

**The Seljuk Caravanserais of Anatolia:  
A GIScience and Landscape Archaeology Study**

**NELC Dissertation Proposal**

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## **Introduction**

The use in archaeology of geographical information systems (GIS) and other elements of GIScience has grown increasingly prominent over the last several decades.<sup>1</sup> A substantial portion of archaeological projects, in both the New World and Old World, now use GIS in both simplistic and complex applications to map sites, organize survey data, and as an analytic tool to study spatial relationships. Unfortunately, for the Islamic archaeologist, i.e. those archaeologists concerned with the historical period from roughly 600 to 1900 A.D. in the Middle East, implementation of these technologies has lagged considerably. This is due to a variety of reasons, from the historical development of the field to the general reluctance to use scientific modeling when studying an historical period where textual sources exist. This dissertation proposes to demonstrate that these GIScience methods and technologies can be of equal use for Islamic archaeology as for other archaeologies through a GIS-based study and analysis of the Seljuk caravanserais of Anatolia.

The Seljuk caravanserais, constructed in Anatolia in the late 12<sup>th</sup> and 13<sup>th</sup> centuries, are a near-ideal test case for the application of archaeological GIS. In the first place they form a dataset that is distinct both spatially and temporally, having known, identifiable locations and all being constructed in a 75 to 90 year period, the majority during a single 30 year span.<sup>2</sup> Consequently, this dissertation can avoid one of the major problems with regional landscape archaeology projects, namely the projection of speculative data as basis for analysis. Many regional investigations, particularly those involving locational analyses and settlement patterning, are forced to deal with

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<sup>1</sup> Wheatley and Gillings(2002); Conolly and Lake (2006).

<sup>2</sup> Yavuz (1997).

incomplete information regarding site location. Even those studies relying on extensive field surveys<sup>3</sup> miss many sites through issues of sampling or the simple fact that cultural material of the past has been destroyed and obscured by both environment and human activity. The Seljuk caravanserais, by way of contrast, are well documented and largely have all been located, though problems of definition and similar factors of destruction have muddled the issue somewhat.<sup>4</sup>

The temporal narrowness of the caravanserai phenomenon is also an asset. While landscape archaeology, and archaeology as a whole, is concerned with changes over time<sup>5</sup>, the narrow time frame of caravanserai construction allows this dissertation to capture a particular cultural phenomenon and study it apart from major socio-cultural shifts. An added bonus is that this analysis can avoid the pitfalls of trying to date regional material culture without an appropriate baseline as the caravanserais of Anatolia were all contemporaries of one another.

Moreover, the historical problem presented by these caravanserais and their relation to the Seljuk cultural landscape has yet to be significantly studied. Scott Redford, in his monograph on the Seljuk gardens of Alanya<sup>6</sup>, has show one way of investigating this material, but he is limited both by his narrow geographic focus and limited use of GIScience techniques. A regional landscape study of the Seljuk caravanserais will benefit from his work, but by working with new methods and in a new direction will be able to move beyond what he could say.

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<sup>3</sup> See, for example, Hritz's (2005) expansion of Adams (1965) wherein she identifies many sites missed in the initial survey. Banning (2002).

<sup>4</sup> Yavuz (1997); Bektaş (1999). See Cytryn-Silverman (2004) for a discussion of terminology issues.

<sup>5</sup> Wilkinson (2003).

<sup>6</sup> Redford (2000).

The main research focus of this dissertation will look at three major issues: the historical development of the caravanserai system, the role the caravaserais played in tying together the Seljuk cultural landscape, and the relationship of the caravanserais to their physical environment. GIS-based analysis is particularly suited to this as it can identify patterns in caravanserai location, model the regional travel the caravanserais supports, and provide an understanding of how caravanserai structures facilitated interaction with the cultural and physical environment of the period. By involving GIScience in this investigation it will be possible to branch out from previous textual and architectural studies and present a model for how historical archaeologies can study past cultures separate of historical and art historical methods.

### **Archaeological Problem**

This dissertation will examine a set of archaeological problems relating to the construction and use of the Seljuk caravanserai of Anatolia in the 12<sup>th</sup> and 13<sup>th</sup> centuries A.D. It should be mentioned immediately that this dissertation will be firmly focused in the discipline of archaeology and will not seek to address these questions about the past through the methods of an historian. Specifically it will be centered on a set of spatial studies using geographic and archaeological evidence to draw its conclusions. Certainly studies of the textual information or art historical evidence could shed light on many of these issues, however, they will not be the focus of this dissertation in the interests of narrowing the dissertation's focus as well the author's lack of qualifications in those fields.

The caravanserais of Anatolia were constructed starting in the late 12<sup>th</sup> century by the Seljuk court in Anatolia. Over a period of 75 to 90 years<sup>7</sup> over 200 of these buildings were constructed throughout the Anatolian landscape, centering in the southwest around the city of Konya, but stretching into the East as far as Lake Van and north to the Black Sea. These structures outline an extensive network of travel and trade which was developed during this period acting as the primary stopping points for travelers and caravans traversing the Anatolian countryside. The term for these structures, caravanserai, is used here to mirror the Turkish term *kervansaray*, which derives from their primary function of serving caravan traffic. However, the term *khan* or *han* is also used as well as the Arabic word *funduq*, which have more ambiguous meanings.<sup>8</sup>

While there have been several studies of the Seljuk caravanserais and other similar structures throughout the Near East the exact nature of these buildings has not been fully elucidated. Traditional analyses have concluded that they were constructed solely for the housing of travelers and most often these have concluded that the caravanserais were primarily charitable institutions. This dissertation will argue, and hopefully show through GIS analysis, that the network of caravanserais was far more than a network of way stations for travellers. In fact, these buildings were the nexus points for a variety of functions relating to the projection of state power into the rural spaces of the Anatolian countryside.

## **Methodological Problem**

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<sup>7</sup> Estimates vary.

<sup>8</sup> See Cytryn-Silverman (2004) for a fuller discussion of terminology.

In addition to addressing a particular set of historical and archaeological problems this dissertation will focus on a set of methodological concerns for historical archaeologies. In particular it will attempt to provide an example of how new technologies and techniques for studying spatial relationships and context, specifically elements of GIScience, can be used to address historical questions. It is hoped this will contribute in a small way to the ongoing dialogue between the fields of archaeology and history as to what role archaeological can and should play in studying periods and subject areas for which there are significant textual records.<sup>9</sup>

As an investigation of archaeological remains from a period with surviving textual history, this dissertation immediately must address a tension between the disciplines of archaeology and history. While a full discussion of this problem likely merits a dissertation of its own, this dissertation hopes to demonstrate the use of archaeology by applying distinctly archaeological methods to investigate the historical Seljuk caravanserais. Typically, studies of Seljuk monuments have relied heavily on examining inscriptions and analyzing historical documents. Many studies of caravanserais, for example, have been confined solely to translating an inscription and discussing its meaning. While relying on an examination of an historical artifact, namely the inscribed stones, these studies are not really archaeological as the artifact is not studied apart from the words written on it.

While attempting to define “archaeology” is another question too broad and complex to resolve here and is certainly not a focus of this dissertation, a major element of the discipline is using spatial relationships between artifacts and patterns of artifacts to draw larger conclusions about past cultures. This dissertation will expand on this by using

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<sup>9</sup> See Andren (1997) for a fuller discussion of this issue.

a set of methods from GIScience, an area of research particularly concerned with space and spatial patterns, to investigate the Seljuk caravanserais as artifacts and as a pattern of artifacts. In doing so it will avoid relying on inscriptions and textual histories, as many other studies have, and demonstrate how a strictly archaeological approach to this historical dataset can provide new and valuable insight.

Moreover, the use of a geographic information system (GIS) and quantitative and qualitative methods associated with it will allow this dissertation to synthesize a wide variety of data through the common medium of location. Diverse elements of geology (such as topography and hydrology) can be studied alongside the architectural features of caravanserais and the historical social fabric. It is hoped and expected that analysis examining transportation, location, and perception and incorporation of multiple data types will be much more informative than studies looking at just one element. Additionally, by providing a wider regional and contextual focus this dissertation will demonstrate what studying only single pieces misses.

### **Previous Research**

Previous research into the Seljuk caravanserais of Anatolia has primarily been done by art and architectural historians. This has resulted in a large body of scholarship, but one focused on describing the buildings themselves, independent of regional context. Prior work should not be dismissed on this basis, as it provides a very solid foundation for further studies, but it is clear from an initial study of the material that such foundational work has involved very little archaeology.

Some of the first Western scholarly investigations of the Seljuk caravanserais were conducted in the late 19<sup>th</sup> century. Frederick Sarre, perhaps best known for his work at Samarra, visited several caravanserais during a trip through Anatolia and described his observations in his 1896 publication *Reise in Kleinasien*. During his two month journey, Sarre described in detail the Seljuk architecture he encountered, but did not concentrate specifically on caravanserais, instead discussing a wide variety of monuments, palaces, tombs, and other prominent structures. Sarre did investigate a few caravanserais, however, reserving his most extensive discussion for Sultan Han, perhaps the most ornate and prominent of the caravanserais still largely preserved around Konya. Sarre's observations are firmly art historical, however. The chapter he devotes to Sultan Han describes inscriptions, decorations, and architectural forms, but provides little archaeological information. The plans he produced are useful for studying the building, but without discussion of phasing, artifact finds, or, most significantly the landscape surrounding the caravanserai, Sarre's work is of limited use to the archaeologist beyond the raw descriptive data it provides. Moreover, as a record of observation it fails from the outset to create an historical argument or cohesive presentation of Seljuk architecture united by some underlying principle.

Roughly 70 years would pass before a more structured and cohesive presentation of the Seljuk caravanserais would be written. Intervening scholarship was sparse, confined primarily to recoding inscriptions and describing architecture of individual caravanserais in isolation. In 1961, however, Kurt Erdmann, one time director of the Museum of Islamic Art in Berlin, wrote what was then, and still to a large degree is, the definitive work about the Seljuk caravanserais. He published, along with his wife Hanna,



an extensive two-volume gazetteer of the known caravanserais in Anatolia, *Das anatolische Karavansaray des 13. Jahrhunderts*. This publication based on extensive fieldwork, presented the first comprehensive, standardized set of data about these structures, as well as one of the first major attempts at developing a formal classification system to characterize their architecture. As with earlier work Erdmann's study is still written in an architectural history and art historical tradition. It focuses on presenting observations about the caravanserais' form and decorative elements. While still lacking any major synthesis of the caravanserais beyond his rudimentary classification system his work was the first to look at the Seljuk caravanserais as a united phenomenon, rather than as individual pieces of architecture.

Unfortunately, Erdmann's work was not followed up by more analytical and archaeological scholarship, particularly scholarship that discussed the caravanserais as a single pattern and phenomenon. Small excavations at individual caravanserais happened, though primarily as part of art historical restoration work. The occasional scholar would study an inscription, the *waqf* inscription from Alay Han receiving the most attention. Starting in the mid to late 1990s, however, archaeologists began to look more closely at the Seljuk caravanserais and small studies began to investigate them collectively. Most prominent of these is Aysel Yavuz, currently a professor of architecture at the Middle East Technical University in Ankara. In the 1990s she began a long-term project to expand and revise Erdmann's work and re-catalog the Seljuk caravanserais. At the same time she began publishing work, most notably a 1997 article in the journal *Muqarnas*, examining the whole phenomenon of the Seljuk caravanserais and attempting to understand the principles underlying their construction and use.

At the same time Cengiz Bektaş, an independent scholar interested in architecture and restoration, published a work in 1999 discussing the caravanserais and their spatial pattern in the landscape. While intended for a non-academic audience and primarily concerned with issues of building conservation and conversion for modern use, the book does provide a very simplistic model for how the caravanserais can be investigated collectively through their landscape and location.

At the same time similar structures outside of Turkey began to be investigated archaeologically.<sup>10</sup> Sauvaget's investigation of the Ayyubid and Mamluk caravanserais in Syria is a good, though limited, example, conforming largely to the art historical traditions that characterize early caravanserai studies. More importantly the Mamluk khans of Syria, a phenomenon very similar to Anatolia's caravanserais, were investigated in a highly-regarded dissertation by Katia Cytryn-Silverman in 2004. This dissertation provides a great deal of groundwork for the currently project's work with Seljuk caravanserais, discussing at length issues of terminology, patronage and finance, which are equally relevant to the development of a caravanserai network in Anatolia as they are to Syria. Cytryn-Silverman also discussed the physical architecture of the khans, identifying patterns in the various elements of each structure, such as water supply, masonry, and decoration, to name a few. Her archaeological analysis, however, focuses almost entirely on the buildings themselves and does not expand to examine their regional context and the overlying spatial pattern.

As can be seen, while much data has been collected and published about Seljuk caravanserais of Anatolia, and related phenomenon, there remain many avenues of investigation that have been so far unexplored. This dissertation will be able to draw on

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<sup>10</sup> Müller (1920). Sauvaget (1939). Siroux (1949; 1971).

the raw gazetteer information of Erdmann and other descriptions by scholars and travelers such as Sarre to augment and further develop an understanding of the caravanserais as put forth by scholars like Yavuz and Cytryn-Silverman. Having this framework to start from will allow this dissertation to fruitfully take research in new directions, rather than being overly concerned with primary data collection.

### **Process**

The core of this dissertation will be a three-phase GIS-based spatial analysis of the Seljuk caravanserais. This analysis will attempt to examine the caravanserais in their local and regional contexts. In particular it will attempt to identify patterns in caravanserai locations and relations to other features of the Seljuk period landscape, both natural and man-made. The goal will be a spatially broader understanding of the role these structures had in the landscape than that given by studies confined to the buildings themselves. The base data for this analysis will come from multiple sources, most notably from previous research and descriptions, remote sensing and other geospatial data, and on-the-ground field research. This last will be conducted in Turkey during the summers of 2010 and 2011. It will consist of a series of visits to Seljuk caravanserais, attempting to verify previous information about these structures and to record observations regarding their construction and the local landscape around them, for example the locations of hydrological features, other buildings, etc. A representative sample of the 200-plus caravanserais will be visited in order to reduce the amount of data to a manageable size. The method by which this sample will be selected will be determined during the initial

phase of research to create the most informative dataset possible that this also feasible, likely by selecting a single geographic region within Anatolia to study.

The first portion of GIS analysis, and the most data oriented, will be a location and landscape study of the caravanserais. This will involve the construction of an extensive geodatabase in a GIS<sup>11</sup> to collect and organize spatial information regarding the caravanserais and the overall landscape surrounding them. This information will then be analyzed using a variety of methods to discern spatial relationships between features and gain a better understanding of the caravanserais' spatial context. In addition to mapping the locations of the known caravanserais this geodatabase will incorporate information regarding other Seljuk settlement, i.e. urban centers and villages, environment and topography, information regarding earlier Byzantine settlement and road networks, and economic information, i.e. locations of resources, productions, and transportation hubs. Much of this information can be taken from previous investigations, but will be verified and augmented during fieldwork to create a fuller, more standardized dataset from which to work. Analysis of this information will be varied looking for patterns in distributions using nearest neighbor cluster analysis, mean distances, and other analytical tools. The results of this phase of analysis will form the core of Chapter 3.

The second phase of GIS analysis will be more tightly focused on GIS-based modeling. Drawing from recent investigations into ancient transportation, such as Scott Branting's (2004; In Press) at Kerkenes Dag, an extensive set of regional and local transportation networks will be examined in the GIS. Understanding both regional and local transportation will augment the first phase of analysis by further elucidating the role of these structures in the movement of people through the landscape, which was, after all,

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<sup>11</sup> Most likely the program ArcGIS by ESRI.

their primary purpose. Analysis of regional transportation will largely be conducted using least-cost path analysis to identify idealized patterns of movement between major Seljuk period centers. These models can then be compared to the actual travel network of caravanserais and the differences and similarities between them will inform our understanding of the caravanserais' function and use. More localized patterns of movement can be similarly modeled to better understand the interaction of the caravanserais with local features, such as buildings, observation points, and water sources. Data for this phase of analysis can be acquired through use of remote sensing imagery. ASTER and Corona stereopairs can be used to develop large-scale DEMs for use in modeling regional transportation, though smaller scale transportation will require more detailed elevation models, developed primarily from topographic maps.<sup>12</sup> Fairly detailed pedestrian models, including agent-based models, have been developed and used in other archaeological contexts<sup>13</sup> and can be used to augment the fairly simplistic tools contained in standard GIS software packages, particularly in modeling more localized transportation. The process and results of this analysis will form Chapter 4 of this dissertation.

Lastly, GIS software will be used to perform a rudimentary perception study. Drawing on some theoretical principles of phenomenology<sup>14</sup> and more technical examples of similar archaeological projects<sup>15</sup> this phase of analysis will examine how the Seljuk caravanserais were seen and perceived in their landscape. This will be done through the generation of viewsheds from and to these caravanserais as well as for other

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<sup>12</sup> Branting (In Press).

<sup>13</sup> Branting (2004).

<sup>14</sup> See Tilley (1994).

<sup>15</sup> See Exon et al. (2000).

major features in the landscape. This will help inform our understanding of the visibility and prominence of these structures as state monuments as well as their use and suitability as watchtowers and observation posts. Visibility of inscriptions and other expressions of state authority may also prove a useful avenue of investigation. Elevation models used in the second phase of this study as well as architectural plans and topographic information gathered from fieldwork will facilitate this study. Should this results of this phase of analysis prove insufficient to merit their own chapter, they will be discussed in Chapters 3 and 4, but otherwise will form the bulk of Chapter 5.

### **Chapter Outline**

This dissertation will be organized into six chapters. The initial chapter will be an extensive examination of previous research into the Seljuk caravanserai. It will cover larger works, such as Kurt Erdmann's gazetteer<sup>16</sup>, as well as smaller articles. The goal of this chapter will be to summarize current research and point out the areas where this dissertation can significantly contribute to historical and archaeological understand of the Seljuk caravanserais.

Chapter two will be a discussion of the methodology behind the GIS-based analyses conducted in Chapters 3 to 5. In particular this will discuss elements of GIScience and landscape archaeology as they apply to this study and to the investigation of historical archaeologies in general.

The third chapter be devoted to issues of location and locational analysis. It will incorporate the bulk of the results from fieldwork as well as the results of GIS analysis involving location patterns, e.g. clustering, density, etc. A large set of maps and

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<sup>16</sup> Erdmann 197?

photographs will accompany this section detailing information regarding the locations of the caravanserais under study as well as all relevant ancillary features.

The next chapter, Chapter 4, will focus on the transportation analysis. The results of the GIS transportation study will comprise most of this chapter. It will form the bulk of the more complex and detailed GIS analysis and therefore be more technically focused than other chapters. Pedestrian transportation will be the primary focus of this modeling, but animal-based transportation will also be investigated, if possible.

A fifth chapter is tentatively planned to incorporate elements of perception analysis not covered in Chapters 3 and 4. Depending on the feasibility of performing useful perception analysis it may or may not prove a fruitful avenue of investigation and, if not, will be omitted from the final dissertation.<sup>17</sup>

The final chapter will be a conclusion drawing together all the elements from the rest of the dissertation to make cohesive arguments about the nature of the Seljuk caravanserais. It will address both the archaeological problem as well as synthesize the useful elements of analysis in order to discuss the larger methodological issues in the field.

## **Significance**

The results of this GIS-based analysis will enhance our understanding of the Seljuk period landscape in Anatolia and the history of the region as a whole. Moreover, this dissertation will fill a gap in our knowledge about caravanserais. As mentioned, previous art historical and historical research into these structures and the circumstances of their construction has focused almost entirely on the caravanserais as buildings and

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<sup>17</sup> See Llobera (1996) for a fuller discussion of perception analysis.

monuments. By examining the regional pattern of the structures and the spatial context surrounding them this dissertation will lead to a fuller understanding of transportation in Anatolia as well as how the Seljuk state projected its power from urban centers into rural spaces. Current technologies and methodologies surrounding them have reached a point where such investigations should prove fruitful and this dissertation will demonstrate this by its example.

This example will present a successful method of applying to GIScience techniques to a set of historical archaeological problems. While archaeologists, particularly in the New World, have embraced the use of GIS and related technologies, those scholars investigating historical periods have largely ignored what they have to offer. In particular it is hoped that this dissertation will show how these techniques are particularly archaeological in their emphasis on context and patterns and more broadly reaffirm the usefulness of archaeological investigation of the Islamic periods in the Near East, even where textual sources are present.



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