

ESF Exploratory Workshop

Scientific Report

*General issues in the study of medieval logistics:
sources, problems and methodologies*

*Friday 14th November – Sunday 16th November 2003
University of Birmingham*

Executive summary

The workshop, which set out to introduce and to discuss the issues facing historians and archaeologists interested in the question of pre-modern land-use, resource production, distribution and consumption, was agreed by all participants to have been a great success. In the view of all participants, the workshop achieved all its aims in respect of (a) sharing information and knowledge among experts from a range of different historical and geographical specialisms; (b) establishing a framework for future research; (c) inaugurating new research and stimulating new questions; and (d) enabling a clear set of priorities for the next stage of the project to be formulated and agreed.

A clear plan for the next stage of the project was established by the end of the final meeting. This entailed the following key points:

1. The papers from the meeting would be published, through the Institute of Archaeology and Antiquity (IAA) of the School of Historical studies at Birmingham, in electronic and hard-copy format.
2. It was agreed that the Birmingham group would effectively function as a steering group, and John Haldon would act provisionally as overall director for the project. This group will meet in early February to review these plans.
3. A series of small-scale projects relating the analysis of specific historical events to computer-modelled medieval landscapes would be undertaken by different groups within the project wider membership.
4. Large-scale coarse landscape modelling would be inaugurated by the Birmingham group at the University of Birmingham, expanding work already begun. The digital mapping of Asia Minor and the Balkans was achievable on the basis of existing resources at Birmingham and could be begun in 2004, subject to availability of funding.

5. Detailed modelling of other landscapes based on existing survey projects in Italy and Turkey, initially, would similarly be begun.
6. Collaboration with the Tiber Valley project (Rome) and the Vienna *Tabula imperii Byzantini* (Vienna) could be inaugurated early in 2004.
7. Colleagues leading or involved in survey projects whose results could be fed into the Logistics project would be contacted in due course. The working basis of the project should be information exchange, so that the Logistics project can offer data-modelling and landscape-modelling systems and expertise to colleagues on a reciprocal basis.

Workshop discussion and scientific content:

The Workshop set out to establish a framework within which to set up a project to analyse the logistics of East Roman, early medieval western European, and early Islamic warfare in all its aspects (cultural, technological, organisational). The project will examine three levels at which logistics need to be understood: the physical basis of logistics, the organisational structures evolved by different societies and economic systems to meet logistical demands, and the ways in which different societies responded to warfare and the need to organise for it (and how this inflected social organisation more widely). The project will examine the shared organisational imperatives with regard to defensive and offensive warfare of the three zones, and set out some alternative approaches to the study and understanding of warfare and medieval societies in the wider sense. Since the project will establish the material – physical - base for the study of these themes across the three regions, this will be its initial emphasis and priority, with warfare taking a relatively secondary position until a later phase.

This exploratory workshop was intended to address the first theme, the physical basis of logistics. It discussed the methodologies to be employed, the integration of historical, geographical and archaeological data through the application of advanced computer-modelling techniques, GIS and related spatial modeling approaches. The workshop will, therefore, have a strong emphasis on inter-disciplinarity. The final object of the workshop was to generate a timetable and operational plan for the implementation of the project as a whole.

The introductory presentation by Vince Gaffney discussed the major issues and the advantages for the project of computer-modelling systems, and was intended to set the scene for some of the later technical presentations. It considered key historical and archaeological issues related to logistics and military organization, and the relevance of digital technologies for their analysis. Specific emphasis was placed on the potential of GIS as a core technology for logistical study and a basic introduction to the nature and use of GIS technologies was provided for the benefits of participants not familiar with their use. Examples of relevant work were presented and the limitations of current applications and technologies considered.

Malcolm Wagstaff then presented a paper dealing with Network analysis, logistics and applied topology, since any analysis of the logistics of warfare must be concerned with routes and with nodes in networks of routes. Routes focus movement; nodes command intersections. Both are intimately related to the ways in which armies actually move across country and with the ways in which they are provisioned. Routes also mediate power, linking its *loci* with territory, its peoples and their use of land. They are essential to the exercise of control and the extraction of surplus. Thus, the reconstruction and analysis of the communications structure is basic to the examination of the logistics of medieval warfare in the regions proposed for study. The potential of graph theory in this respect and some of the indices that have been derived from it were discussed, some practical questions of making graph theory operational were presented, and some applications of graph theory published by Sanders and Whitbread were considered.

As a more specifically historical-archaeological demonstration of modelling techniques Helen Patterson then presented an account of the Tiber valley project led by the British School of Archaeology at Rome. Since 1997 the Tiber valley project has been the focus of the British School at Rome's archaeology programme. Over the last five years a large research group of mainly British and Italian scholars has been studying the changing landscapes of the middle Tiber valley from protohistory to the medieval period. Drawing on the long tradition of landscape archaeology by British and Italian scholars in the area, the project examines the impact of the growth, success and decline of Rome on the history of settlement, economy and culture of the river valley. The core of the project involves the re-evaluation of the South Etruria survey carried out during the 1950s and 1970s, integration of this data with material from more recent British projects, and with the information from the numerous published surveys and excavations carried out primarily by Italian scholars. Thematic studies of specific aspects of the landscape and new fieldwork aimed primarily at filling the gaps in our archaeological knowledge also form an integral part of the project. The resulting GIS and database system now contains over 5000 sites from the Bronze Age to the Medieval period. The aim is to produce a new, materially based history of the middle Tiber valley from 1000 BC to AD 1000.

The interpretation of the data and its synthesis is underway, and the paper examined some of the methodological issues involved with the integration and interpretation of the Tiber valley data. It then focused on the late antique and early medieval periods, examining, in the light of the restudy, the impact of the disintegration of the Roman state and the emergence of new forms of political and religious control on the settlement, economy and culture of the river valley from the 4th to 9th centuries AD. The results are preliminary but have interesting implications as regards previous conceptions of developments in this period.

The practical application of computer-modelling and the use of Geographical Information Systems (GIS's) was graphically demonstrated in the paper by Warren Eastwood on palaeoenvironmental and archaeo-historical research in Turkey, which outlined a brief introduction to the palaeoecological theory required for reconstructing palaeoenvironments. It then summarised vegetation and environmental change in the eastern Mediterranean with an emphasis on Turkey. Eastwood's paper was linked to that of Steve Wilkes, which presented and explained the range of remote-sensing systems available to the Project in relation to survey work and landscape reconstruction and modelling, and in the final part of the presentation outlined a pilot project which attempts to reconstruct palaeoenvironments using a GIS-based model approach.

Relating geographical and ecological theory to the historical documentation, Johannes Koder then presented a discussion about theoretical approaches to land-use and settlement patterns, in which he dealt with sources for settlement history, theoretical concepts (von Thünen: Location Theory; Christaller: Central Place Theory) and practical applications.

Logistics depend upon modes of communication and related factors, and the important paper by Gino Bellavia presented computer-modelling techniques based on the principles of viewshed analysis which could be employed both to predict and to trace through survey or archaeology ancient and medieval routes and tracks.

Different types of route through the landscape were discussed, along with the characteristics that need to be considered to model these routes. Whilst least-cost path analysis provides one approach to the problem of predicting paths, the paper discussed a generic approach to predicting routes through a landscape regardless of start- and end-points. The approach depended on creating a cost surface model, through a combination of the factors which define different types of routes. This approach has been used to analyse the relationship between the distribution of prehistoric archaeological sites and communication routes through the landscape. The issues around the potential application of this methodology to the questions asked in the area of medieval military logistics were then discussed.

Especially important to logistical issues is the quantity, availability, rate of production and quality of foods, in particular staple dietary elements such as grains. In Helen Goodchild's paper, a model for agricultural production and crop levels, derived from the Tiber Valley project database, was discussed. Data was modelled in order to answer questions on aspects such as subsistence regimes, manpower, carrying capacities of land units, and most importantly, testing the validity of historical sources for use within quantitative modelling.

With a more historical/archaeological emphasis the paper by Gatier and Rousset discussed the 'arid margins' programme, which is concerned with the relationship between people and environment in a region to the south-east of Aleppo, where aridity represents a strong determining feature. The high number of sites, the repetition of types of situation, and the analysis of locations, facilitates the asking of questions about the occupation of the land and its exploitation both in space and across time. The steppe is interesting because the methods of exploitation of the land reveal strong ecological constraining factors, yet particular possibilities, associated, for example, with supplies from watercourses, were widely exploited in the course of time. The pattern of occupation varied across time. While enumerating the sites and evaluating their functions and their size is one element in this picture, defining the nature of the relationship between sedentary settlements and those of nomads or semi-settled populations was also important. During the Roman period the extent of sedentary occupation was broadly similar to that of today. During the proto-Byzantine period (4th-7th c.) there took place a considerable expansion in this occupation which, in the east, covered areas which were never subsequently reoccupied. This was the period of maximal exploitation of the steppe, due in particular to the possibilities facilitated by the *qanats*, but also to the great stock farms or ranches to the east. Thereafter, there took place a significant retreat in the extent of sedentary occupation of the area. The Ayyubid period (mid-12th c. - mid 13th c.) shows some original traits, insofar as we can distinguish both a relative increase in the number of sites occupied and a clear separation between the sedentary west and the exclusively nomadic region to the east. Fundamental characteristics of the agrarian régime that the survey revealed were, in particular, the close interrelationship between the cultivation of cereals and stockraising. This dependency, which arises from purely economic needs at the present time, existed also in the past, certainly from the Bronze Age. It expresses the adaptability of the populations of the region to the variable nature of environmental constraints.

The final contribution from Ron Yorston attempted to demonstrate how the different technologies and modelling systems could work together to generate both an

integrated pattern of research and analysis, but also to support better collaborative work of the sort this project represented. In a project as wide-ranging as the one covered by this workshop there were clearly difficulties in the handling of disparate and complex data from multiple sources. Yorston's paper described how the Stonehenge Landscapes project, managed by the Institute of Archaeology and Antiquity at the University of Birmingham, used novel computer technologies to assist in the manipulation and dissemination of the largest digital survey ever undertaken of this important archaeological landscape. It was shown how the challenges faced by the Medieval Logistics project might be addressed by similar technologies.

Assessment of results and decisions for future development of the project:

1. As well as introducing the problematic aspects of an undertaking to analyse medieval logistics and resource use, the workshop achieved its main goal, which was to establish a plan for future development and international co-operation, both across institutional as well as national boundaries. Over the two and a half days of the meeting, some twelve papers from a range of disciplines were read, accompanied by a great deal of discussion. By the end of the meeting, although many questions remain to be tackled, a broad picture had emerged of what might and might not be possible or achievable through the harnessing of traditional historical and archaeological work with modern remote sensing and survey systems and the application of computer modelling. The results of the workshop fulfilled all the expectations of the organisers, and demonstrated that a meaningful international project on the subject of logistics was viable organisationally and in respect of the range of expertise present. It was also clear that there was sufficient interest from colleagues outside Birmingham to pursue both the funding and the academic programme.
2. Applications to the ESF would be made, with the aim of establishing an ESF Network, or alternatively to funding a Research Conference within the EURESCO framework or a Scientific Programme (with a four-year or possibly longer duration); and to NATO. An application for funding submitted to the AHRB (Arts & Humanities Research Board) was awaiting the outcome. We have since heard that this application was highly regarded and came close to gaining funding but did not. Useful feedback from the AHRB was received and a new application would be submitted in due course. Applications for smaller sums for field-work support would be made to the British Institute of Archaeology at Ankara and other similar institutions.
3. For the publication of the Workshop contributions, a deadline for the submission of papers was agreed unanimously as 30 April 2004. The editor would be John Haldon, who undertook to send to all contributors a style guide and instructions for submission of manuscripts and disks in due course. Initial publication would be in electronic form, via the IAA webpages at Birmingham. Brill, at Leiden, have also offered a contract to publish the papers as the first in a series, in hard copy. The Birmingham group will discuss this in due course.
4. It was agreed that the logistics project should investigate the potential of modelling logistical behaviour at two levels:
 - a. Detailed modelling of landscapes where significant archaeological and historical survey had taken place and where there was an appropriate digital database. These studies would incorporate significant detail relating to production and settlement and provide terrain and route data that would permit detailed modelling of movement and consumption.

- b. General modelling of larger landscapes. Such models would incorporate relatively coarse landscape and environmental data and permit general assessments of the nature, value and significance of terrain through which armies might pass.
5. The first co-operative arrangement for a detailed study would be between the British School of Archaeology at Rome Tiber Valley Project and the Birmingham logistics group, where the aim will be to offer support in the historical interpretation of the Tiber valley materials, and the use of the latter by members of the Birmingham group in their establishment of a regionally-specific database for the analysis of logistics in a historical context. If applications for funding were successful, this might entail the secondment of a Birmingham-based project member to the BSR to work on the Tiber Valley material.
6. A second co-operative arrangement between the Vienna *Tabula Imperii Byzantini* Project and the Birmingham group was also discussed and while in the medium-term this might – depending upon funding – involve likewise the secondment of a team-member to Vienna, a decision on this would have to be delayed until (a) the outcome of the TIB project's applications for funding (after January 2004) and (b) the outcome of our applications for funding. Given the technical possibilities opened up by the digitisation of the TIB materials and the existing availability of computer-modelled landscapes for much of the area covered by the TIB, this seemed an extremely profitable way forward. Prof. Haldon and Dr Gaffney would visit Vienna in June 2004 to discuss further collaboration.
7. A third area for co-operation would be pursued between members of the Birmingham group and members of existing archaeological projects in Turkey (Konya Plain survey, Dr Doug Baird; Tauros survey, Dr Hugh Elton; Balboura survey, Lycia, Dr Jim Coulton; Project Paphlagonia, Dr Roger Matthews, Institute of Archaeology, among others). John Haldon will contact project leaders in due course. Colleagues were asked to let John Haldon know if there are other colleagues conducting similar operations in Turkey whom the project should contact.
8. The first general study by the logistics group would begin by establishing a digitally-mapped landscape for Asia Minor, including terrain, major routes and corridors, and including basic features of land-potential and related features relevant to resource availability. The majority of this data is currently available in digital format within Birmingham whilst some additional data would be captured for this purpose. The data would be processed to provide an applet-based tool for the investigation of the potential of land traversed by army groups along specified routes.

9. Whether or not the funding already noted materialises, the group agreed that a second workshop should be organised – provisionally to be held at Birmingham, although this can be changed according to circumstances and demand – in about 12-15 months' time, both to present different approaches and research in this area, and to bring our information and programme up-to-date.

10. In the meantime, and in view of the relatively favourable situation in respect of the medieval sources, the Birmingham group agreed to pursue a specific case-study, namely the Manzikert campaign of 1071; possibly with the support of Prof. J.-Cl. Cheynet (Paris) and Prof. R.-J. Lilie (Berlin), and possibly extending also to cover the campaign routes of the second crusade.

FINAL PROGRAMME

Exploratory Workshop

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Day 1

09.00	arrival and registration	
10.00-10.30	<i>Introduction and opening session Why model logistical systems?</i>	John Haldon (Birmingham)
10.30-10.45	<i>Introduction to ESF and Exploratory Workshops scheme by ESF representative</i>	Przemyslaw Urbanczyk (Warsaw)
10.45-11.25	<i>Computer modelling and logistics: Problems and possibilities</i>	Vince Gaffney (Birmingham)
11.25-12.15	Response and discussion Discussant: Lyn Hanson	
12.15-13.0	<i>Network Analysis and Logistics: Applied Topology</i>	Malcolm Wagstaff (Southampton)
13.00-13.30	Response and discussion Discussant: Doug Baird	
13.30-14.50	Lunch	
14.50-15.30	<i>The Tiber Valley project: archaeology, intensive survey and history</i>	Helen Patterson (BSA Rome)
15.30-16.10	Response and discussion Discussant: Hugh Elton	
16.10-16.30	Tea/coffee	
16.30-17.10	<i>Paleoenvironments and and archaeo- historical research</i>	Warren Eastwood (Birmingham)
17.00-17.50	Response and discussion Discussant: Archie Dunn	
19.30	Dinner (in Lucas House)	

Day 2

9.30-10.10	<i>Land-use and settlement: theoretical approaches</i>	Johannes Koder (Vienna)
10.10-10.50	Response and discussion Discussant: James Howard-Johnston	
10.50-11.30	<i>Predicting communication routes</i>	Gino Bellavia (Birmingham)
11.30-12.00	Response and discussion (+ tea/coffee) Discussant: Klaus Belke	
12.00-12.40	<i>Predicting land productivity</i>	Helen Goodchild (Birmingham)
12.40 – 13.10	Response and discussion Discussant: John Haldon	
13.10-14.20	Lunch	
14.20-15.00	<i>Remote Sensing: topographic change in historical times in the East Mediterranean</i>	Steve Wilkes (Birmingham)
15.00-15.40	Response and discussion Discussant: Helen Patterson	
15.40-16.20	<i>Land, environment and settlement in Roman, early Byzantine and Islamic central Syria (east of Hama)</i>	Pierre-Louis Gatier, Marie-Odile Rousset (MOM, Lyons)
16.20-17.00	Response and discussion Discussant: Jean-Michel Carrié	
17.00-17.40	<i>Superiority of Numbers: methodologies for modelling the behaviour of armies</i>	Helen Gaffney (Birmingham)
17.40-18.20	Response and discussion Discussant: John France	
20.00	Dinner (in restaurant: the coach will collect participants at Lucas House at 7.30 p.m.)	

Day 3

9.30-10.10	<i>Integrative technologies</i>	Ron Yorston (Reading)
10.20-11.20	Response and discussion Discussant: Vince Gaffney	
11.20-11.50	Tea/coffee	
11.50-13.30	<i>Summary of results, and planning session: towards a longer-term project</i>	John Haldon
13.30	Lunch	
14.30 on:	Departure	

Medieval logistics: Final list of participants

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Statistics on participants

Nationality:

UK	13
France	4
Germany	1
Austria	6
Greece	1
USA (invited observer)	1

There is a clear weighting towards UK participants, and the Workshop organisers clarified the reasons to the EU representative. The main grounds were the technical expertise at Birmingham necessary to inaugurate the project and to demonstrate the technical potential of remote-sensing systems and landscape-modelling. Subsequent project meetings will have more balanced EU structure since colleagues can now be made aware of the issues raised and can be invited to participate on a more international basis.

Age range:

20 – 30	1
30 – 40	3
40 – 50	11
50 – 60	9
60 – 70	2