

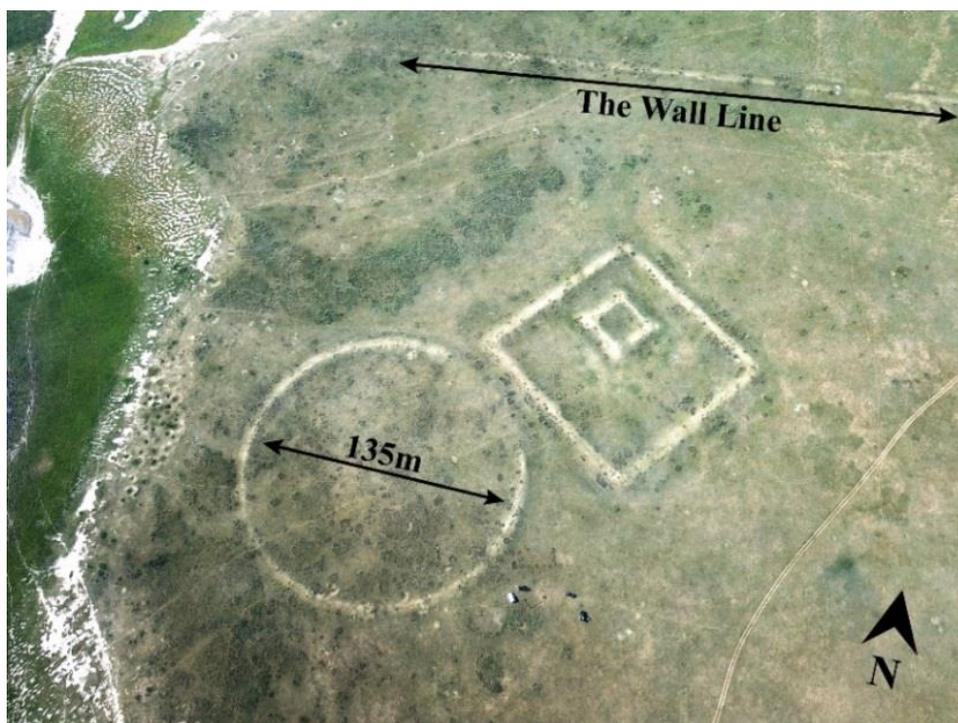
ERC Advanced Grant 2019

## *The Wall: People and Ecology in Medieval Mongolia and China*

### Summary

Why did some (but not all) Chinese dynasties invest huge amounts of resources in the construction of 'Great Walls'? The proposed project will focus on precisely that question, in an attempt to unravel what is, perhaps, the most enigmatic episode of 'Great Wall' construction. Roughly dated to the 10th-13th centuries CE and located far to the north of other 'Great Wall' lines, this Medieval Wall System (MWS) is one of the longest walls ever constructed in world history, stretching over more than 3,500 km and including large auxiliary structures (Fig. 1). The amount of resources invested in this MWS must have been enormous, but historical sources are mute about its construction, and modern scholarship is unable to date it precisely or understand why it was built and how it functioned.

The motives behind the construction of the MWS, its political context and ecological implications, are highly relevant for the understanding of the complex history of China and Mongolia on the eve of Chinggis Khan's rise to power. However, because in the past scholars have assumed that 'Great Walls' were fortified border lines designed to stop military incursions, such issues' impetus and consequences were never addressed. Hence, the proposed project will put forward novel



hypotheses, analyse them by using advanced recovery and analytical methods, and examine them against a broad archaeological, historical, environmental, and geographical background. The research hypothesis of the proposed project is that the MWS was not built as a defence against invading armies, but rather as a means to monitor and sometimes stop the movement of nomadic people and their herds. The large-scale movements of

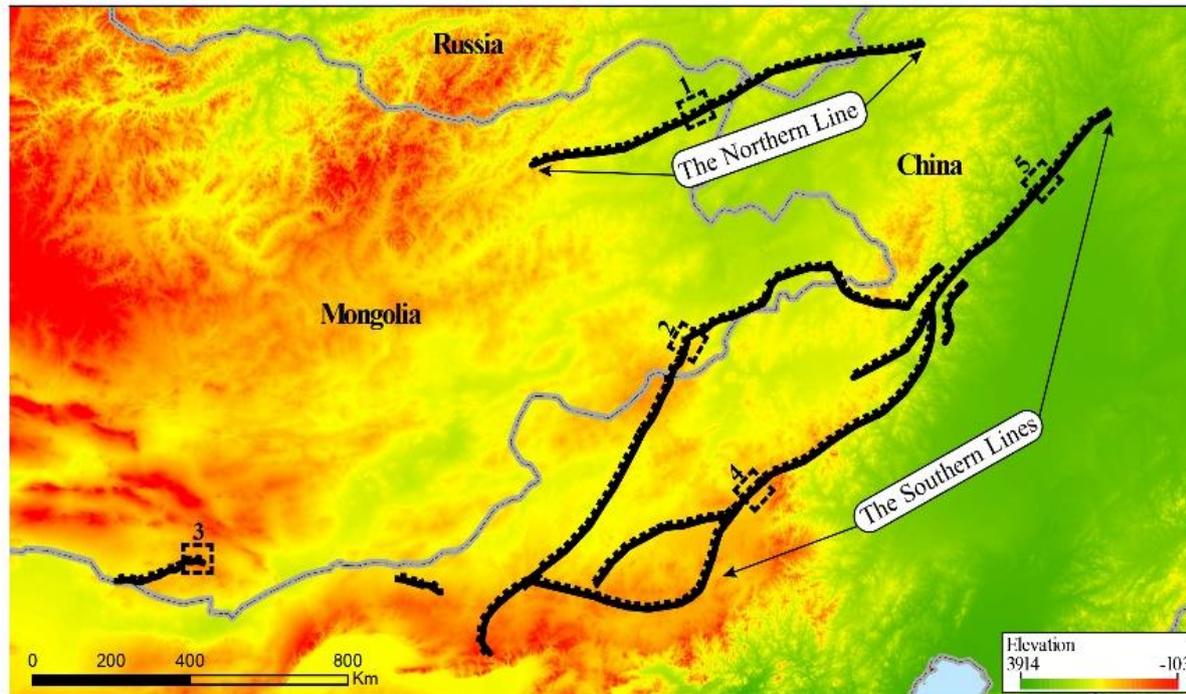
nomadic people towards more central areas of the empire happened, I would suggest, in times of ecological stress in the Steppe.

*Fig. 1: The wall line in northeast Mongolia and a cluster of rectangular and circular structures south of it (a drone photo taken during my preliminary expedition).*

## ERC Advanced Grant 2019 - Part B2

**Objectives**

Why did some (but not all) Chinese dynasties invest huge amounts of resources in the construction of ‘Great Walls’? The proposed project will focus on precisely that question, in an attempt to unravel what is, perhaps, the most enigmatic episode of ‘Great Wall’ construction. This wall system is located in North China and Mongolia and covers a distance of over 3,500 km (Jing and Miao 2008: 22). However, if one takes into account the different parallel lines, their accumulated length is probably closer to 6,500 km (Ping 2008:101), making it one of the longest walls ever constructed in world history (Fig. 1).



*Fig. 1: A map of major lines of the MWS. Numbered squares represent the areas designated for archaeological expeditions.*

Notwithstanding its huge size and the vast resources, material and human, that must have been invested in its construction, it is unclear who built it and for what purpose(s). The construction of this complex system, which includes long earthen walls and accompanying ditches, auxiliary structures (camps, beacon towers, etc.) (Fig. 2) and roads, is dated roughly to the 10th to 13th centuries CE, but its construction is not described in any of the relevant historical chronicles. Moreover, very little historical and archaeological research has been done on it. This Medieval Wall System (MWS) is enigmatic not only because its history is obscure, but also because it is located deep in the Steppe area, hundreds of kilometres north and west of earlier and later lines of the so-called ‘Great Wall of China’.

The proposed project shall address some of the fundamental questions regarding the MWS: When was it built and for how long was it in use? Who built it? For what purposes? What was the structure of the MWS (including the associated features) and how did it function? What amount of human labour and other resources were necessary in order to build it? On a more fundamental level, this project will attempt to answer the more basic question: What was the logic behind the construction of such long and enormously expensive linear barriers (‘Great Walls’) by several Chinese dynasties (and other polities in the pre-modern world)? What were the political preconditions for such monumental works? How, if at all, did wall construction relate to climatic changes and ecological conditions? These issues were not addressed properly in the past, first and foremost because scholars have assumed that ‘Great Walls’ were fortified border lines designed to stop military incursions. The proposed research will suggest novel hypotheses, never previously considered, and examine them using advanced recovery and analytical methods, integrating archaeological, historical, environmental, and geographical data.

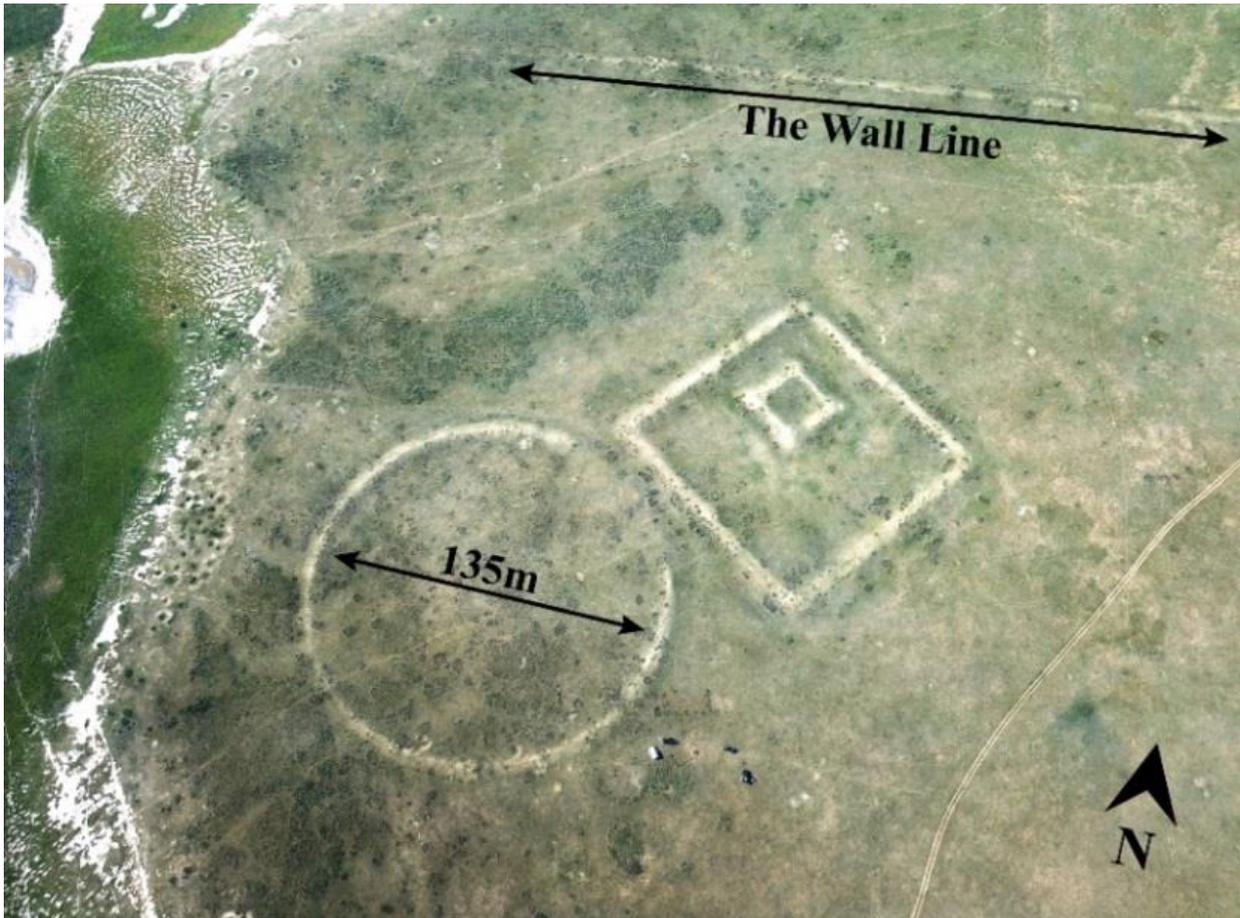


Fig. 2: The wall line in northeast Mongolia and a cluster of rectangular and circular structures south of it (a drone photo taken during my preliminary expedition)

### Research Hypothesis and Expected Breakthroughs

The construction of long-walls is not a Chinese phenomenon, as they are also known from other ancient civilizations throughout the Old World. Notable examples are the Roman *limes* (Braun 1984; Breeze & Dobson 2000; Woolliscroft 2001) and the Sasanian Gorgān and Tammīsheh walls (Nokandeh et al. 2006; Sauer et al. 2013). However, the most extensive examples in time, space and amount of labour invested in their construction, are the walls built by Chinese empires (Jing 2006; Waldron 1990). The so-called ‘Great Wall of China’ is, in fact, a series of walls constructed by different dynasties at different times. Each of those walls extends over hundreds, sometimes even thousands, of kilometres and is accompanied by auxiliary structures (camps, beacon towers, etc.) and roads. Estimates of the amount of work required to build these walls vary, but it was suggested, for example, that it took a working force of at least 300,000 men five years to construct the earliest, and by no means the most extensive, Chinese wall system (Shelach-Lavi 2014). While Chinese dynasties constructed the most extensive wall-systems the world has ever seen, many dynasties in China did not construct long-walls. Apart from the construction of several different walls by pre-dynastic states of the Warring States period (481-221 BCE), long-walls were constructed during four main episodes over the last two millennia (Jing 2006; Pines 2019; Waldron 1990): the Qin and Western Han dynasties (the 3rd to 1st centuries BCE); the Northern Wei and Northern Qi dynasties (5th and 6th centuries CE); the Liao-Jin dynasties (11th or 12th and 13th centuries); and the Ming dynasty (15th and 16th centuries).

A traditional view describes the ‘Great Wall’ as a symbolic and real demarcation of a cultural-ecological line that separates two distinct ways of life: the pastoral-nomadism of the Steppe and desert areas, on the one hand, and sedentary agricultural societies, on the other. Consequently, modern scholarship identifies the walls as a fortified border intended to stop nomadic armies from invading China (Bodde 1986; Jagchid and Van-Jay 1989; Jing 2006; Su 2014; Waldron 1990). This paradigm of Chinese long-walls (including the

MWS) as military installations has never been challenged, although disagreement regarding the motivation for ‘Great Wall’ construction exists between scholars who see them as defensive structures against the aggression of nomadic tribes (e.g. Barfield 1989) and those who argue that ‘Great Walls’ were part of the Chinese imperial expansion and conquest of lands previously inhabited by nomads (Di Cosmo 2002). And yet, a superficial examination of the MWS suggests that it is at odds with many of the fundamental assumptions of the accepted paradigm. For example, the MWS is located deep in the Steppe zone (and, in a few of its southern parts, inside the desert area), and does not demarcate any cultural-ecological border. Moreover, although we do not know who constructed this wall, the two main candidates are the Liao and the Jin dynasties, both of which were founded by nomadic or semi-nomadic peoples, and subsequently their concept of empire had more to do with control over people, many of them nomads, rather than forming clearly defined land borders (Standen 2007). In addition, a preliminary analysis based on pilot field work and GIS analysis suggests that the location and structure of the wall and the auxiliary structures associated with it are not compatible with what we might expect from a military installation that was meant to defend the border against invading armies (Shelach-Lavi et al. forthcoming).

Based on this preliminary information, the research hypothesis of the proposed project is that the MWS, and probably many of the other episodes of ‘Great Wall’ construction in Chinese history, were built to monitor and sometimes stop movements of *people* rather than armies. It is highly plausible that the walls were built during periods of large-scale movements of nomadic people towards more central areas of the empire. An additional hypothesis, as to why such control was needed, suggests that extreme climatic anomalies, especially concentrations of cold spells and droughts, must have affected the fragile ecology of the Steppe. The devastating effects of these climatic phenomena, known as *dzud* in Mongolian, on communities of nomadic pastoralists, are well documented in historical and modern periods. For example, between 2000-2002, and again in the winter of 2009-2010, intense cold conditions caused the death of 20% to 40% of all livestock, causing mass migration of herders to the Mongolian capital, Ulaanbaatar (Rao 2015; Sternberg 2016). Whereas sporadic and local occurrences of such events are common, a concentration of extreme events over a period of ten to twenty years must have an acute socio-economic impact. The 10th-14th centuries were a period of climatic instability, known as the *Medieval Climate Anomaly* (Stocker et al. 2013). Although this global phenomenon did not have the same effect on the local ecologies of different places throughout Eurasia, recent research has started to flesh out the ways in which it catalysed economic crisis, socio-political unrest, and large-scale migration in the Mediterranean and West Asia (Ellenblum 2012), as well as in East Asia (Li et al. 2019).

If these hypotheses (or some of them) are confirmed for the MWS, it will change our understanding of the complex history of the region during the centuries prior to Chinggis Khan’s rise to power. These hypotheses may not account for all the episodes of ‘Great Wall’ construction in China. For example, the wall constructed by the Ming dynasty is much more massive than that of earlier periods. Although it was not successful in defending the Ming, there are historic accounts of it being a formidable military obstacle (Fan 2015; Hucker 1998). However, the model developed by this research can serve to explain some of the other episodes of ‘Great Wall’ construction in Chinese history and change our perception of the conditions that triggered wall-building in China, the purposes for which these walls were built, and their function. Understanding the background and reasons for wall construction will thus contribute to a better understanding of the decision- and policy-making of Chinese dynasties, and of the dynastic system more generally. Such insights could be applicable to the analysis of long-walls of other civilizations. For example, the famous Hadrian’s Wall, which is seen by many as the fortified border line *par excellence*, has a gate every Roman mile (1,479 m). It is suggested that creating so many openings in the wall was intended to enable, but also to supervise, the civilian movement of traders and, perhaps, transhumance (Woolliscroft 2001: 58; and see also Isaac 1988 for a general considerations of the Roman *limes*).

### Historical Background

The period between the 10th and the 13th centuries was a dynamic period in the history of Inner and East Asia. It marks the heyday of nomadic power in Eurasia which affected both nomadic and sedentary populations in China, Mongolia and in surrounding regions (Di Cosmo 1999). Since the early 10th century there had been no unifying state either in China, after the collapse of the Tang dynasty (618-906); the Mongolian Steppes, since the fall of the Uighur empire in 840; or the Muslim world, where the Abbasid Caliphate increasingly lost territories and authority to local dynasties from the 9th century onward. Nomadic polities were established on the eastern Steppe by the Liao (Khitan) (907-1125) and the Jin (Jurchen) (1115-1234) dynasties, which gradually pushed the Chinese dynasties—the Northern Song (960-

1127) and Southern Song (1127-1279)—southwards (Franke 1994; Twitchett and Tietze 1994). In northwest China, the Tangut people established the Western Xia dynasty (982-1227), while Turkic dynasties like the Qarakhanids (ca. 950-1231) and the Seljuks were established in central and western Asia (Dunnell 1996; Ellenblum 2012). In the 12th century, following the rapid rise of the Jin, Liao fugitives established the Western Liao or Qara Khitai dynasty (1124-1218) in Inner Asia, combining Chinese, nomadic and Muslim elements (Biran 2005). The process of nomadic conquest culminated in the early 13th century with the rise of Chinggis Khan to power and the establishment of the Mongol empire, the largest contiguous empire the world has ever seen. The united Mongol empire, however, lasted for less than 60 years (1206-60); a century later, its four successor states faced severe crises which led to the collapse of the Mongol states in China and Iran and to the weakening of the khanates in Inner Asia and Russia (Biran 2007; Fitzhugh et al. 2013; Golden 2011).

The two dynasties most often associated with the construction of the MWS are the Liao (907-1125) and the Jin (1115-1234) (Fig. 3), both of which were established by nomadic or semi-nomadic peoples. They controlled both nomadic and sedentary populations and their administration combined Chinese and nomadic elements. It is precisely in this context that the MWS acquires its unique historical importance. Rather than examine it through the lens of a Chinese-nomadic dichotomy, the proposed project shall focus its attention on the vibrant political and economic interactions among varied societies in this vast region: sedentary agriculturalists, semi-nomads, and nomads, and the internal dynamics of each of these groups.

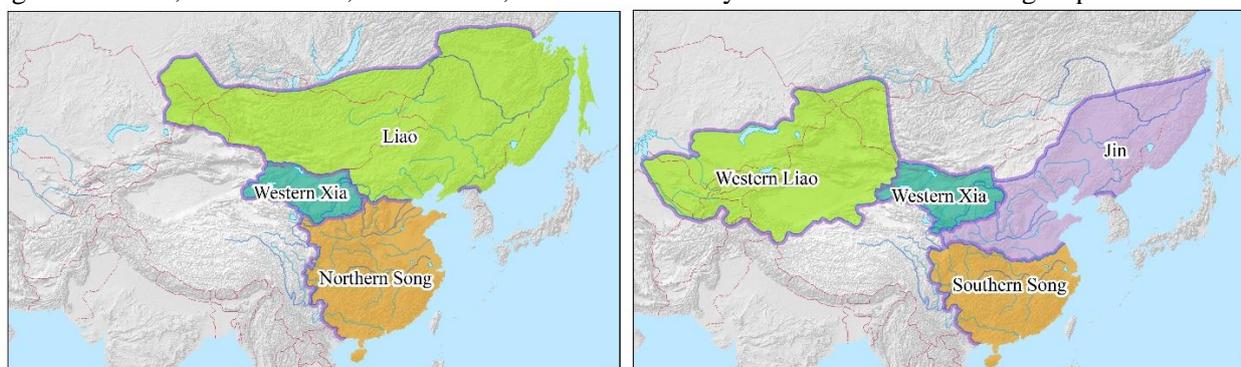


Fig. 3: Maps of East Asia and Mongolia during the 11th century (left) and the 12th century (right).

### State-of-the-art: Archaeological and Historical Research on the Medieval Wall System

Given its huge size and the large amount of work and resources that must have been invested in its construction, it is quite surprising that no concrete mention of the MWS was made in the relatively extensive extant historical records of either the Liao or the Jin dynasties, or in any other contemporaneous Chinese records. Given the fact that the wall is composed of two main lines and many sublimes (Fig. 1), it is not impossible that different parts were built during different periods, by different dynasties and for different purposes. Perhaps it is for this reason that the MWS is rarely mentioned in general works on the Great Wall of China. For example, in his famous book *The Great Wall of China: From History to Myth*, Arthur Waldron (1990) never mentions a medieval wall-building episode. Even in the authoritative work on this period in English, volume 6 of the *Cambridge History of China*, only one short paragraph is devoted to a schematic description of the wall (Franke 1994: 250).

Research on the History of the MWS: The MWS did not, however, go unnoticed by traditional Chinese scholars during the late Imperial era (Sun 2010). The eminent Chinese historian Wang Guowei (王國維 1877-1927) was the first to propose that it was built within a short period of time by the Jin dynasty, in its attempt to stop the invasion of Chinggis Khan's Mongol armies (Wang 1921). While many scholars continue to adhere to the historical explanation suggested by Wang Guowei, other opinions have been expressed since then. Lattimore (1963: 5) attributed the construction of the MWS to the beginning of the Jin dynasty and associated it with a change of policy—from an active involvement in the Mongolian Steppe by the Liao to a retreat eastwards and a defensive policy adopted by the Jin. More recently, most Chinese historians and archaeologists are convinced that the MWS was built in several episodes throughout the Jin era (Chang 2013; Jing 2006; Li 2008; Sun 2010). Others suggest that the MWS, or sections of it, were actually built during the Liao period (Chen 2017; Ma 2013; Lunkov et al. 2011). Still others argue that at least the southwestern part of the wall were, in fact, built and maintained by the Western Xia (西夏 982-1227) dynasty (Kovalev and Erdenebaatar 2010).

The uncertainty about who constructed and used the MWS and for what purposes reflects the inconclusive nature of the relevant historic documents. However, this does not negate the fact that these documents contain important information that, if systematically collected and analysed, can contribute (together with other types of data) to a better understanding of the MWS. For example, no less than ten different terms found in the official history of the Jin (*Jinshi* 金史) are identified by scholars with a border wall or fortification system (e.g. Sun 2010). However, it is not clear to what those classical Chinese terms actually refer. Similar issues pertain to information found in the Liao official history (*Liaoshi* 遼史). In a recent study, Ma Yanming collected a number of references that appear in the *Liaoshi* and argued that they refer to the construction of the MWS (Ma 2013). It is unclear, however, whether those terms refer to the construction of linear border walls, city walls or even to unfortified cities. While none of those references describe the construction of the MWS and many may not be related to this monument at all, through the systematic collection of all relevant information of this kind, and its analysis in the framework of a database that records the date of each entry, the geographic location to which it refers, its context, etc., we can focus on those references that are relevant to our understanding of the way the MWS functioned. More pertinent, perhaps, in this context, is evidence for the frontier policy of the Liao, the Jin and the Western Xia. For example, the *Liaoshi* and *Jinshi* contain many references to interactions with different tribes on the frontiers, the changing policy regarding trade with those people, restrictions on artefacts and materials that could be given to them, and to specific incidents that occurred in those regions. For example, the *Liaoshi* mentions prohibitions on the export of iron materials and implements to the Huihu (回鶻) and Zubu (阻卜) tribes that were intended to be enforced on the frontiers of the Liao Empire (Wittfogel and Feng 1949: 178, and see many more examples discussed therein). A recent study of a Western Xia document, found in an archaeological context, also contains important evidence about the Tanguts' frontier policy (Kovalev and Erdenebaatar, 2010), which is also attested in the surviving Western Xia legal code. By themselves such data do not explain the existence of the MWS or the way it functioned, but once assembled and then integrated with the archaeological and climatic data, they can highlight many important issues about the aim and functioning of the MWS.

Archaeology of the MWS: Although in many places remains of the MWS are visible above ground and have been reported by travellers since the 18th century (Jing 1982; Müller 1937), little archaeological work has been conducted on the various MWS lines and no concrete archaeological evidence related to the exact dating of their construction and use has been unearthed. In China, where a large part of the MWS lines are located, archaeological work comprises mainly reconnaissance surveys along known wall lines (Sun 2010; Sun and Wang 2008). In a few locations, targeted survey work documented the dimensions of surviving remains and traced the visible lines of the walls and of some auxiliary structures (Jing 2006; Jing and Miao 2008; Xiang 2008), but, to date, few excavations of the wall itself or the features associated with it have been conducted. The work done by Chinese archaeologists on the northern line of the wall has been even more sporadic. The most detailed research on this section of the wall by Chinese scholars uses satellite images to document the line of the wall and the structures that accompanied it (Ma 2013), but a preliminary study that my colleagues and I conducted, using better imagery and more systematic methods, demonstrated that it is possible to add many more structures to those identified by Ma (Shelach-Lavi et al. forthcoming).

Soviet archaeologists and explorers studied parts of the MWS located in Russian territory and in Mongolia from the 1920s. In the 1950s, based on pottery collected on the surface of a circular structure located south of the wall-line, Kiselev dated it to the 11th-12th centuries CE (Kiselev 1958). More recent work includes the Soviet-Mongolian expedition of the late 1980s, which excavated sections of the wall in northeast Mongolia (Chichagov et al. 1995). At the same time, the Russian archaeologists Kirillov and Kovychev (2002) mapped and conducted test excavations at sections of the wall and forts located in Russian territory. To date, the most extensive analysis of this Russian section, based on the synthesis of earlier field work and information collected from satellite imagery was published by Lunkov and his colleagues (Lunkov et al. 2011). Even less work has been done on the sections of the wall located in the southern Gobi Desert. Kovalev and Erdenebaatar (2010) conducted a preliminary reconnaissance in this region but no extensive survey or excavation is reported. A single attempt to describe all the parts of the MWS located inside the present borders of Mongolia is currently available (Baasan 2006), but its data are incomplete at best and contain no clear evidence about the dating of the MWS, its structure and functioning.

Clearly, archaeological explorations have barely scratched the surface hereto and most of the analysis of the MWS is yet to be done. So far, archaeological research has been able to trace many (but not all) of the MWS lines and to identify some of the main features of this monument. However, the survey work was not conducted systematically, and the analysis of its results is mostly descriptive. Very few archaeological

excavations of the wall and its associated features have been carried out and none was extensively published. As a result, many of the more basic facts about the wall, such as the dating of its construction and use, its original shape, the function of the different structures that accompany it, and the variability that existed within what we call the MWS, are not yet fully documented and understood. Moreover, to date there is no comprehensive study of the entire MWS or an analysis of it as an integrated system (or as several independent systems).

### **Research Strategy and Testing the Research Hypotheses**

My research strategy emphasises the collection of specific data that are relevant to the research questions adduced above, and their integration into a broader multidimensional understanding of the MWS in its historical, geographical, and ecological contexts. At the core of this project, and potentially its greatest breakthrough, is the juxtaposition of two competing hypotheses—the traditional view of the MWS as a military installation to defend against invading armies, versus my hypothesis that the wall was built to monitor, and perhaps stop, the movements of people and their herds.

To uphold the militaristic model, the MWS's date of construction and its use should correspond to a period preceding a military conflict between armies from both sides of the walls. It is possible that such a conflict was eventually averted, but we would expect its date (based on new evidence) to correspond to a period when a clear threat of conflict existed. Structural analysis of the MWS is another important element of verification. On the micro level, we need to ascertain that the structure of the MWS, as reconstructed on the basis of our excavations, was such that it would indeed form a real obstacle for mounted armies. Gates and openings in the wall should be fortified and easily blocked. Findings from the area of the wall and inside structures located near it, such as weapons and army insignia, can support this hypothesis. Identifying the source of artefacts found in the excavations is another factor to be considered—my hypothesis is that if the auxiliary structures south of the MWS line were military camps that housed soldiers that were sent to the frontiers, then most of the ceramic and metal artefacts found in the excavations will be traceable, using petrographic and chemical analysis, to central areas of the empire. On the macro level, we would like to know if the entire system was designed according to military logic: Were the forts and watch towers located in such a way that their lines of view cover the entire length of the wall, with overlap between adjacent forts? Were the forts placed at strategic points, from which the defending armies could operate effectively? Moreover, since the effectiveness of even the most formidable fortification is dependent on the soldiers that man it, the camps, located near the wall line and further away from it, should house enough forces to maintain the wall, and should be organised such that those forces could be mobilised rapidly to engage invading armies. Communication between units and different levels of the system in order to warn of coming attacks, to call for reinforcements, and to concentrate fighting units, is another telling aspect of a military defence system. Such communication—in the pre-modern era, visual signalling—can be inferred from the geographical location and visibility between the main and the secondary forts (Woolliscroft 2001). We will address issues of sight and communication using Geographic Information Science (GIS) tools such as viewshed and least cost path analyses and other relevant methods.

Alternatively, to uphold the 'movement of people' model, the construction date of the MWS should correspond to a period of social instability, characterised by stress among the nomadic population on the frontiers of the established dynasty. Reports of extreme cold spells in the Steppe zones and correlations with scientific evidence of climatic anomalies can strengthen this scenario. On the micro level of our archaeological analysis, it is expected that the size and shape of the walls and ditches would be more suited to demarcating the landscape and hindering the movement of people and herds. Thus its size should be more modest and the walls and ditches not very steep. Because the emphasis is on the movement of people, we would expect to find many more gates (and less fortified ones) in the walls. Understanding the functions of the auxiliary structures may provide important supporting evidence. Artefacts may indicate the interaction between the state and the nomadic population, supposedly in the form of commerce and taxation (Wright 2015). Our multi-proxy geo-archaeological investigation will provide evidence, currently unavailable, on the type and number of animals kept in some of those structures and the activity taking place there. In particular, if we can prove that the huge circular structures, some of them more than 10,100 m<sup>2</sup> in size (Fig. 2), served as animal corrals and that most of the animals kept in them were sheep/goats and not horses, then a civilian function, including taxation of the nomadic population, is more likely than a military function associated with horses. On the macro level, controlling the movement of people required lesser amounts of manpower. The location of the wall itself, as well as the auxiliary structures, is expected to be associated with access to resources of daily life and less constrained by military considerations and strategy, such as viewshed and

defence. Whereas, in the Steppe, attacking armies can operate almost anywhere, the movement of people and herds is guided by considerations of energy expenditure and the availability of water. Routes determined by those principles are sometime archaeologically visible (e.g. Burentogtokh 2017: 185-186), and may also be identified using satellite imagery, air photography and GIS tools. The expectation is that the system should be geared towards those natural routes of movement. Camps and lookouts should be located on or near them and the wall should be built where control over those routes is the easiest.

### Research Methodology

Archaeological fieldwork (itself multidisciplinary) and the analysis of the data obtained in the field are at the heart of the research. Supplementing this is the historical data that our team will collect and analyse and the climate-driven data from our field research and from existing reports. The second phase of the research includes the integration of the three Work Packages (WP) and comparing the results regarding the MWS to other episodes of wall-building in Chinese history and, by extension, to wall-building episodes in other parts of the world.

**WP I: Archaeological Field Research, Data Acquisition and Data Analysis.** A virtual survey of all the wall lines, using satellite imagery and remote sensing methods, will be the first stage of the work. A pilot experiment with this method on the northern line of the MWS demonstrated that using the most up-to-date high resolution imagery and working in a systematic fashion can provide not only an accurate mapping of all the wall lines but also gather detailed information, not available before, on different structures and features that are associated with the walls (Shelach-Lavi et. al., forthcoming) (Fig. 4).

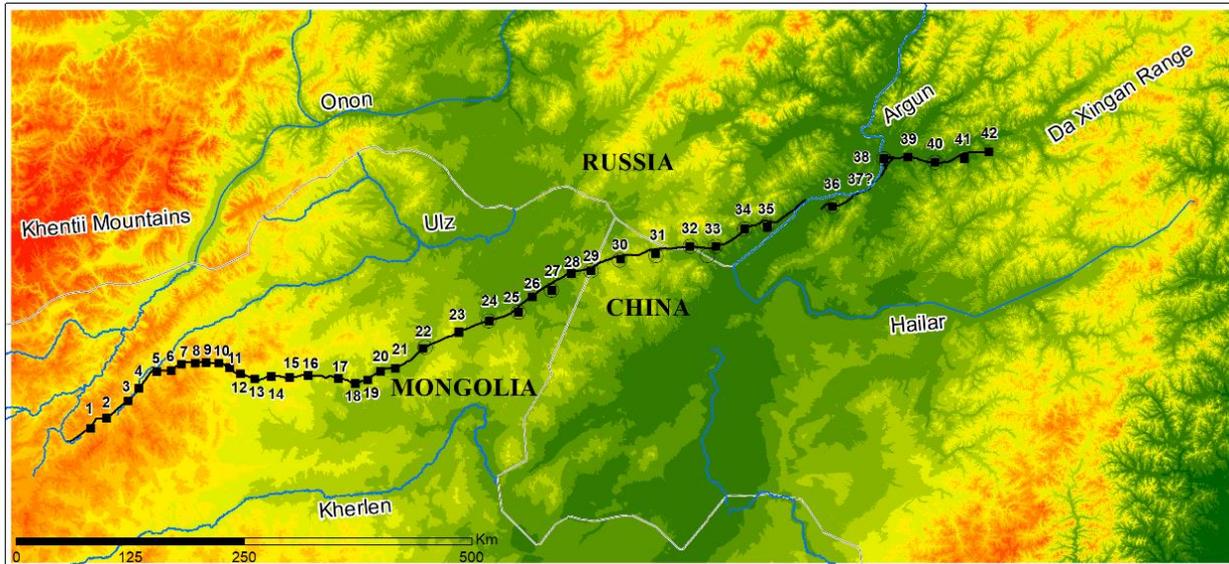


Fig. 4: A map of the Northern Wall line of the MWS and the location of associated clusters of structures.

The data collected through this work will provide, for the first time, an accurate and comprehensive map of the MWS and is crucial, not only for planning our field research, but also for advanced analysis. Through GIS analysis that integrates accurate mapping of the different wall lines and the location of associated structures with layers of geological, environmental, geographical and other types of information, we will address the geographical and environmental parameters that guided the design of the MWS. A more nuanced understanding that goes beyond schematic divisions such as ‘steppe’, ‘desert’ and ‘agricultural’ zones is vital for such an analysis. For example, systematic attention will be paid to different ecological zones within the Steppe. The division between two such ecologic niches within the Steppe seems to coincide with the line of the ‘Northern Wall’ (Dixon et al 2014), but more systematic research needs to be done to integrate such observations within an explanatory model. This analysis, as well as the analysis of the relations of different components of the wall-system, such as the distance between the wall line and different auxiliary structures, the distances between the auxiliary structures themselves, the relations between these and environmental factors (water sources, route lines), is also the first step in understanding the intended functioning of the MWS. This data, when integrated with the results of our test excavations, will also be used to estimate the amount of work needed to undertake such large-scale projects. As I have demonstrated in my research on earlier walls (linear walls and city-walls) in China, once we know the dimension of the walls and associated

structures and the techniques used to construct them, it is possible to generate a relatively accurate estimation of the amount of labour invested in their construction (Shelach-Lavi 2014; Shelach et al. 2011). Such estimates are a crucial component in our understanding of the policy- and decision-making of the dynasties which built those walls.

The archaeological field work will be conducted in five different locales. Those locales were selected to represent different segments of the MWS, which some have argued were built at different times and by different dynasties, as well as different types of environments in which the MWS was constructed. This spread, rather than conducting more extensive work at one locality, will enable us to address the time of construction and use of the wall-system, and whether it was one planned project or rather several different projects realised by different dynasties; how the system is modified according to different geographical needs and different purposes; and how homogenous the system and its different components are. It will also enable us to collect samples for different analyses that reflect the entire region of the MWS and not just one randomly selected spot. The five locales selected for this work are (Fig. 1): 1. Northeast Mongolia, Dornod Province. Here a pilot project around a section of the Northern Line has already been started. This locality represents a Steppe environment and previous research strongly suggested that it was built by the Liao dynasty; 2. Eastern Mongolia, Suhbaatar Province. This locality represents a Steppe-desert transitional zone. It will be centered on a segment of what is defined as the ‘outer’ section of the southern line. Much of the previous research associated this part with the Jin dynasty; 3. Southern Mongolia, Omnogovi Province. This locality represents a desert zone and the line here was recently attributed to the Western Xia dynasty (Kovalev and Erdenebaatar 2010); 4. Chifeng region, Inner Mongolia, China, focusing on a section of the ‘inner’ part of the southern wall-line, near Dalainuoer (达来诺尔) lake. This region represents a Steppe to semi-arid transition zone typical of the southern parts of the MWS. Recent paleoclimatic research done in this region (Goldsmith et al. 2017) provides excellent environmental data for our work. This area is associated in the literature with the wall of Jin (Xiang 2008) but is also known for fortified cities that are sometimes dated to the Liao (Lin 2009); 5. Heilongjiang Province, China, focusing on a section of the north-eastern-most part of the southern line, north and west of Qiqihaer city (齐齐哈尔). This locality, which is relatively well documented, represents a Steppe-forest transition zone. This is also the section most strongly associated in the literature with the Jin dynasty (Heilongjiang 2008).

The purpose of the archaeological field work is not to excavate large areas or expose entire structures but rather, through targeted small-scale test excavations, to collect the types of data through which it is possible to address our research questions. In each of the five locales we will follow the same research protocol, designed to address the basic research questions: When was the wall system built and for how long was it used? By whom it was built? For what purposes? What was the structure of the MWS (including the associated features)? And with what expenditure of human labour and other resources was it built? In each locale we will start the field work with intensive systematic full-coverage survey of a designated area (ca. 10 km<sup>2</sup>) that includes a section of the wall and associated features. As demonstrated during our pilot project in Dornod Province (Shelach-Lavi et al. forthcoming), through such work we can identify features of the system which are not visible even on high-resolution satellite imagery, and through the collection and detailed mapping of ceramic concentrations, it provides a dating baseline for the time and intensity of occupation. The results of our pilot project demonstrate that under good visibility conditions in the targeted localities selected for field research and using drone technology, it is possible to document the wall and associated structures accurately (Fig. 2). Learning from this experience, we will use the most advanced technology currently available that combines drone photography and RTK measurements to document all the visible features and to create 3D models of them and their environment using photogrammetry. This data will be used to analyse the function of each structure and to calculate the work invested in its construction. The same technology, combined with total-station measurements, will also be used to document the progress and results of our test excavations and to locate artefacts and samples taken for further analysis precisely. In each of the features identified by our survey we will excavate a test trench that cuts through the walls (the linear wall or the enclosure wall) and exposes areas inside and outside of it. The purpose of those test trenches is twofold: 1. To expose the original structure and make-up of the wall and accompanying features (such as ditches, gates, drainage systems); 2. To collect material cultural remains, as well as soil and other samples for dating, paleoclimatic reconstructions, and micro-geological analysis.

**Samples and their analysis:** The systematic and extensive collection of samples for scientific analysis is one of the main features of this project. In China and Mongolia, it is still common to date a site based on one or two 14C dates and discuss its environment based on a similarly small number of pollen samples. My

research strategy is based on understanding the nature and limitations of such proxy data, and advocate its use only as part of a statistically viable sample. In the field we will collect samples for three main purposes: **1. Dating:** dating of the time of construction of the MWS and the time-span of its use is at the core of this research, not only because it will allow us to know who built the wall but also because using accurate dating, we can correlate the construction and use of the wall with paleo-ecological conditions and climatic anomalies and with events described in the historical texts. Coins provide the most accurate dating. To increase our chances of finding ancient coins (and other small artefacts), all the earth excavated will be sieved, using 5 mm mesh, and we will use a metal detector to make sure all the metal objects are found. We will also take samples for 14C and OSL dating. Samples for OSL dating will be taken from the profile of trenches dug through the earthen wall itself and the walls of associated structures. This method has been proven effective in dating large earthen walls and terraces (Avni et al. 2013; Davidovich et al. 2012; Gadot et al. 2018) but it was never attempted for the MWS. Samples for 14C dating will be taken from the same trenches as well as from other archaeological contexts. This combination of proxy methods to date organic (14C) and inorganic materials (OSL), whose availabilities and error ranges overset each other, increase our confidence that we will obtain a large dating data set and will increase the accuracy of the final dating. Currently no such dates exist for any section of the MWS, thus we are certain that the combined method will dramatically improve the resolution of dating for the entire MWS and its different sub-sections. **2. Climatic and ecological reconstruction:** soil samples will be collected for two types of complementary scientific methods: pollen analysis, which represents the overall biomass of the environment (Moore et al. 1991), and  $\delta D_{wax}$  analysis, which primarily records the isotopic composition of rainfall and is also a proxy for the amount of precipitation (Sachse et al. 2012). Wood and plant samples will be collected, using manual flotation (White and Shelton 2014) to reconstruct the environment during the time of the construction of the wall and the effects of human activity on the local environment during the use-life of the wall. I used this combination of methods successfully in my previous research on the origin of agriculture in northeast China (Shelach-Lavi et al. 2019). **3. Multi-proxy geoarchaeological investigation:** one of the main goals of our field research is to identify the function of the different structures we will test excavate. One way to address this question is through the analysis of artefacts found inside the structures. Another strategy we will use is to infer the function(s) of each structure through the recovery and analysis of micro-remains left by the activities carried out there. From the excavated sections we will collect thin sections of soil micromorphology, samples for Fourier Transform Infrared (FTIR) spectroscopy used for identifying mineralogical and organic components, and for the recovery of phytoliths and calcitic remains. These analyses are best suited for the reconstruction of activities that transpired within the structures. Integration of the proposed methods has been highly successful for identifying the formation processes of abandoned structures and human use of space (e.g. Friesem et al. 2016). Analysis of thin sections through soil micromorphology is a useful method for analysing occupation surfaces and associated activity residues (Karkanas and Goldberg 2018); FTIR forms an effective tool to detect burnt materials and archaeological dung remains (Dunseth and Shahack-Gross 2018); calcitic remains (e.g., dung spherulites and wood ash pseudomorphs) are markers for the presence of animal dung and/or wood ash respectively (Gur-Arieh et al. 2013). The combination of these methods is especially appropriate for evaluating our hypothesis that some of the structures, such as the large circular features (Fig. 2) may have been used as animal enclosures, and if so, what types of animals were kept in them. Petrography and chemical analysis will be used to locate the source of artefacts recovered by our excavation. Petrographic analysis of pottery shards is the best way of identifying their production techniques and the source of the materials used (Quinn 2013). Analysis of chemical composition and lead isotopic (LI) of metal artefacts will be used to determine the source of the materials used for their production (e.g. Eshel et al. 2019).

WP II: Historical Research. Our use of the historical sources will be focused on aspects that are relevant to the understanding of the MWS or events that can be correlated, in time and space, with its construction and use. While not ethnically ‘Chinese’, the Liao and Jin dynasties conformed to the highly literate Chinese tradition and preserved a very extensive record pertaining not only to political and historical events but also to the social, economic, cultural and climatic conditions during their reign. Although, as noted, the construction of the MWS is not directly mentioned, our methodology is built on the assumption that much specific and accurately dated information is found in the wealth of textual sources. Although those texts have been studied before, my approach is to treat them as a large reservoir of information and to mine them for concrete data on specific topics relevant to this research. We will systematically ‘mine’ the historical records for concrete data that are relevant to the understanding of the MWS, such as frontier diplomatic, defence,

taxation and trade policies, and events, such as climatic anomalies or food shortages and large-scale migrations, that can be correlated, in time and space, with its construction and use. The data we collect will be sorted in a framework that integrates it with the archaeological and paleoclimatic data. This database will be geared towards GIS-type analysis and will integrate relevant geographical information as well. It will allow big-data analysis of the temporal and spatial clustering of phenomena and events and their correlations. While such correlations are not themselves explanations, they will form a crucial part of the testing of our research hypotheses.

In recent years similar approaches to the use of historic texts have proved to be very effective in, for example, the reconstruction of past climatic events in different parts of the world (e.g. Brázdil et al. 2018, and references there). A pilot project I conducted in collaboration with my post-doctoral student Dr. Li Yali and with Prof. Ronnie Ellenblum, a historian of the Middle Ages in West Asia, demonstrated the amount of accurate data that are available in the Chinese sources and the effectiveness of our methodology (Li et al. 2019). The sources we intend to explore include, in addition to the official histories of the Liao and Jin already mentioned, records of the contemporaneous Song dynasties that contain indirect descriptions relevant to the Liao and Jin and much data on climatic events and conditions. These include not only the official histories of the Northern and Southern Song but also official documents, such as the *Collection of Song Imperial Edicts* (宋大詔令集), *Memorials of Song Ministers* (宋朝諸臣奏議) and others. Geographical surveys and encyclopaedic compendia of the Song are another type of source that contain much pertinent information on economic, demographic and geographical conditions throughout the empire and beyond its borders. Literary writings (*biji* 筆記) and personal diaries from the Song period contain anecdotal information that is mainly relevant for identifying the timing and scope of climatic anomalies. Those anomalies can be indicated by concrete reports of the events and their consequences or by indirect information, such as descriptions of the untimely blooming of peach and apricot trees and other unusual occurrences. Documents in other languages, such as the Tangut documents (most of them available in Chinese translation) of the Western Xia dynasty will supplement this rich information (e.g. Shi et al. 1994; Wu 1968). Although the amount of unexploited material written in Chinese is vast, in recent years most of it has been digitised, thus it is much more accessible for the kind of research I propose.

WP III: Paleoclimatic Research. In recent years, reconstruction of the paleoclimatic history of north China and Mongolia has advanced dramatically (e.g. Ge et al. 2016; Goldsmith et al. 2017) and significant attempts have been made to correlate climatic conditions with historical events (e.g. Dong et al. 2015; Pederson et al. 2014). However, the multi-decadal error range of many of the proxy signals and their uneven geographic distribution are problematic when studying phenomena which can last for a decade or two and are located in an area for which no proxy data exists. Because the proxy signals are radiometrically dated, they have a multi-decadal error range which for a historical period can miss the entire phenomenon we are studying (such as a short but intensive climatic anomaly) or date them in a way that is not relevant for our understanding of their effects on the construction of the MWS. Some methods, such as dendrochronology (and the resulting dendroclimatology) and speleothem studies, provide much more accurate dating. Such methods are highly important for our understanding of the paleoclimatic history of the region (e.g. Dong et al. 2015; Pederson et al. 2014) but because of the scarcity of ancient wood and of stalactite caves, the phenomenon they measure is often located far from the area we want to study. It is often unclear how these supraregional-scale trends affected the regional and local levels. Proxy data are often difficult to quantify, thus it is difficult to know how the climatic trends they reveal actually affected the welfare of people and the political systems. Moreover, while the current scientific methods are better at identifying droughts, they are not very suitable for identifying cold anomalies (Hou et al. 2016), which, as indicated above, are one of the major factors affecting the life of nomadic and semi-nomadic populations in this region.

To overcome these problems, we shall integrate data from three sources: 1. Data generated by paleoclimatic studies conducted in Mongolia and north China in recent years; 2. Data recovered from the historical sources; 3. Data recovered by our archaeological expeditions. We believe that such an integration of data, with different ranges of chronological and geographical resolutions, can offset some of these problems and provide solid controls for some of the uncertainties inherent in the data. In conjunction with the archaeological field work we will conduct targeted research to collect data relevant for paleoclimatic reconstruction. This will include documentation of ancient lake shores and  $\delta D_{wax}$  analysis that our team has already experimented with (Goldsmith et al. 2017; Shelach-Lavi et al. forthcoming) as well as the analysis of pollen sequences from sediment from nearby lakes (Wen et al. 2010). The data we will recover in these

explorations and the archaeological excavations and the data collected from the historic sources will be used to verify and correct for the three deficiencies discussed above. While the scientific data provide the long-term trajectory, the historical data will be used to identify short-term but intensive anomalies, such as severe cold spells, and document the ways in which they affected the livelihood of the population, as well as governmental reactions to such stress. Samples collected during our archaeological and paleoclimatic explorations, for pollen, phytolith and  $\delta D_{wax}$  analyses, will be used to reconstruct the local ecology during the time of the construction and use of the MWS, thus providing the missing local component.

### **Challenges, Feasibility and the High-Risk High-Gain Nature of this Project**

The sheer scale of the MWS and the complexity of this project pose many challenges, including the organisation of the proposed field work at five different localities in two countries (Mongolia and China) and the integration of large amounts of archaeological, historical, climatic, and geographical data. However, I believe the experience I gained from leading large-scale international research projects in China, and more recently in Mongolia, has prepared me for these challenges. From methodological and intellectual perspectives, I bring to this project the knowledge and sensitivities I developed from working on prehistoric periods. I have much experience in conducting multidisciplinary research that integrates archaeology with geology, biology, and climatology (e.g. Avni et al. 2010; Shelach et al. forthcoming; Zou et al. 2018), as well as in working on historical periods and integrating archaeological and historical data (e.g. Chen and Shelach 2014; Li et al. 2019; Shelach 2014; Shelach and Pines 2005).

The greatest risk of this proposal, but also its greatest potential for extraordinary gain, is whether the research results will allow me to form a comprehensive understanding of the function of the MWS and to construct a model that explains long-wall building in Chinese and world history. Why some states in some periods decided to invest huge amounts of resources in the construction of intensive systems of long walls and their numerous accompanying structures, is one of the great riddles of human history. A well-based model that provides an explanation for those episodes of wall construction, in China and elsewhere, will contribute greatly not only to a better understanding of these historic monuments but also for the functioning and decision-making of states and empires and their reaction to stressful conditions. Such insights have the ground-breaking potential of bringing about paradigmatic changes in the fields of the medieval history and archaeology of China and Mongolia, as well as that of nomad-sedentary relations. Recent outbursts of mass migration of refugees, world-wide, and the attempts of governments to prevent them from entering the lands of their desire and hope, is fuelling an ongoing debate over the construction of separation walls. As is amply evident not only by media reports but also by the publication of popular non-fiction books on the topic (e.g. Spring 2015; Sterling 2009) and the growing body of academic research (e.g. Carter and Poast 2017; Hassner and Wittenberg 2015), the question of long-wall construction is relevant for our understanding not only of the past but also of the present.

On a lower level of generalisation, the integration of the different dimensions of this research—archaeological, historical, climatic, ecological, and geographical—poses great challenges. However, because of the advanced recovery and analytical methods proposed, I believe that it is reasonable to expect that integration will be possible. Indeed, that very integration, which was hitherto impossible at such a high level of detail and resolution, will be among the more significant achievements of this project. This integration will revolutionise our understanding of the history of China and Inner Asia during the crucial period that preceded the rise of the Mongol empire. In particular, the data generated by our research will contribute to a better understanding of what some call the ‘blank period’ in this history of the Mongolian Steppe (Shiraishi 2001) and to test concrete hypotheses such as Lattimore’s (1963) suggestion that the wall was built as part of a defensive seclusion policy of the Jin, which created a political vacuum in the Mongolian Steppe and enabled Chinggis Khan’s rise to power.

The project will certainly generate a great quantity of new data and contribute to the fields of medieval archaeology (and archaeology more generally) in China and Mongolia. Because so little is currently known about the MWS, any data we generate will be a significant contribution. Our multidisciplinary field work will produce novel data on the MWS and the combination of historical, archaeological and paleoclimate research will contribute to our understanding not only of this enigmatic monument but also of the archaeology and history of Mongolia and China more generally. We will certainly collect novel data on the structure of the wall, ditches and accompanying structures, which in itself is important to the archaeology of the region and can be correlated with other types of sites and structures (e.g. Wright 2015). In Mongolia (and steppe regions of North China), medieval archaeology has traditionally focused on remains of the Mongol Empire (13th-14th centuries) and more data on this period is rapidly accumulating through recent

international archaeological projects that focused on the Mongolian capital of Karakorum and other sites of this period (e.g. Bemann, Erdenebat, and Pohl 2010; Shiraishi and Tsogtbaatar 2009). Much less work has been done at sites of the Liao-Khitans period (e.g. Krادين et al. 2014; Lin 2009) and almost nothing is known about the period between the fall of the Liao and the rise of Chinggis Khan to power. Thus our work will certainly contribute much to the archaeology of the 10th to early 13th centuries. Because this project will use cutting-edge methodologies of recovery and analysis in archaeology, the data we collect, which is novel for this area, will contribute not only to the understanding of the MWS but also to other aspects, such as a better chronology of archaeological remains, currently underdeveloped for the medieval archaeology of this region. Even if we are unable to pinpoint the construction of the MWS to within the 10-20 years or so necessary for detailed historic analysis, the number of scientific dates we will collect (14C and OSL), will contribute greatly to aspects such as the construction of the ceramic typology and chronology of the medieval period in Mongolia, a crucial archaeological tool which is currently underdeveloped (Makino 2007: 32-37, 71; Shiraishi and Tsogtbaatar 2009; Park et al. in press). Improved chronology will also contribute to a better integration of archaeological and historical data, not only for the MWS but for other sites in Mongolia and north China.

The project will contribute to scientific fields and disciplines beyond archaeology and history. Research on paleoclimate and on ancient climatic changes is a very important and developing field, but it is often focused on long-term processes and on global trends. The well-dated and precisely placed paleo-climatic proxies we will collect in the archaeological field work and from the historical sources will contribute not only to the better understanding of the local environment and climate during the medieval period, but also to more nuanced understandings of the relationship between global and regional paleoclimate trends (e.g. Dong et al. 2015; Ge et al. 2016; Goldsmith et al. 2017; Hou et al. 2016; Wen et al. 2010).

This research will undoubtedly contribute to the dissemination of methodological skills and the development of the field of archaeology, especially in Mongolia, where it is currently in the process of opening up and evolving. All our field expeditions will be done in full cooperation with local archaeologists and will integrate students from China and Mongolia with Israeli and European students, so as to train them in the most up-to-date methods and procedures of data acquisition, sampling, and analysis.

### **Work Plan and Schedule**

Because the proposed research builds on the integration of three main components—archaeological, historical and paleoclimatic—it is vital that our work be tightly scheduled so as to enable the project to achieve its goals in five years. The project will be divided into three teams (archaeological, historical and paleoclimatic), each including the PI (Prof. Shelach-Lavi), a team coordinator, and affiliated doctoral and post-doctoral students. Each team will meet at least once a week to review its progress and the entire project team will meet every month for a joint seminar, in which we will discuss issues of mutual interest, including lectures by team members and guests.

The most time-consuming and uncertain part of this project is the archaeological field expeditions. However, because the field work is focused on small-scale test excavations and because the sedimentation rate in the Steppe is very slow (so remains are not buried deep underground) it is estimated, based on previous experience, that in each of the five designated locations the research goals can be achieved in 45 days. Those five expeditions will be carried out during the first three years of the project. The analysis of the data and samples collected during the field expedition will start immediately after the end of the first field season and will continue into the fourth year of the project. The collection, sorting and initial analysis of the historical data and the published paleoclimatic data will also be accomplished within the framework of those first three years. The end of the third year will be an important milestone, when I will check the data already collected and assess the need for more data acquisition. The fourth year will be devoted mainly to the analysis of the data, and the fifth year—to the development of the explanatory model and its implications for other episodes of ‘Great Wall’ building in Chinese history and to the construction of long-walls in other parts of the world.

The results of my project will be published, as they are gathered and analysed during the course of the project, in highly ranked journals in archaeology, history and the earth sciences. The three conferences will form the basis for the publication of collected volumes, either as books or as special issues of journals.. I am committed to making the data of my research openly available to anyone who wants to use and analyse it. As I did in a previous archaeological project, at the end of the project all the raw data we collect will be deposited at the Comparative Archaeology Database of the University of Pittsburgh (URL: <http://www.cadb.pitt.edu>), and remain open to anyone who wants to use it.

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