ARCL0095
GIS Approaches to Past Landscapes

2023–2024, Term 2

15 credits

Co-ordinator: Prof. Mark Lake
mark.lake@ucl.ac.uk
Office hours: Wednesdays 15:00–17:00 in Room 115

Moodle: https://moodle.ucl.ac.uk/course/view.php?id=39624

The **coursework coversheet** is available on the course Moodle pages and here: https://www.ucl.ac.uk/archaeology/current-students under "Policies, Forms and Guidelines". Please enter your **five-digit candidate code on the coversheet and in the subject line** when you upload your work in Moodle.
Please use your **five-digit candidate code as the name of the file you submit**.
Please refer to
https://www.ucl.ac.uk/archaeology/current-students/ioa-student-handbook/13-information-assessment
https://www.ucl.ac.uk/archaeology/current-students/ioa-study-skills-guide/referencing-effectively-and-ioa-guidelines
https://www.ucl.ac.uk/students/exams-and-assessments/academic-integrity
https://library-guides.ucl.ac.uk/referencing-plagiarism/acknowledging-AI
for instructions on coursework submission, IoA referencing guidelines and marking criteria, as well asUCL policies on penalties for late submission, over-length work, the use of text generation software (AI) and academic misconduct.

Contents

1 Module overview

1.1 Module description

This course builds on ARCL0094: GIS in Archaeology and History to provide students with a theoretical grounding and practical experience in advanced uses of Geographic Informations Systems for landscape and environmental archaeology. There is a strong emphasis on the manipulation of raster data and we consider landscape geomorphometry, viewshed analysis, cost surface analysis and hydrology, as well as 2.5D and 3D landscapes, and Internet GIS.

We make considerable use of Open Source software, particularly GRASS GIS, as well as other specialist software such as Landserf. The course is taught using a combination of lectures, practical sessions and tutorials in the Institute's AGIS laboratory. There is an emphasis on comparative analysis of different algorithms and software implementations, as well as a strong concern with how such techniques might be applied to solve substantive archaeological problems. This course would particularly benefit those who wish to use GIS primarily in an analytical capacity.

Students who wish to take this course must have already taken ARCL0094: GIS in Archaeology and History. Exceptions are only made for those with significant previous experience of GIS in the workplace or who can demonstrate equivalent knowledge. In addition, students who have not taken ARCL0160: Archaeological Data Science may be asked to take an extra class providing an introduction to scripting using the Python programming language in order to help them prepare for one of the assessments.

1.2 Module aims

The course aims to provide:

- an extended consideration of some of the topics that students will have learned in the pre-requisite module *GIS in Archaeology and History*;
- a theoretical grounding and practical experience in more advanced uses of geographical informations systems for archaeological purposes;
- an advanced understanding of how to manipulate raster data
- a familiarity with advanced open source GIS and related software.

1.3 Learning outcomes

On successful completion of the course, students should:

- have become familiar with negotiating a range of software that varies significantly in terms of interface and functionality;
- have an enhanced ability to select the most appropriate technical tools to answer a given substantive research question;
- have an enhanced understanding that, as with many other computer applications, the 'data' stored and manipulated in a GIS, constitutes a model rather than a direct representation of reality;

- understand and be able to perform a range of point and spatial operations;
- understand and be able to compute measures of landscape structure;
- understand and be able to perform hydrological analysis
- understand and be able to perform cost surface analysis;
- understand and be able to perform various forms of viewshed analysis;
- be able to write Python scripts to undertake iterative analysis;
- implement simple webserving of GIS data.

1.4 Methods of assessment

The course is assessed entirely by coursework, consisting of two assignments:-

	Weighting	Word count	Submission date	Assessment criteria
1. Laboratory notebook	60%	-	7th Feb, 28th Feb, 27th Mar	Special
2. Essay	40%	2000	24th April	Standard

1.5 Communications

- The Moodle pages are the main hub for this course.
- Important information will be posted by staff in theAnnouncements section of the Moodle page and you will automatically receive an email notification for these.
- Please post any general queries relating to module content, assessments and administrationin theMoodle discussion forum, or via email if you prefer. The forum will be checked regularly.
- For personal queries, please contact the co-ordinator by email.

1.6 Week-by-week summary

The course will be taught in Term 2. The first class will be held on 10th January and there will be no taught class on 14th February (Reading Week).

Classes will be held on Wednesdays, commencing at 10:00 and lasting until 13:00. Lectures, seminars and practical sessions will all be taught in the AGIS lab. (room 322C).

Week	Date	Subject
1	10 Jan	Point and spatial operations
2	17 Jan	Landscape Structure
3	24 Jan	Hydrological Analysis
4	31 Jan	Cost Surface Analysis
5	7 Feb	Advanced Cost Surfaces and Least Cost Paths
6	14 Feb	*Reading week*
7	21 Feb	Visibility Analysis: Practical Considerations
8	28 Feb	Visibility Analysis: Theoretical Perspectives
9	6 Mar	Scripting Advanced Visibility Analysis
10	13 Mar	Internet GIS, R and Interactive Scientific Visualisation
11	20 Mar	An advanced research topic

1.7 Lecturers

The course coordinator and principal teacher is:

Prof. Mark Lake (ML), who is available for consultation in room 115 from 13:00–17:00 on Wednesdays in Term 2, or by appointment.

Email / Teams calling: mark.lake@ucl.ac.uk

1.8 Weekly module plan

Teaching will be by a mixture of lecture, seminar, demonstration and supervised practical exercises. You are asked to review an online lecture ahead of class each week so that the in-person session can focus on review and discussion. In-person lectures and seminars will last for 1 hour when followed by a practical class. Practical classes will last up to two hours.

N.B. Participation in practical exercises is limited by the availability of suitably equipped computers, and is *guaranteed only for those who are taking this course as an examined module for a Masters degree*.

1.9 Workload

This is a 15-credit module which equates to 150 hours of learning time including session preparation, background reading, and researching and writing your assignments. With that in mind you should expect to organise your time in roughly this way:

- 30 hours staff-led teaching sessions;
- 30 hours self-guided session preparation / completing in-class practical work;
- 30 hours work researching and writing the essay;
- 60 hours work completing the laboratory notebook.

2 Assessment

Each assignment and possible approaches to it will be discussed in class, in advance of the submission deadline. If students are unclear about the nature of an assignment, they should

discuss this with the module co-ordinator in advance (via office hours or class Moodle forum). You will receive feedback on your written coursework via Moodle, and have the opportunity to discuss your marks and feedback with the co-ordinator in their office hours. For more details see the 'Assessment section on Moodle.

The coursework coversheet is available on the course Moodle pages and here: https://www.ucl.ac.uk/archaeology/current-students under "Policies, Forms and Guidelines". Please make sure you enter your five-digit candidate code on the coversheet and in the subject line when you upload your work in Moodle. Please use your five-digit candidate code as the name of the file you submit.

The IoA marking criteria can be found in the IoA Student Handbook (Section 13: Information on assessment). The IoA Study Skills Guide provides useful guidance on writing different types of assignment.

Please note that **late submission**, **exceeding the maximum word count** and **academic misconduct (unacknowledged use of text generation software and plagiarism)** will be **penalized and can significantly reduce the mark awarded for the assignment and/or overall module result**. Please do consult:

- https://www.ucl.ac.uk/archaeology/current-students/ioa-student-handbook/13-information-assessment with sections 13.7–13.8: coursework submission, 13.10: word count, 13.12–14: academic integrity.
- https://www.ucl.ac.uk/students/exams-and-assessments/academic-integrity for UCLs guidance on academic integrity.
- https://library-guides.ucl.ac.uk/referencing-plagiarism/acknowledging-AI for UCLs guidance on how to acknowledge the use of text generation software.

The use of software to generate content is not allowed for assessments for this course except in a specific situation where the assessment rubric has asked for it.

The use of software for language and writing review and improvement is permitted, but the software and the way it has been used **must be indicated in the relevant boxes on the coursework coversheet**. UCL defines language and writing review as checking "areas of academic writing such as structure, fluency, presentation, grammar, spelling, punctuation, and language translation".

Assessment 1, Laboratory notebook. A write-up of practical work which counts for 60% of your overall module grade. This is made up of 3 assessments which should be submitted individually, as follows:-

	Weight A	Weight B	Submission date	Assessment criteria
1a. Geomorphometry and hydrology	30%	18%	7th Feb	Special
1b. Cost-surface analysis	30%	18%	28th Feb	Special
1c. Viewshed analysis	40%	24%	27th Mar	Special

Weighting A is the proportion of the whole of the laboratory notebook. Weighting B is the proportion of the overall module result. Further detailed instructions and advice will be provided in tandem with the relevant class practicals, including word counts and dedicated assessment criteria. Note that all illustrations should have informative captions. Where appropriate, maps should include indicators of scale and orientation, as well as a legend (key) based on sensible ranges of data values. Graphs should include informative labels for the X- and Y-axes.

Assessment 2, Essay. A **2000 word** essay which counts for 40% of your overall module grade. You will be asked to critically evaluate existing archaeological literature covered in the course and its syllabus. A list of questions will be provided for you to choose from. The IoA marking criteria for essays can be found in the IoA Student Handbook (Section 12.2).

3 Resources and preparation for class

3.1 Preparation for class

The practical element of teaching on this course makes heavy use of GRASS GIS. This is available in the Institute of Archaeology AGIS lab., but you may wish to install it on your own computer as it is also freely available for most operating systems (MS Windows, MacOS, Linux). If installing on a computer running MS Windows you may wish to consider the OSGeo4W installer, since this includes other useful software, such as QGIS, and ensures that the various programs are properly integrated. In week 11 we will make use of RStudio and the R statistical programming language.

You are expected to read the essential readings as well as completing any online activities posted on Moodle each week. Typically you will be asked to review an online lecture ahead of class each week so that the in-person session can focus on review and discussion. Completing the readings is essential for your effective participation in the activities and discussions that we will do, and it will greatly enhance your understanding of the material covered. Further readings are provided via the Online Reading List for you to get a sense of the range of current work on a given topic and for you to draw upon for your assessments. The online reading list is accessible through the Moodle page of the module and can be directly accessed here.

3.2 Recommended basic texts and online resources

There are several methodologically oriented textbooks covering the use of GIS in archaeology. We particularly recommend the following, which are available online:-

Conolly, J. and Lake, M. W. (2006). *Geographical Information Systems in Archaeology*. Cambridge: Cambridge University Press, Chapter 1. [https://doi-org.libproxy.ucl.ac.uk/10.1017/CBO9780511807459, INST ARCH AK 40 CON]

Gillings, M., Hacgzeller, P. and Lock, G. (2020). *Archaeological Spatial Analysis*. London: Routledge. [https://doi-org.libproxy.ucl.ac.uk/10.4324/9781351243858]

Alternative and supplementary texts are listed at the end of this handbook.

4 Syllabus

The following is an outline for the course as a whole. The syllabus identifies essential readings relevant to each session, which are also listed in the course online reading list. The latter also includes suggested supplementary readings.

Week 1: Point and spatial operations (ML)

Introduction to the course. Introduction to point and spatial operations: map-algebra, high-pass filters, low-pass filters and edge-filters.

Practical Point and spatial operations in GRASS GIS.

Essential reading

Conolly, J. and Lake, M. (2006). *Geographical Information Systems in Archaeology*, Cambridge Manuals in Archaeology. Cambridge: Cambridge University Press, **Chapter 9**. [https://doi-org.libproxy.ucl.ac.uk/10.1017/CBO9780511807459, ISSUE DESK IOA CON 10, INST ARCH AK 40 CON].

Shapiro, M. and Westervelt, J. (1992). *R.MAPCALC: An Algebra for GIS and Image Processing*. Technical report. Champaign, Illinois: U.S. Army Construction Engineering Research Laboratory. [https://grass.osgeo.org/gdp/raster/mapcalc-algebra.pdf]

Week 2: Landscape Structure (ML)

Introduction to landscape characterisation and multi-scale analytical methods.

Practical Terrain analysis in Landserf.

Essential reading

Conolly, J. and Lake, M. (2006). *Geographical Information Systems in Archaeology*, Cambridge Manuals in Archaeology. Cambridge: Cambridge University Press, **Chapter 9**. [https://doi-org.libproxy.ucl.ac.uk/10.1017/CBO9780511807459, ISSUE DESK IOA CON 10, INST ARCH AK 40 CON]

Bevan, A. and Conolly, J. (2006). 'Multiscalar approaches to settlement pattern analysis'. In G. Lock and B. Molyneaux (eds) *Confronting Scale in Archaeology: Issues of Theory and Practice*. New York, Springer, pp. 217–234. [https://link-springer-com.libproxy.ucl.ac.uk/book/10.1007%2F0-387-32773-8]

Bevan, A. and Conolly, J. (2013). *Mediterranean Islands, Fragile Communities and Persistent Landscapes: Antikythera in Long-term Perspective*. Cambridge: Cambridge University Press, **Chapter 3**. [https://doi-org.libproxy.ucl.ac.uk/10.1017/CBO9781139519748, INST ARCH DAG 10 BEV]

Ramisch, A., Bebermeier, W., Hartmann, K., Schütt, B. and Alexanian, N. (2012). 'Fractals in topography: Application to geoarchaeological studies in the surroundings of the necropolis of Dahshur, Egypt', *Quaternary International*, 266, pp. 34–46. [https://doi.org/10.1016/j.quaint.2012.02.045]

Zhang, J., Atkinson, P. and Goodchild, M. F. (2014). *Scale in Spatial Information and Analysis*. Boca Raton, Florida: CRC Press, **Chapters 1 and 9**. [https://doi-org.libproxy.ucl.ac.uk/10.1201/b16751]

Week 3: Hydrological Analysis (ML)

The hydrological properties of landscapes. GIS-led hydrological algorithms. Archaeological applications of hydrological analysis.

Practical Building a hydrological model with GRASS.

Essential reading

Conolly, J. and Lake, M. (2006). *Geographical Information Systems in Archaeology*, Cambridge Manuals in Archaeology. Cambridge: Cambridge University Press, **Chapter 11**. [https://doi-org.libproxy.ucl.ac.uk/10.1017/CBO9780511807459, ISSUE DESK IOA CON 10, INST ARCH AK 40 CON]

Bevan, A. and Conolly, J. (2013). *Mediterranean Islands, Fragile Communities and Persistent Landscapes: Antikythera in Long-term Perspective*. Cambridge: Cambridge University Press, **Chapter 3**. [https://doi-org.libproxy.ucl.ac.uk/10.1017/CBO9781139519748, INST ARCH DAG 10 BEV]

Harrower, M. J. (2010). 'Geographic information systems (GIS) hydrological modeling in archaeology: An example from the origins of irrigation in Southwest Arabia (Yemen)', *Journal of Archaeological Science*, 37, pp. 1447–1452. [https://doi.org/10.1016/j.jas.2010.01.004]

Harrower, M. J. and D'Andrea, A. C. (2014). 'Landscapes of state formation: Geospatial analysis of Aksumite settlement patterns (Ethiopia)', *African Archaeological Review*, 31/3, pp. 513–541. [https://doi.org/10.1007/s10437-014-9165-4]

Week 4: Cost Surface Analysis (ML)

Modelling pedestrian, animal and other types of movement in a GIS environment. Isotropic and anisotropic cost surfaces.

Practical Isotropic cost surface analysis in ArcGIS.

Essential reading

Conolly, J. and Lake, M. (2006). *Geographical Information Systems in Archaeology*, Cambridge Manuals in Archaeology. Cambridge: Cambridge University Press, **Chapters 10 and 11**. [https://doi-org.libproxy.ucl.ac.uk/10.1017/CBO9780511807459, ISSUE DESK IOA CON 10, INST ARCH AK 40 CON]

Herzog, I. (2013). 'The potential and limits of optimal path analysis', in Bevan, A. and Lake, M. (eds.) *Computational Approaches to Archaeological Spaces*. Walnut Creek, California, Left Coast Press, pp. 179–211. [https://doi-org.libproxy.ucl.ac.uk/10.4324/9781315431932, INST ARCH AK 30 BEV]

Howey, M. C. L. (2007). 'Using multi-criteria cost surface analysis to explore past regional landscapes: A case study of ritual activity and social interaction in Michigan, AD 1200–1600', *Journal of Archaeological Science*, 34, pp. 1830–1846. [https://doi-org.libproxy.ucl.ac.uk/10.1016/j.jas.2007.01.002]

Verhagen, P., Nuninger, L. and Groenhuijzen, M. R. (2019). 'Modelling of Pathways and Movement Networks in Archaeology: An Overview of Current Approaches', in Verhagen, P., Joyce, J. and Groenhuijzen, M. R. (eds) *Finding the Limits of the Limes*

Cham: Springer International, pp. 217–49. Publishing. [https://doi.org/10.1007/978-3-030-04576-0_11]

Week 5: Advanced Cost Surfaces and Least Cost Paths (ML)

This continues on from the previous weeks class, but addresses more advanced applications of cost surfaces and distance operators, as well as considering the construction of least cost paths.

Practical Anisotropic least cost paths in GRASS.

Essential reading

Altaweel, M. and Wu, Y. (2010). 'Route selection and pedestrian traffic: Applying an integrated modeling approach to understanding movement', *Structure and Dynamics*, 4/2, article 2. [https://escholarship.org/uc/item/6898p5vm]

Bevan, A. H. (2010). 'Political geography and Palatial Crete', *Journal of Mediterranean Archaeology*, 23, pp. 27–54. [https://journals-equinoxpub-com.libproxy.ucl.ac.uk/index.php/JMA/article/view/9217]

Gravel-Miguel, C. and Wren, C. D. (2018), 'Agent-Based Least-Cost Path Analysis and the Diffusion of Cantabrian Lower Magdalenian Engraved Scapulae', *Journal of Archaeological Science*, 99, pp. 1–9. [https://doi.org/10.1016/j.jas.2018.08.014]

Lewis, J. (2021). 'Probabilistic Modelling for Incorporating Uncertainty in Least Cost Path Results: A Postdictive Roman Road Case Study', *Journal of Archaeological Method and Theory*, 28/3, pp. 911–24. [https://doi.org/10.1007/s10816-021-09522-w]

Week 7: Visibility Analysis: Practical Considerations (ML)

Modelling human visual perception in a GIS environment. The use and limitations of viewshed (line-of-sight) analysis.

Practical Viewshed analysis from sites using ArcGIS and GRASS.

Essential reading

Conolly, J. and Lake, M. (2006). *Geographical Information Systems in Archaeology*, Cambridge Manuals in Archaeology. Cambridge: Cambridge University Press, **Chapter 10**. [https://doi-org.libproxy.ucl.ac.uk/10.1017/CBO9780511807459, ISSUE DESK IOA CON 10, INST ARCH AK 40 CON]

Dungan, K. A., White, D. Déderix, S., Mills, B. J. and Safi, K. (2018). 'A Total Viewshed Approach to Local Visibility in the Chaco World', *Antiquity*, 92/364, pp. 905–21. [https://doi.org/10.15184/aqy.2018.135]

Lake, M. and Ortega, D. A. (2013). 'Compute-Intensive GIS Visibility Analysis of the Settings of Prehistoric Stone Circles', in Bevan, A. and Lake, M. (eds) *Computational Approaches to Archaeological Spaces*. Walnut Creek, California: Left Coast Press, pp. 213–42. [https://doi-org.libproxy.ucl.ac.uk/10.4324/9781315431932, INST ARCH AK 30 BEV] .

Llobera, M. (2003). 'Extending GIS-Based Visual Analysis: The Concept of "Visualscapes"', *International Journal of Geographical Information Science*, 17, pp. 25–48. [https://doi.org/10.1080/713811741]

Week 8: Visibility Analysis: Theoretical Perspectives (ML)

A session exploring theoretical critiques of GIS and using visibility analysis as a case study in the relationship between method and theory.

Practical Introduction to scripting in the Python programming language for those who did not take ARCL0160 Archaeological Data Science. **In consultation with students, this practical may be scheduled outside normal class time.**

Essential reading

Fisher, P. F., Farrelly, C., Maddocks, A. and Ruggles, C. (1997). 'Spatial analysis of visible areas from the Bronze Age cairns of Mull', *Journal of Archaeological Science*, 24, pp. 581–592. [https://doi-org.libproxy.ucl.ac.uk/10.1006/jasc.1996.0142]

Gillings, M. (2012). 'Landscape phenomenology, GIS and the role of affordance', *Journal of Archaeological Method and Theory*, 19/4, pp. 601–611. [https://doi.org/10.1007/s10816-012-9137-4]

Lake, M. W. and P. E. Woodman. (2003). 'Visibility Studies in Archaeology: A Review and Case Study', *Environment and Planning B: Planning and Design*, 30, pp. 689–707 [https://doi.org/10.1068/b29122].

Wheatley, D. (2014). 'Connecting landscapes with built environments: Visibility analysis, scale and the senses', in Paliou, E., Lieberwirth, U. and Polla, S. (eds) *Spatial Analysis and Social Spaces*. Berlin, De Gruyter, pp. 115–134. [https://doi.org/10.1515/9783110266436.115]

Week 9: Scripting Advanced Visibility Analysis (ML)

This session addresses more advanced visibility analysis including the use of Python scripting to generate cumulative viewsheds.

Practical Scripting cumulative viewshed analysis in GRASS.

Week 10: Internet GIS, R and Interactive Scientific Visualisation (ML)

Technical, social and legal issues in web-serving GIS.

Practical Introduction to web-serving spatial data using R Shiny.

Essential reading

Bonacchi, C. (2017). 'Digital media in public archaeology', in Moshenska, G. (ed.) *Key Concepts in Public Archaeology*. London, UCL Press, pp. 60–72. [https://doi.org/10.2307/j.ctt1vxm8r7]

Haklay, M. (2013). 'Neogeography and the delusion of democratisation', *Environment and Planning A*, 45, pp. 55–69. [https://doi.org/10.1068/a45184]

Harris, T. M. (2012). 'Interfacing archaeology and the world of citizen sensors: Exploring the impact of neogeography and volunteered geographic information on an authenticated archaeology', *World Archaeology*, 44/4, pp. 580–591. [https://doi.org/10.1080/00438243.2012.736273]

May, K. (2017). 'Digital Archaeological Heritage: An Introduction', *Internet Archaeology*, 43. [https://doi.org/10.11141/ia.43.1]

Richards, J. D., Jakobsson, U., Novák, D., Štular, B. and Wright, H. (2021). 'Digital Archiving in Archaeology: The State of the Art. Introduction', *Internet Archaeology*, 58. [https://doi.org/10.11141/ia.58.23]

Turner, A. (2006). *Introduction to Neogeography*. O'Reilly. **Introduction to Neogeography** and **GeoStack**. [https://learning.oreilly.com/library/view/introduction-to-neogeography/0596529953/?sso_link=yes&sso_link_from=university-college-london]

Week 11: An advanced research topic

We will look at an example of the use of GIS in a current research topic. Previous examples have included GIS-based research into the construction of British earthen monuments, with particular emphasis on the computational pipeline.

Practical A practical relevant to the research topic.

Essential reading The exact readings will be confirmed when the topic has been finalised.

5 Alternative and supplementary texts

In addition to the core texts listed above (3.2), the following textbooks and edited texts may be useful.

Alternative textbooks on archaeological GIS

Chapman, H. (2006). *Landscape archaeology and GIS*. Stroud, Gloucestershire: Tempus. [INST ARCH AK 40 CHA]

Wheatley, D. and Gillings, M. (2002). *Spatial Technology and Archaeology: The Archaeological Applications of GIS*. New York, Taylor and Francis. [INST ARCH AK 40 WHE].

Non-archaeological textbooks on GIS

Burrough, P. A. and McDonnell, R. A. (1998). *Principles of Geographic Information Systems*. Oxford, Oxford University Press. [INST ARCH AK 40 BUR, GEOGRAPHY D 60 BUR, ENGINEERING D 80 BUR]

Turner, A. (2006). *Introduction to Neogeography*. Sebastopol, California, O'Reilly. [https://ucl-new-primo.hosted.exlibrisgroup.com/permalink/f/5qfvbu/UCL_LMS_DS51341642830004761]

Worboys, M. and Duckham, M. (2004). *GIS: A Computing Perspective*. Boca Raton; London, CRC Press. [ENGINEERING D 80 WOR, Science Short Loan Collection WOR]

Relatively more recent edited collections The following survey archaeological (or cognate) applications of GIS:-

Bevan, A. and Lake, M. (eds) (2013). *Computational Approaches to Archaeological Spaces*. Walnut Creek, California, Left Coast Press. [https://doi-org.libproxy.ucl.ac.uk/10.4324/9781315431932, INST ARCH AK 30 BEV]

Bodenhamer, D. J., Corrigan, J. and Harris, T. M. (eds) (2010). *The Spatial Humanities: GIS and the Future of Humanities Scholarship*. Bloomington, Indiana, Indiana University Press. [https://www.jstor.org/stable/j.ctt16gzj77, GEOGRAPHY D 68 BOD]

Paliou, E., Lieberwirth, U. and Polla, S. (eds). (2014). *Spatial Analysis and Social Spaces: Interdisciplinary Approaches to the Interpretation of Prehistoric and Historic Built Environments*. Berlin, De Gruyter. [https://www-degruyter-com.libproxy.ucl.ac.uk/document/doi/10.1515/9783110266436/html, INST ARCH AK 30 PAL, Bartlett CC79.S63 S63 2014]

Polla. S. and Verhagen, P. (eds) (2014). *Computational Approaches to the Study of Movement in Archaeology Theory, Practice and Interpretation of Factors and Effects of Long Term Landscape Formation and Transformation*. Berlin: De Gruyter. [https://www.degruyter.com/document/doi/10.1515/9783110288384/html, INST ARCH AK 40 POL]

Papers in *Journal of Archaeological Method and Theory*, 19 (4), 2012.

Classic older edited collections

Aldenderfer, M. and Maschner, H. D. G. (eds) (1996). *Anthropology, Space and Geographic Information Systems.* New York, Oxford University Press. [INST ARCH AK 40 ALD]

Allen, K. M. S., Green, S. W., and Zubrow, E. B. W. (eds) (1990). *Interpreting Space: GIS and Archaeology.* London, Taylor & Francis. [INST ARCH AK 40 ALL]

Gillings, M., Mattingly, D. and van Dalen, J. (eds) (1999). *Geographical Information Systems and Landscape Archaeology*, volume 3 of The Archaeology of Mediterranean Landscapes. Oxford, Oxbow Books. [INST ARCH AK 40 QTO BAR]

Lock, G. (ed.). (2000). *Beyond the Map: Archaeology and Spatial Technologies.* Amsterdam, IOS Press. [INST ARCH AH LOC].

Lock, G. and Stancic, Z. (eds) (1995). *Archaeology and Geographical Information Systems: A European perspective.* London, Taylor & Francis. [INST ARCH AK 40 LOC]

Maschner, H. D. G. (ed.) (1996). *New Methods, Old Problems. Geographic Information Systems in Modern Archaeological Research*, volume 23 of Occasional Paper. Carbondale, Southern Illinois University Center for Archaeological Investigations. [ISSUE DESK IOA MAS]