

Soil Research Centre



# Soil & The Past

John Carson

December 12, 2014

© University of Reading 2014

[www.reading.ac.uk](http://www.reading.ac.uk)

# Overview

“The present is the key to the past”

Summary of Uniformitarian principle by C. Lyell et al.

We say “**Understanding the past is key to the future**”.

- Selection of projects summarising work on:
  - Modelling past climates
  - Peatlands as cultural archives of past environments
  - Deforestation and early civilisation in the Amazon
  - Ancient civilisations in the Middle East

# Soil Research Themes

**Soil & Climate**

**Soil & Food  
Security**

**Soil & Built  
Environment**

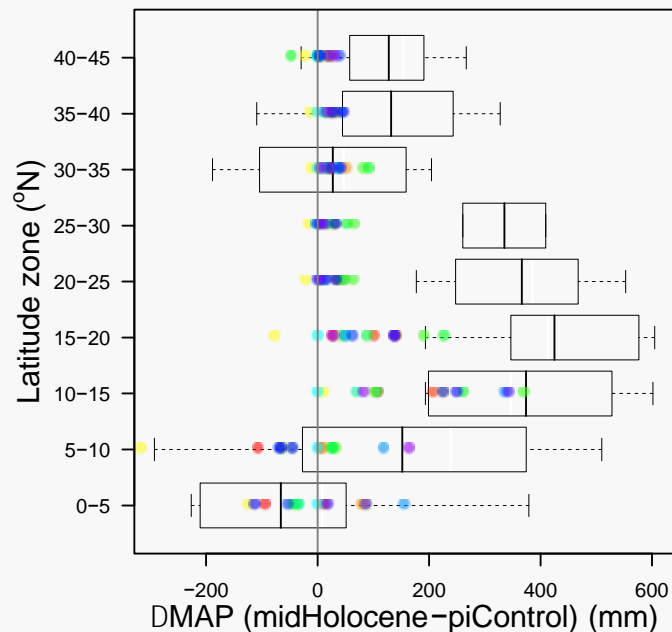
**Soil & The Past**

**Novel Technologies**

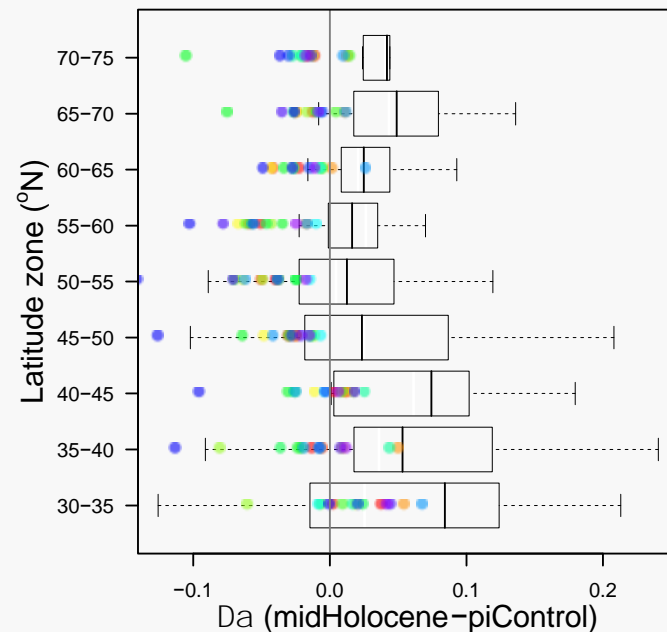
# The past as a guide to the future

Contact: Sandy Harrison

## Mid-Holocene Northern Africa Monsoon



## Mid-Holocene Eurasian mid-continent



- BCC-CSM1-1\_OAC
- CCSM4\_OA
- CNRM-CM5\_OA
- CSIRO-Mk3-6-0\_OA
- CSIRO-Mk3L-1-2\_OA
- EC-EARTH-2-2\_OA
- FGOALS-g2\_OA
- FGOALS-s2\_OA
- GISS-E2-R\_OA
- HadGEM2-CC\_OAC
- HadGEM2-ES\_OAC
- IPSL-CM5A-LR\_OAC
- MIROC-ESM\_OAC
- MPI-ESM-P\_OA
- MRI-CGCM3\_OA

### Key knowledge gap:

Current global climate models underestimate regional climate 6000 years ago by up to 50%

# Peatlands in the UK and Ireland:

**Contact:** Nick Branch

## Archives of environmental change and human activities

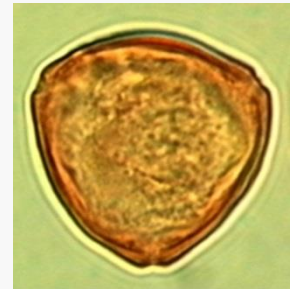
Peatlands are **at risk** from climate change, mining, drainage and land reclamation

Many organisations value of peatlands as a ***cultural resource***, providing archives to inform ***conservation and management plans***

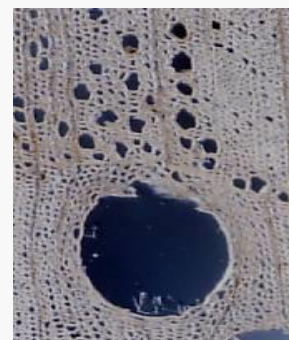
We work with Surrey Wildlife Trust at Chobham Common National Nature Reserve (Surrey), the largest heathland in SE England, to understand its history by studying ***fossilised biological remains*** in its peatlands







POLLEN



Seeds,

Charcoal,

Wood,

Insects

MACRO REMAINS

**Key findings:**

At Chobham Common, we have found a vegetation history spanning the last 11,700 years, indicating shifts in heathland and peatland vegetation composition over time

TESTATE AMOEBAE



# Climate and ancient human environmental impact in Amazonia

Ideas about Amazonia in the past changing...

Responses to past climate

**Pristine wilderness**



Rainforest resilience to human impact

*landscape*

Anthropogenic soils

Plant

Sustainable

use soils as archives of environmental change in the past

cal  
ture

# Geometric earthworks

## Key Findings:

- Earthworks built in a naturally open landscape
- No regional-scale deforestation
- Rainforest migration in southern Amazon



Need to understand antecedent environment  
Clues to rainforest response to drought in future?





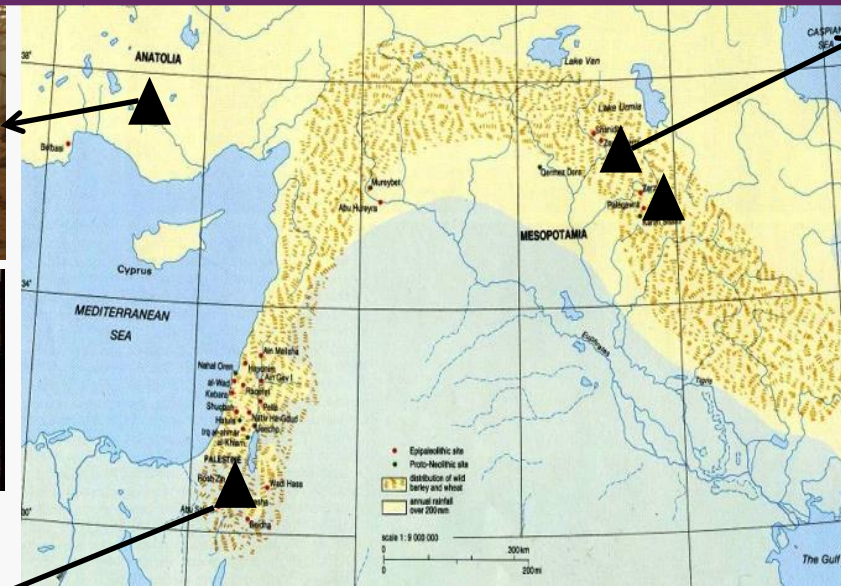
# Early Agriculture, Food Security and Built Environments in the Middle East

Contact: Wendy Matthews

12,000-8,000 years before present day (BP)



**Çatalhöyük,**  
Turkey 7400-6000 BC  
World Heritage Site



**Central Zagros**  
**Iraq, Iran**  
Wendy Matthews

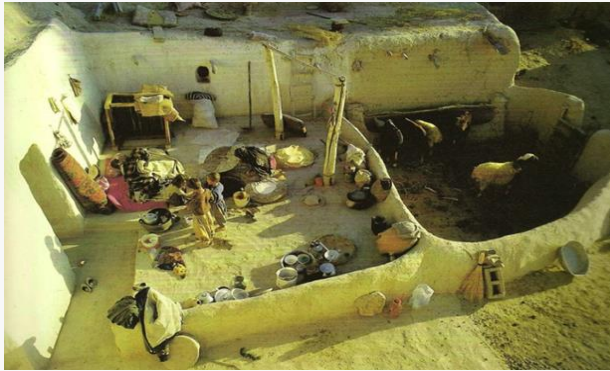


**Zarzi, Bestansur,**  
**Shimshara, Iraq**  
*ca.* 12,000-7000 BC

**Wadi Faynan,**  
Jordan 9600-8200 BC  
Steve Mithen



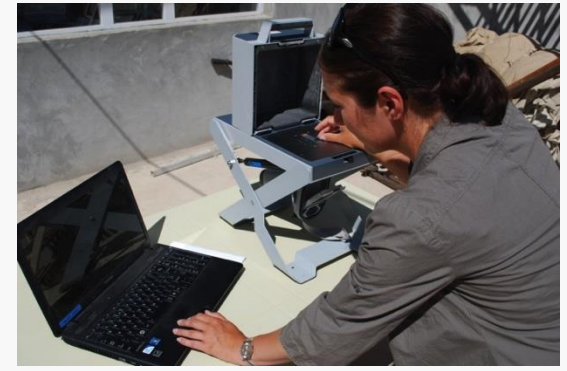
# Interdisciplinary analyses of ecology, built environment and materials



Ethnoarchaeology and spatial analysis



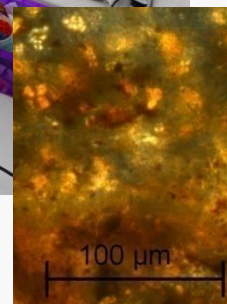
Geochemistry: portable XRF analysis of activity areas and artefacts



Microarchaeology



Microscopy,  
Micromorphology



Archaeobotany,  
Zooarchaeology



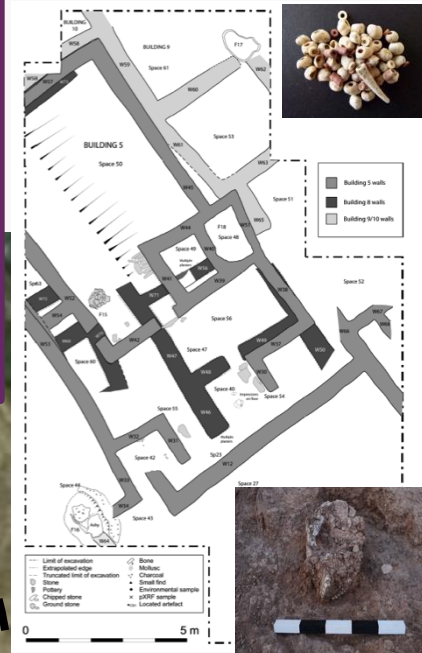
# Ancient built environment

**Bestansur, Iraq KRG**

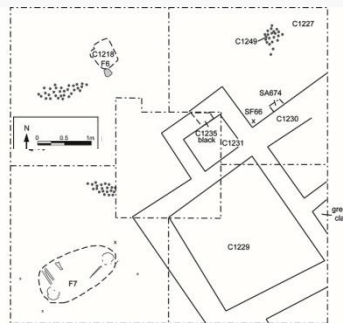
**9660 Year Before Present Day**

**553m asl, 2.5 hectares**

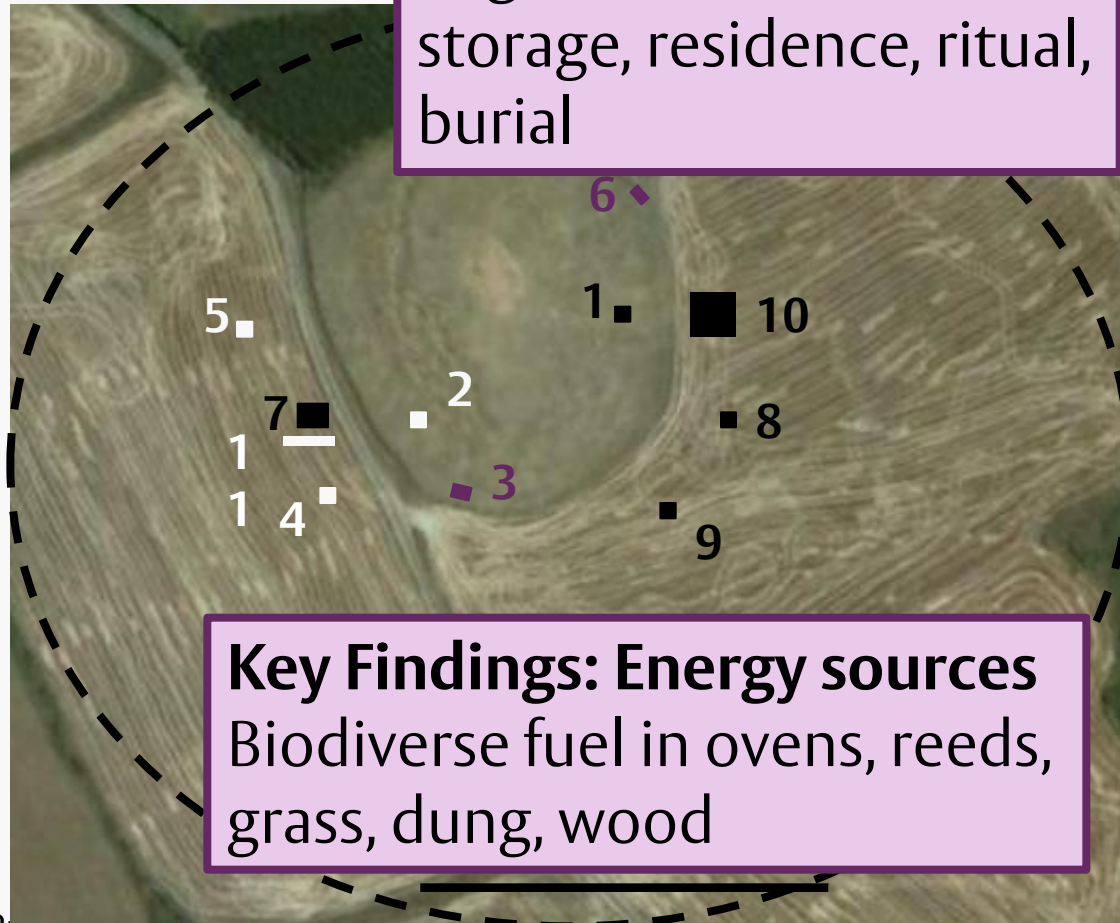
**Key Findings:**  
**Built environment**  
 Organised structures for storage, residence, ritual, burial



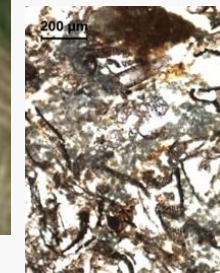
Trench 5 open area  
 food refuse- snail shell  
 midden



Trench 7 Building and  
 open area: cooking



**Key Findings: Energy sources**  
 Biodiverse fuel in ovens, reeds,  
 grass, dung, wood





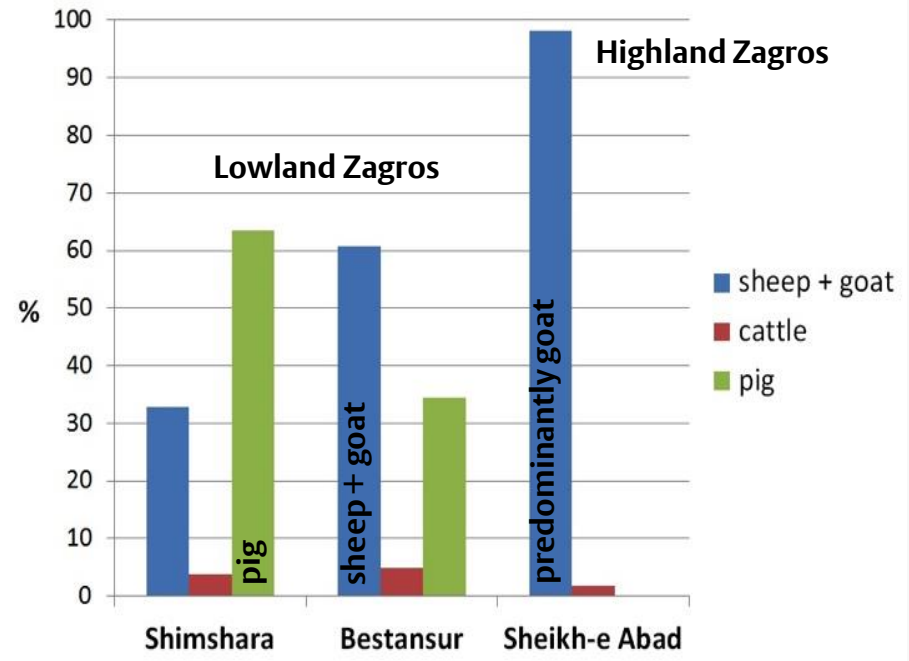
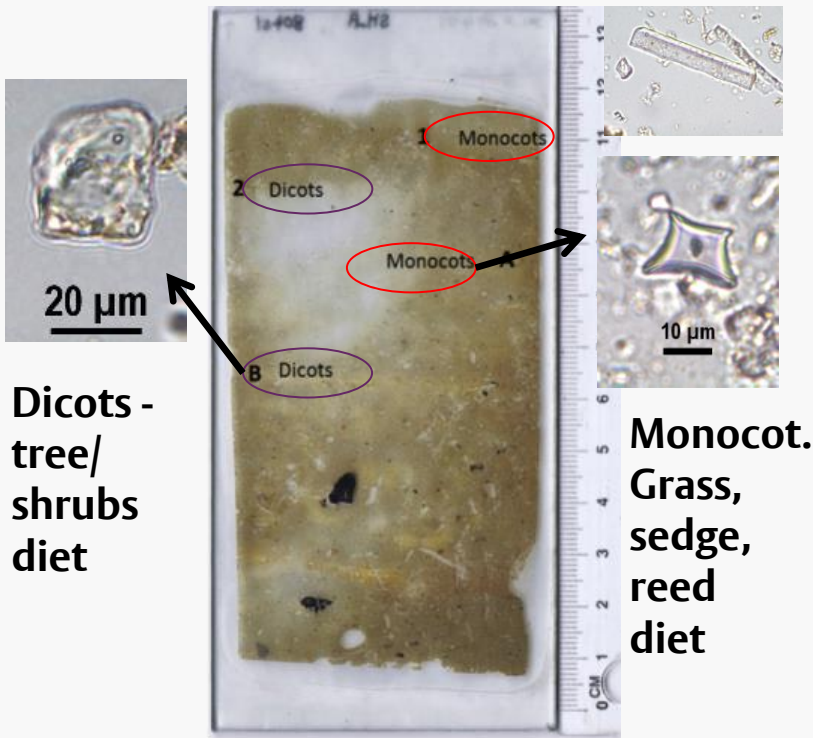
# Ancient food security

## Key Findings: Animal diet

Kept within settlements and fed trees, shrubs, grass and sedges

## Key findings: Human diet

Locally available bio-diverse resources meat  
Goat in highlands  
Sheep, pigs, cattle in lowlands  
Domesticated barley 9,950 BP



Analysis of dung in an early animal pen

# Soil & The Past: Research Highlights

- Soils provide rich **archive** of past environments and human activity
- **UK Lowland Peatlands:** shift between heathland and peatland communities of last 11000 years
- **Amazon:** human settlements before the rainforest developed
- **Middle East:** use of bio-diverse sources of energy and food in ancient civilisations 10 000 years ago
- Information from the past can be used to improve global models of current and future climates **and their impact**

# Interested in finding out more...?



**Sandy Harrison**  
Models



**Nick Branch**  
Peatlands



**Frank Mayle**  
Tropical  
Environments



**John Carson**  
Tropical  
Environments



**Wendy Matthews**  
Early Agriculture