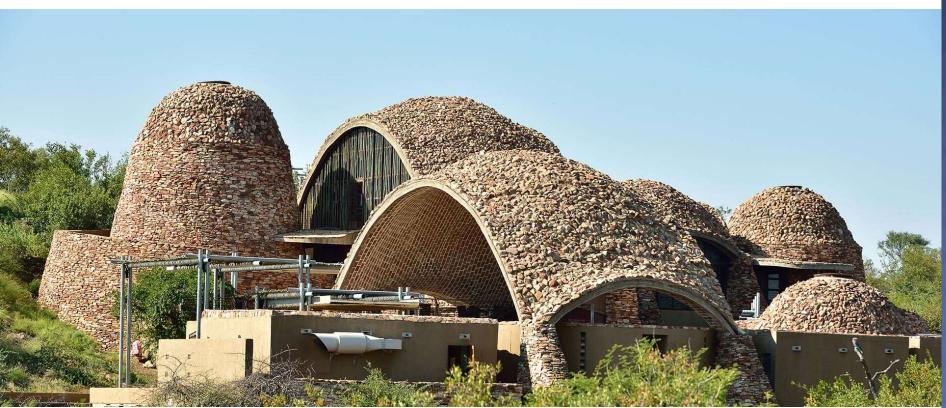
Uses much less cement than cement bricks

Cement and fired bricks use excessive energy in their manufacture, so unsustainable



## Stabilised Earth

Mapungubwe Interpretation Centre: winner of the World Architectural Festival Building of the Year 2009



https://www.southafrica.net/gl/en/travel/article/mapungubwe-national-park



# Wits Prototype

Double vault roof of stabilised earth

- Monitoring of indoor and outdoor temperature over the last few years
- Need for more sophisticated thermal modelling
  - Heat flux through roofs
  - Effect of ventilation



# Data Available

- Surface albedo
- Seasonal variation
- Ventilation
- Effect of insulation

(see links to published papers)



# Visiting the Prototype

This is located on West Campus near the Wits Club

Familiarise yourselves with the layout

Get a sense of the thermal comfort



# Benefits of MISG study

- Strong motivation for the use of stabilised earth vaults for low-cost housing
- Improve our understanding of the thermal performance of the vaulted roofs
- Facilitate improvements to the layout



#### Questions?

