A little knowledge can be a dangerous thing:

Southern African palaeoenvironments

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A little knowledge, the result of little evidence

Conceptual models:

• ‘Glacial periods are characterised by arid climates’

• ‘Antarctic trends dominate southern hemisphere climates’

• ‘Precessional forcing drives low latitude climate change’
A little knowledge, the result of little evidence

Conceptual models:

• Glacial periods are characterised by arid climates
• Antarctic trends dominate southern hemisphere climates
• Precessional forcing drives low latitude climate change
Southern African palaeo-sites
Southern African palaeo-sites: dune records
Southern African palaeo-sites: dune records
Southern African palaeo-sites
Southern African palaeo-sites: discontinuous records
Southern African palaeo-sites: “humid” records
From Thomas & Shaw, 2002, QSR
Data from Holmgren et al., 1999, Holocene
Data from Butzer, 1978, QR
Data from Holmgren et al., 1999, *Holocene*

Data from Butzer, 1978, *QR*
Southern African palaeo-sites: “humid” records
Southern African palaeo-sites
So… where can we look for reliable, continuous palaeoenvironmental records?
More trees
More grass
Wetter
Drier

Chase et al., 2009, Geology
Chase et al., under review, QR
Data from Farmer et al., 2005 *Paleoceanography*

More upwelling

Less upwelling

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Data from Farmer et al., 2005 *Paleoceanography*
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- Conceptual models:
- Glacial periods are characterised by arid climates
- Antarctic trends dominate southern hemisphere climates
- Precessional forcing drives low latitude climate change
Behavioral ecological models of lithic technological change during the later Middle Stone Age of South Africa

Grant S. McCall* 

Department of Anthropology, University of Iowa, 114 MacBride Hall, Iowa City, IA 52242, USA

Received 5 October 2006; received in revised form 7 December 2006; accepted 8 December 2006

Abstract

This paper examines changes in the organization of lithic technological systems during the later Middle Stone Age (MSA) of South Africa. Using principal components analysis (PCA), the study looks at the lithic data from two important South African MSA sites: Blombos Cave and Klasies River Mouth. The paper uses PCA to describe the transition to (1) the biface-dominated Still Bay industry at Blombos Cave and (2) the microlithic Howiesons Poort industry at Klasies River Mouth. Based on these analyses, the paper offers a synthetic scenario of the emergence of the Still Bay industry from earlier MSA industries, closely followed by the dramatic transition to the Howiesons Poort. Using a few principles of tool design and behavioral ecological models derived from the study of modern foragers, the paper suggests that the Still Bay came about as the result of deteriorating environmental conditions at the beginning of Oxygen Isotope Stage 4, which caused resources to become scarce and more widely distributed. The study proposes that the bifacial point strategy of the Still Bay was a response to wider mobility patterns and increased movement away from lithic raw material sources. The paper then suggests that Howiesons Poort emerged as information sharing strategies improved, and resources in the environment could be more efficiently targeted with more task-specific tools. The paper closes by reviewing the implications of these findings for modern human origins in South Africa.

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Abstract

This paper examines changes in the organization of lithic technological systems during the later Middle Stone Age (MSA) of South Africa. Using principal-component analysis (PCA) of the lithic assemblages from Blombos Cave and Klasies River Mouth, the paper uses PCA to describe the transition to (1) the biface-dominated Still Bay industry at Blombos Cave and (2) the microlithic Howiesons Poort industry at Klasies River Mouth. This study uses PCA to describe the change in the Still Bay industry and how the Howiesons Poort industry is closely followed by the dramatic transition to the Howiesons Poort. Using a few principles of tool design and behavioral ecological models derived from the study of modern foragers, the paper suggests that the Still Bay came about as the result of deteriorating environmental conditions at the beginning of OIS 4...

This perceived environmental context has been applied to both the Still Bay and Howiesons Poort industries.
Klein, 1983, Fynbos Palaeoecology: a preliminary synthesis
Figure 4. Variation in values of the Shannon–Weiner index with (a) and without (b) *Otomys irroratus*, compared with change in oxygen isotope composition of planktonic foraminifera in core RC11–120 (after Shackleton, 1982). 5e–5a, Oxygen isotope substages.
• Problem #1: chronology
HP = ~58 – 66 ka
SB = ~70.5 – 73.5 ka

Jacobs et al., 2008, Science
Avery, 1987,

Klasies River microfauna HP, ~58 – 66 ka, Not ~110 – 100 ka…

Figure 4. Variation in values of the Shannon–Weiner index with (a) and without (b) *Otomys irroratus*, compared with change in oxygen isotope composition of planktonic foraminifera in core RC11–120 (after Shackleton, 1982). 5e–5a, Oxygen isotope substages.
• Problem #1: chronology
• Problem #2: temperature alone is not climate
Howiesons Poort sites

Border Cave  Rose Cottage Cave  Boomplaas Cave
Howiesons Poort sites

Border Cave
Rose Cottage Cave
Boomplaas Cave

Angular spall
Angular spall
Angular spall

= cold
Howiesons Poort sites

<table>
<thead>
<tr>
<th>Cave</th>
<th>Feature</th>
<th>Feature</th>
<th>Feature</th>
<th>= cold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Border Cave</td>
<td>Angular spall</td>
<td>Rose Cottage Cave</td>
<td>Angular spall</td>
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<tr>
<td></td>
<td>micromammals</td>
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<td>Boomplaas Cave</td>
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<td></td>
<td>strong spring influx and</td>
<td></td>
<td>charcoal assemblage</td>
<td>= wet</td>
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<td></td>
<td>high water tables</td>
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</tbody>
</table>
• Problem #1: chronology
• Problem #2: temperature alone is not climate
• Problem #3: on the south coast grass ≠ “dry”

![Graph showing the percentage distribution of different animal feeding strategies over time.](image)

- **DGL (1400 cal yr BP)**
- **BLD (2000 cal yr BP)**
- **BLA (7300 cal yr BP)**
- **BRL (12300 cal yr BP)**
- **CL (13800-17500 cal yr BP)**
- **GWA/HCA (21400 cal yr BP)**
- **GP (25300 cal yr BP)**
- **BP (37500 cal yr BP)**
- **OLP**
- **BOL**
- **OCH (HP, ~66-58 ka)**
- **LOH**

- **graze**
- **mainly graze**
- **mixed-feeder**
- **mainly browse**

*Klein, *Fynbos Palaeoecology: a preliminary synthesis*, 1983*
Klein, 1976, SAAB
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Conceptual models:

• Glacial periods are characterised by arid climates

• **Antarctic trends dominate southern hemisphere climates**

• Precessional forcing drives low latitude climate change
Agulhas Leakage Fauna (%)

Peeters et al., 2004, *Nature*
Obliquity (deg)

Subtropical convergence index

STC index

STC index 9-point

Obliquity (inverted)

Peeters et al., 2004, *Nature*
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Conceptual models:

- Glacial periods are characterised by arid climates
- Antarctic trends dominate southern hemisphere climates
- Precessional forcing drives low latitude climate change
COHMAP members, Science, 1988
Peeters et al., 2004, *Nature*
Data from Farmer et al., 2005 *Paleoceanography*

Less upwelling

More upwelling

*δ15N (%)*
Data from Holmgren et al., 2003 QSR

More tree cover

Less tree cover

Data from Holmgren et al., 2003 QSR
Data from Scheuβ et al., 2005 Nature
More local insolation

Less local insolation