Modern spatial statistics move us beyond environmental determinism

A ‘provocation’ for

SCOTLAND’S
ROCK ART
PROJECT

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Postscript—GIS, environmental determinism and archaeology: a parallel text
V. Gaffney and M. van Leusen
Agenda

- GIS-based landscape archaeology and environmental determinism
- Modern spatial statistics
- The case of Galician megaliths
GIS-based landscape archaeology

- **Rapid deployment** c.1990+

- **Textbook subject** 2002+

- **Anxiety about environmental determinism** by 1993

- **The rush to visibility analysis**
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“The means by which we characteristically represent place ... the Geographical Information System, are all distinctively specular ... All attempt to lay the world bare, like Elliot’s ‘patient etherised upon a table’, or like the corpse under the pathologist’s knife”  Thomas 1993
GIS-based landscape archaeology

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GIS applications in archaeology are now characterised by a largely hidden agenda ... a functionalist approach to archaeological explanation ... [and] have consistently avoided study areas where rituality or subjectivity are a significant aspect of the archaeological record.
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Modern spatial statistics

- Distribution modelling 17/18C +
  - Point pattern analysis c2010+
    - First order effects
    - Second order effects
    - Inhomogeneity

Fox, 1932, The Personality of Britain
Modern spatial statistics

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Distributions:

- Random, clustered or dispersed
- Multiscalar
- Inhomogeneous
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Complete spatial randomness

Clustered Events attract

Dispersed Events repel
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First order effects
Environmental constraints /opportunities
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Distributions:
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Second order effects
Social - repulsion
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Second order effects
Social - attraction
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Second order effects
Social - repulsion and attraction
The case of Galician megaliths

- Galician megalithic mounds
- First order effects (environment)
- Second order effects (social organisation)
- Spatial hierarchy

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The case of Galician megaliths

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Mamoa do rei B

Santa Marina (similar topography)
The case of Galician megaliths

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121 sites in 620 sq km study area (over 7000 in Galicia as a whole)
The case of Galician megaliths

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Multiple regression model of influence of elevation and distance to watershed
The case of Galician megaliths

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Megaliths are clustered — we already know that!

Megaliths are still clustered if we control for environment — interesting!

Theoretical model of megaliths having ‘area of influence’ fits (Widom-Rowlinson penetrable sphere model)
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Megaliths of similar size spaced at c. 4.5km intervals

Permutation test demonstrated that the largest tombs are distributed across spatial groups in a way that is broadly hierarchical.
Points for discussion

- Modern spatial statistics:
  - They facilitate empirical investigation of the interplay of different causes, as opposed to the a priori assertion of primacy according to theoretical preference.
  - The distribution of megalithic mounds in our example region reflects a preference for locations with particular environmental properties, but at a local scale the spacing of these mounds seems to reflect some kind of social partitioning of the landscape into spatially hierarchical units.

- But:
  - Does this really move us beyond the debate about environmental determinism?
  - Does it hinge on a kind of ‘residual’ logic — the social is whatever is left after controlling for the environment?
  - What do we mean by ‘environmental determinism anyway’ — is this really about cognitivism versus behaviourism?