

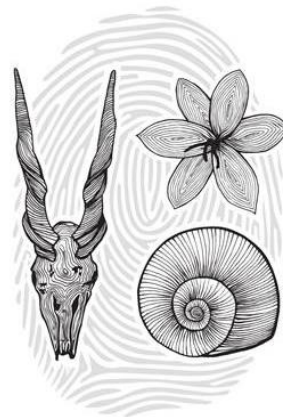
# Resourcescapes: what, why, when, how?

Karen Esler, Alistair Potts, Guy Midgley, Richard Cowling




**Nelson Mandela  
Metropolitan  
University**

*for tomorrow*



Centre for  
Coastal  
Palaeoscience

# INTERDISCIPLINARY EFFORT



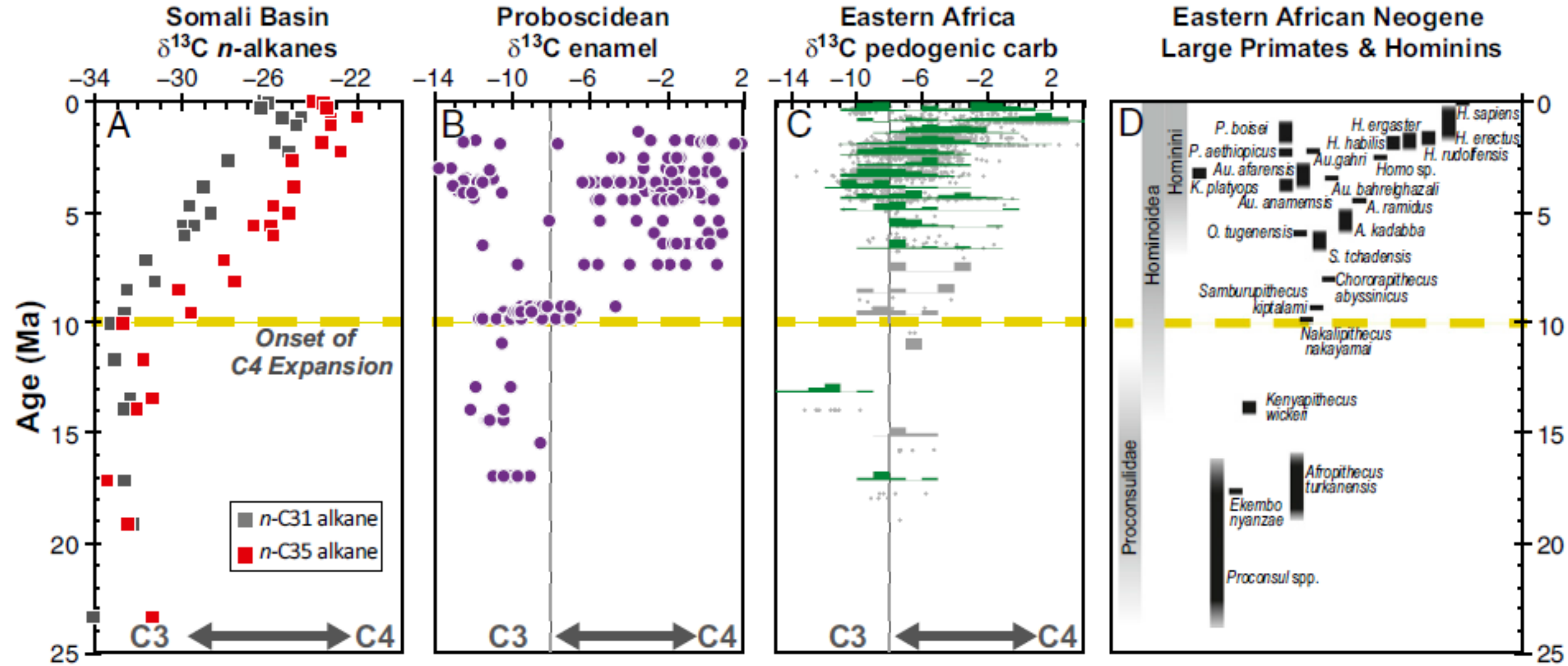
Archaeology  
Climate science  
Computer science  
Paleoanthropology  
Geochemistry  
Plant ecology  
Geological science  
Animal ecology  
Oceanography  
Vegetation science  
Paleoanthropology  
Botany  
Social anthropology

**How did the  
climate &  
environment  
help to  
shape  
modern-  
human  
evolution?**

# Addressing the question: Correlative approach

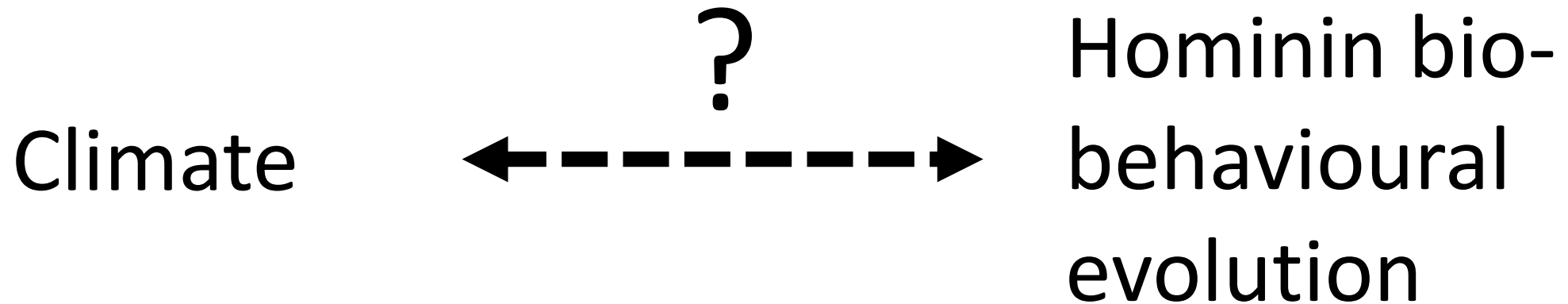
Seek relationships between patterns of hominin evolution & climate/environment change





# But....

- Correlations generally rely on 1-2 proxies
- Explanations for correlations are imprecise / absent
- Correlation  $\neq$  Causation



The missing link...connecting climate with things “meaningful” to hominins



e.g. spatial / temporal understanding of costs / returns of exploiting resources, finding mates, avoiding predators....

## A New Research Strategy for Integrating Studies of Paleoclimate, Paleoenvironment, and Paleoanthropology

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Curtis  
Marean

Arizona  
State  
University



## Paleoscape Model of Coastal South Africa During Modern Human Origins: Progress in Scaling and Coupling Climate, Vegetation, and Agent-based Models on XSEDE

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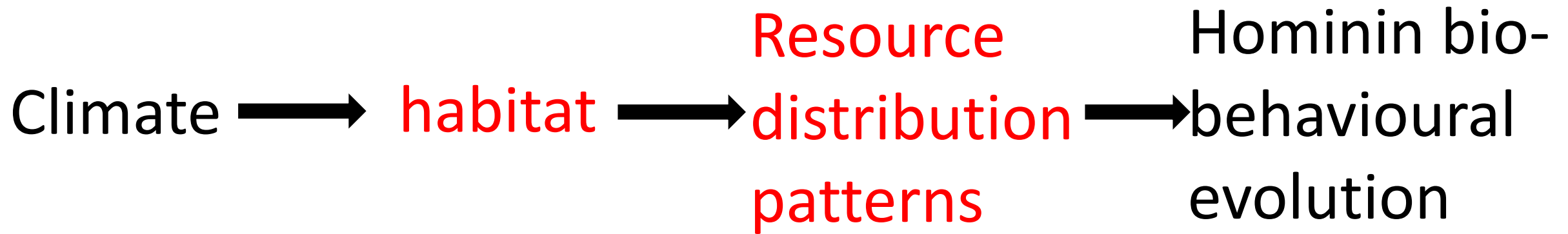
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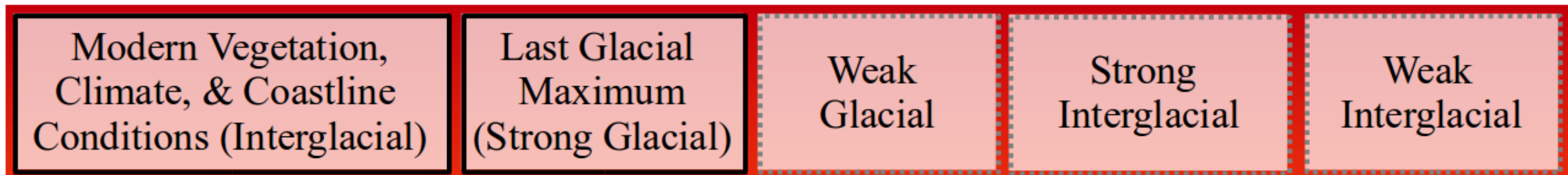
# A move towards integration: building the causal chain



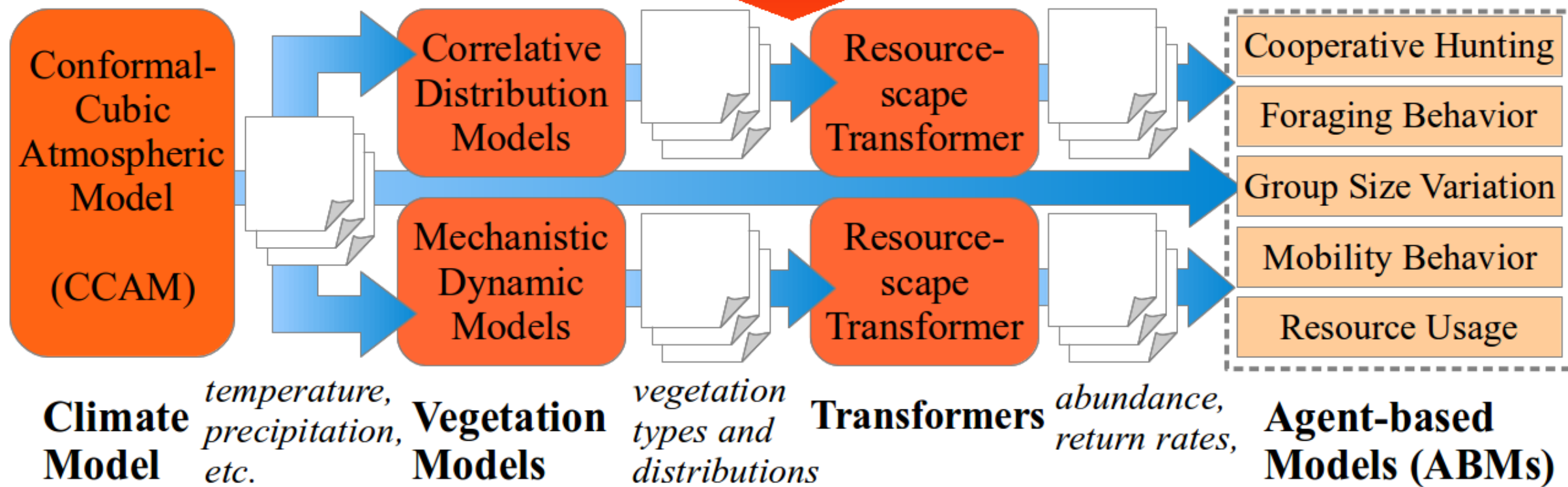
- Super computer power – build 3 explicit models: paleoclimate; resource distributions; human behaviour (agent-based models)
- Optimal foraging theory – when to forage / hunt
- Simulate under range of conditions
- Test against the empirical record



# Climate States



# Computational Workflow



# Our piece of the puzzle: “Resource-scapes”

Building a picture of how people interact with objects / features / resources in the landscape: integrating archaeological/behavioural info (e.g. material culture) with spatially modelled, contemporary field data

Finding the appropriate stick

Finding the appropriate stone



Finding the USOs

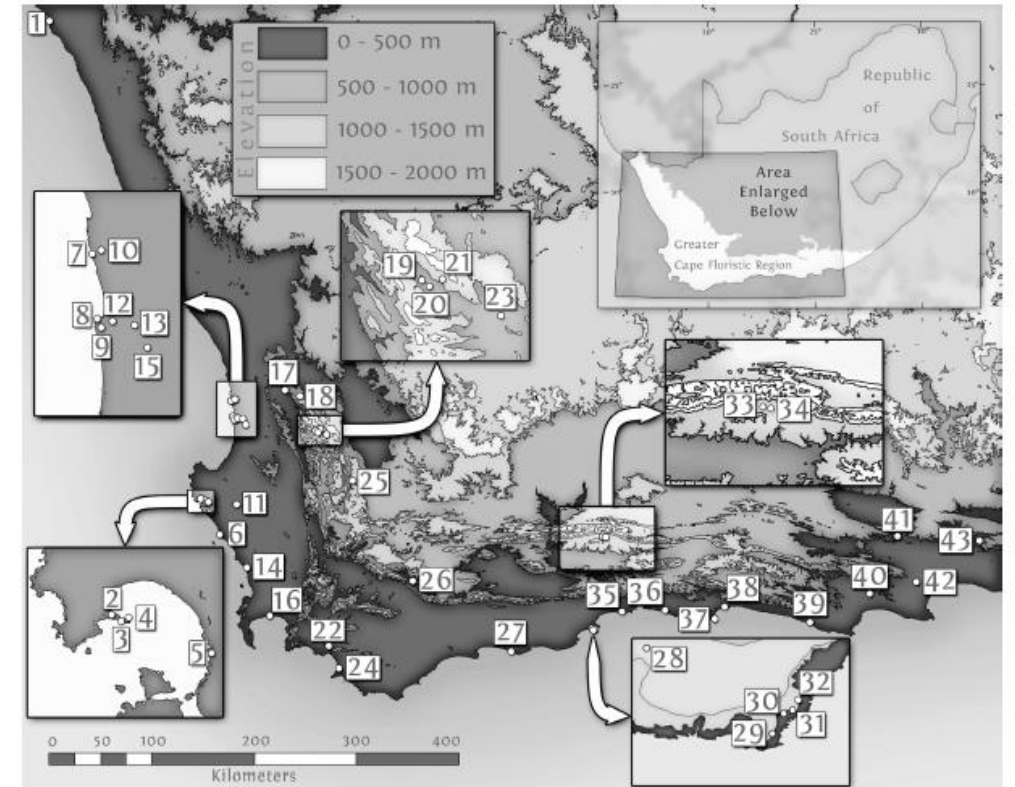
Preparing the USOs to eat

Asking how these “scapes” might change / remain the same under different conditions ( $\text{CO}_2$ )

# Why the Cape?

- Much evidence to suggest that Cape is “ground zero point” for major cognitive revolution of early humans
- A “natural circumscribed laboratory for studying changing hunter-gatherer behaviour” (Marean et al. 2014)

*Fynbos: Ecology, Evolution, and Conservation of a Megadiverse Region.* Edited by Nicky Allsopp, Jonathan F. Colville and G. Anthony Verboom. © Oxford University Press 2014.  
Published 2014 by Oxford University Press.



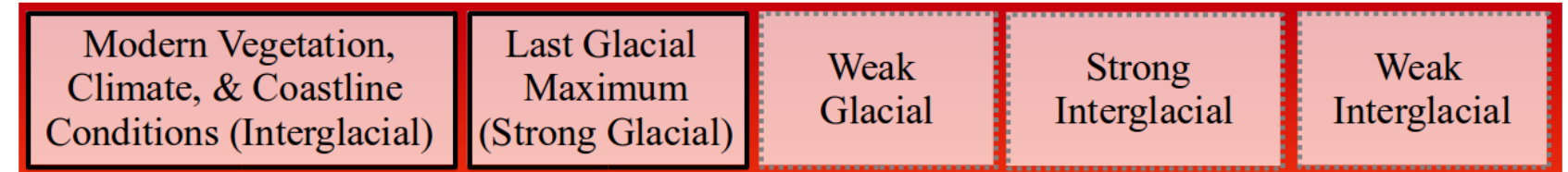
**Figure 8.1** A map of the GCFR and the major regions discussed in the text with the archaeological, palaeontological, and palaeoenvironmental sites and localities in the GCFR mentioned in the text. Site names associated with locality numbers are listed in Table 8.4.

# Paleoscapes



Richard Cowling, Plenary

## Climate States



## Computational Workflow

Conformal-  
Cubic  
Atmospheric  
Model  
  
(CCAM)

Climate  
Model

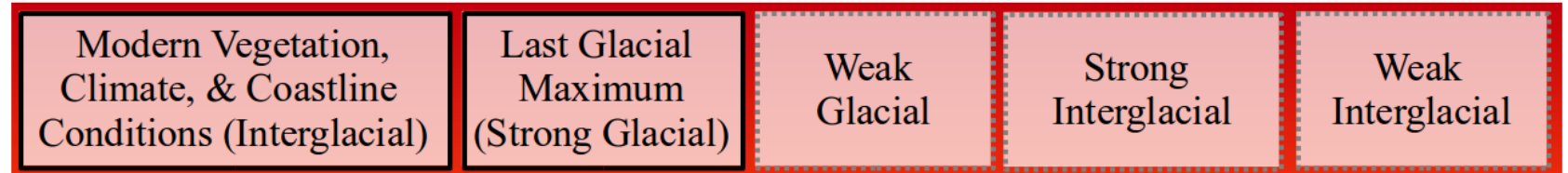
**What environment conditions  
were associated with the  
emergence of modern humans  
on the Cape South Coast?**

# Paleoscapes

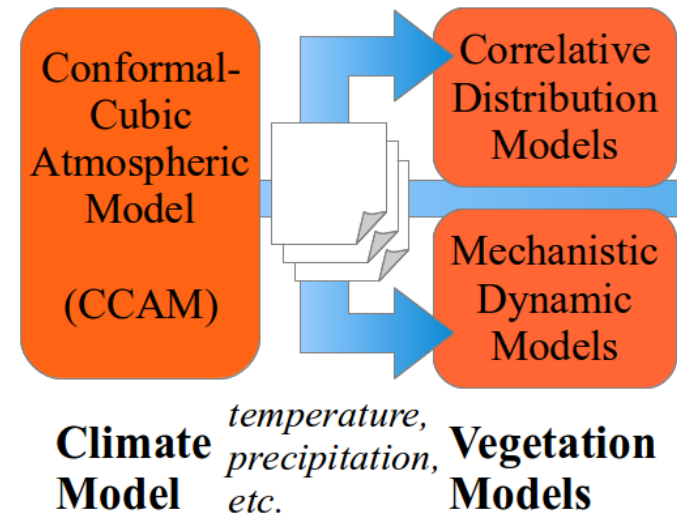


Alastair Potts: Vegetation models

## Climate States



## Computational Workflow



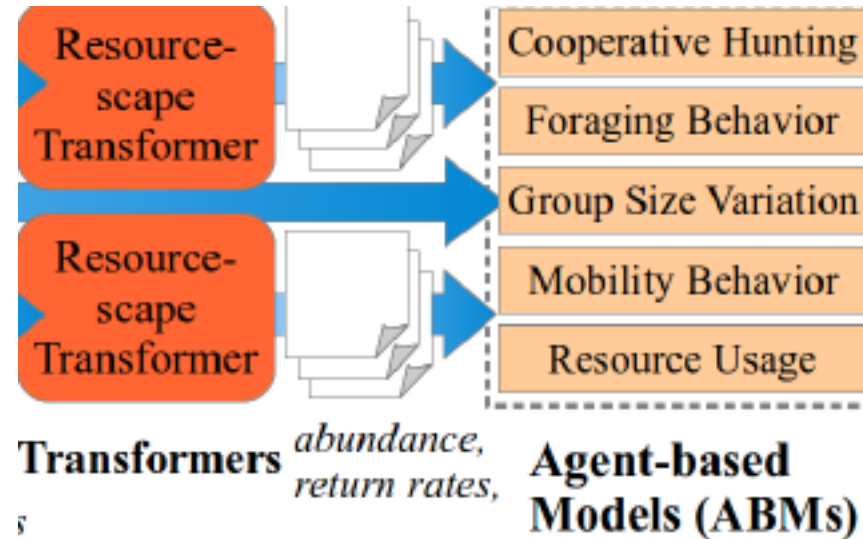
**Reconstructing the  
vegetation of the Cape  
paleolandscape using  
correlative and  
mechanistic models**

# Resourcescapes: terrestrial



**Elzanne Singels:**

Underground storage organs in time and space



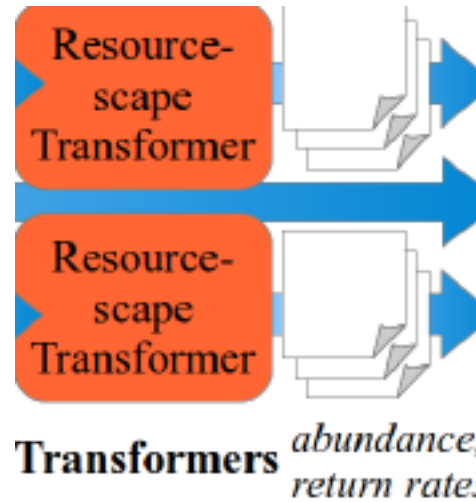
**Susan Botha:**

The foraging potential of edible plants foods in the Southern Cape

# Resourcescapes: the CO<sub>2</sub> question



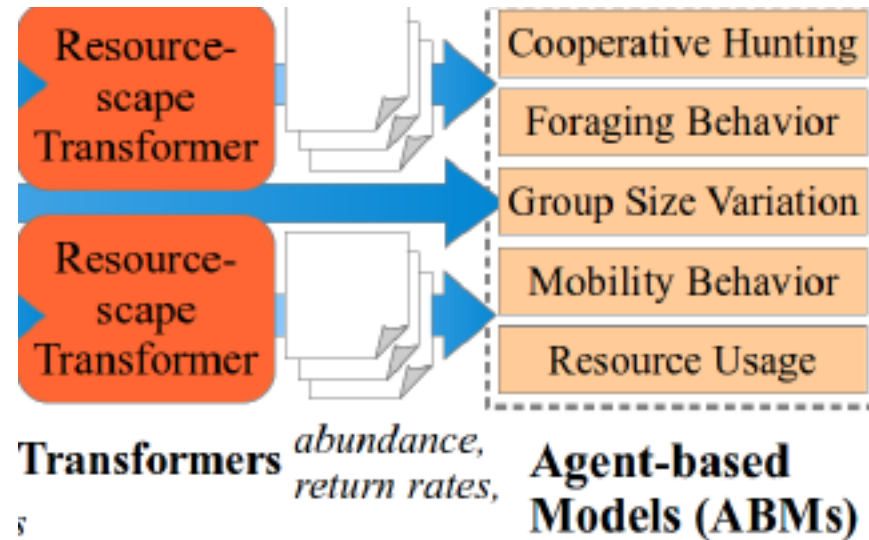
RHODES UNIVERSITY  
*Where leaders learn*



## Zintle Faltein:

How might CO<sub>2</sub> levels change the resource-scape picture? An assessment of geophyte growth at sub-atmospheric CO<sub>2</sub> concentrations

# Resourcescapes: coastal / intertidal



**Leesha Richardson:** Marine bird exploitation: A key factor in better understanding foraging and mobility patterns of Later Stone Age people on the Mossel Bay coast.

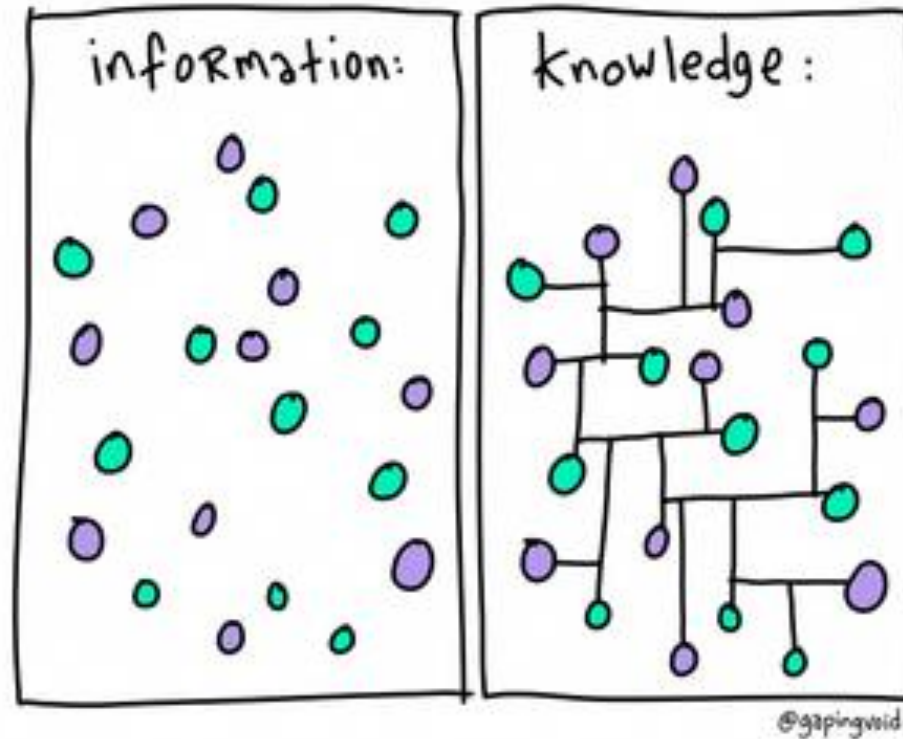
**Jan de Vynck:** Productive and resilient intertidal marine resources available to human foragers on the South Coast of South Africa



# **A New Research Strategy for Integrating Studies of Paleoclimate, Paleoenvironment, and Paleoanthropology**

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# Complex, ambitious



But fun and potentially VERY rewarding!

# Acknowledgements

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- Curtis Marean – Arizona State University

