The Present-day Value of Maps Illustrating the Archaeological Surveys of Sir Aurel Stein in Xinjiang and Gansu

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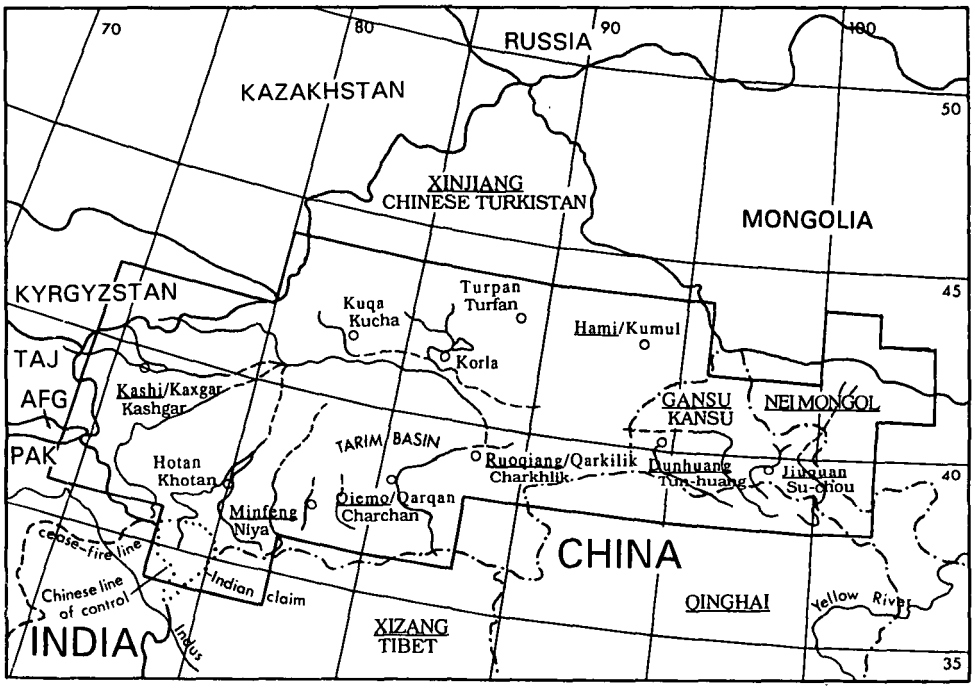
Introduction

The maps illustrating the archaeological surveys of Sir Aurel Stein's Central Asian expeditions remain to this day the most authoritative map series concerning the location of archaeological monuments in the Tarim Basin and Gansu Corridor of western China. The aim of this article is to evaluate the present-day value of Stein's maps for both relocating known ancient sites and attempting to locate additional sites on more recent maps. Figure 1 of this article shows the general area surveyed by Stein's expeditions. This study will be divided into three main parts: (1) a general description of Stein's cartographic surveys in terms of the regions of Xinjiang and Gansu surveyed and features depicted; (2) map series covering this region produced since Stein's surveys, and an outline of the history of the treatment of place names on both Stein's and subsequent maps; (3) an in-depth study of the Niya site area to illustrate both the extent to which Stein's original findings can be relocated on recent maps and the value of such maps for locating additional ancient sites.

Although archaeological investigations in the Tarim Basin began in the late nineteenth century,[1] the three Stein expeditions of 1900–1, 1906–8 and 1913–15 resulted in the first systematic archaeological surveys of this region. In the early part of this century the British Indian Government and the British Museum jointly sponsored the Central Asian expeditions of Sir Aurel Stein. Due to the need for accurate maps of what was to the West at this time a remote and largely unsurveyed region the British Indian Government despatched professional surveyors to accompany Stein, and provided cartographers at the Survey of India office at Dehra Dun to compile maps to illustrate the results of each expedition upon its return. The maps thus contain a wealth of information on the historical, cultural and physical geography of a vast region of Central Asia. It is in part because of this interdisciplinary nature of Stein's maps that they are still the main authority on many geographical aspects of a unique region of Central Asia that in the past was an important meeting place of the ancient civilisations of India, China and the West.

[1] Dutreuil de Rhins, *Mission scientifique dans la Haute Asie, 1890–1895* (Paris, 1897–8), and Sven Hedin, *Die geographisch-wissenschaftlichen Ergerbnisse miener Reisen in Zentralasien 1894–1897* (Gotha, 1900).

JRAS, Series 3, 2, 3 (1993), pp. 233–243



THE AREA OF SIR AUREL STEIN'S ARCHAEOLOGICAL SURVEYS IN XINJIANG AND GANSU, CHINA* 1900–1, 1906–8, 1913–15

SCALE
0 300 600

EXPLANATION OF PLACE NAMES

Ruoqiang/Qarkilik...Chinese Name†/Official PRC Uighur Name‡
Charkhlik Name as given on Stein's maps

*This area represents the total coverage of map sheets. Actual ground surveyed is restricted to specific routes followed by the expeditions.

†Place name derived from Chinese characters and romanised according to the Pinyin romanisation system.

‡Place name derived from native script form in Arabic alphabet and romanised acording to official PRC transcription rules for Uighur.

Fig. 1. The area of Stein's surveys.

I History of Maps Illustrating the Archaeological Surveys of Sir Aurel Stein's Central Asian Expeditions

First Expedition, 1900–1

The topographical results of this expedition to the region of the ancient kingdom of Khotan first appeared in cartographic form in the "Map of portions of Chinese Turkistan" in two sheets at the scale of 1 inch to 12 miles. This map was prepared at the Trigonometrical Branch Office of the Survey of India and published in May 1903.[2] On

[2] A. Stein, *Memoirs on Maps of Chinese Turkistan and Kansu* (Dehra Dun, 1923), p. 9.

Stein's subsequent return to England an improved map, based on the Survey of India map but drawn on the scale of 8 miles to 1 inch, was drafted to accompany *Ancient Khotan* (Oxford, 1907), the detailed report of this first expedition. The characteristic geographical features of the Khotan region between the approximate longitudes of 79° and 84° East are represented.

Second Expedition, 1906–8

A detailed cartographic record of the surveys made during this expedition was prepared at the Trigonometrical Survey Office, Dehra Dun, in the form of an atlas of 94 sheets, drawn on the scale of 4 miles to 1 inch (1:253,440) and each extending over one degree of latitude and longitude. These sheets were intended primarily for publication with *Serindia* (Oxford, 1921), the detailed report on the scientific results of the second expedition. The area over which the explorations extended is situated between the approximate longitudes 75° and 101° East. Certain areas revisited in 1906–8, but not resurveyed, depict features from the previous surveys of 1900–1.[3] The only features shown that are based on sources other than Stein's original surveys are certain portions of the Tarim, Kashgar and Charchan river courses, which for the sake of clearness were added (in broken outlines) from the maps illustrating Sven Hedin's explorations, and a number of triangulated points in the mountains south of Khotan which were inserted by the Trigonometrical Survey Office from its early Ladak triangulation records and Captain Deasy's observations of 1898–9.[4]

This atlas of the results of Stein's second expedition was the first map series to depict the archaeological monuments of the Tarim Basin and Gansu Corridor in a systematic fashion. Its late date of publication in 1921 was due to a delay caused in its preparation by Stein's departure on his third expedition, and to difficulties that arose from World War I which beset the printing and issue of *Serindia*. Because of this long delay several general maps suitable for purposes of general reference appeared soon after Stein's second expedition in the *Geographical Journal* (March 1911), and in his personal narrative *Ruins of Desert Cathay* (1912).

Third Expedition, 1913–15

The preparation of the maps illustrating the results of the third expedition commenced early in 1916 at the Trigonometrical Survey Office, Dehra Dun, upon Stein's return. The final atlas was published by the Surveyor General of India, and consisted of 47 sheets at the scale of 1:500,000 (1.014 inches to 8 miles). The area represented in this atlas is situated between the approximate longitudes 74° and 102° East. This atlas subsequently appeared as the map volume of Stein's *Innermost Asia* (Oxford, 1928), the detailed report on the scientific results of the third expedition. Although the scale of these maps is smaller than that used for the second expedition's maps, this map series comprises the highest-quality atlas of Stein's archaeological surveys. In order to ensure greater accuracy in details, reference was made throughout to the original plane-table sheets in the case of ground already represented in the maps illustrating the first two expeditions.[5] Where the same

[3] *Ibid.*, p. 23. [4] *Ibid.* [5] *Ibid.*, p. 56.

route was followed on more than one journey preference was given to the representation of the ground by the later survey, if done under Stein's direct supervision or on a larger scale.[6]

The main basis for the compilation of the maps was provided by the series of triangulations and of astronomically observed latitudes brought back from the three expeditions. At the time of these surveys, with the exception of one or two points on the mountains south of Khotan, no intersected points, from which the surveyors could resect their position, had been fixed by the Survey of India. Thus the relative accuracy and value of the triangulation is dependent on the merits of Captain Deasy's earlier work, on which it was largely based.[7] As a result the surveys of the first and second expedition are only based on a triangulation system from the extreme western edge of the Tibetan Plateau south of Khotan to a point beyond the Charchan river. Stein hoped at the time to carry this triangulation right through to Dunhuang and the westernmost Nan-shan, as Stein referred to the northernmost part of the Tibetan Plateau that forms the present boundary between Gansu and Qinghai Province in the People's Republic of China (PRC), but an illness of the surveyor prevented this.[8] Further difficulties resulted from damage to a theodolite level that prevented the intended triangulation along the Tian Shan mountains north of the Tarim Basin from being carried out.[9] Surveys conducted during the third expedition did manage to effect a triangulation along parts of the southern Tian Shan. In terms of relocating archaeological sites studied by Stein it is important to realise the uncertainty inherent in coordinates obtained from the maps depicting the sites.

II Important Map Series Covering the Xinjiang-Gansu Region produced since the Archaeological Surveys of Sir Aurel Stein

This overview of maps produced since Stein's archaeological surveys will be limited to post-1950s material, because a very good description of maps of Central Asia produced from the end of the last century to the late 1950s is provided by N. P. Ambolt and E. Norin in the *Memoir on Maps* accompanying the Central Asia Atlas of the Sino-Swedish Expedition.[10]

Tactical Pilotage Charts

In the 1960s a world-wide pilotage chart series was produced by the US Government that still remains the highest-quality topographic source for the Xinjiang–Gansu region (and of many other regions of Asia such as Tibet). These charts are termed Tactical Pilotage Charts (see Appendix A). The scale of the Tactical Pilotage Charts (TPCs) is 1:500,000. Although the first editions of TPC sheets provided little data for vast areas of Central Asia, recent editions of TPC sheets (see Fig. 2) are of much higher quality in terms of the topography and hydrography of terrain depicted. For a period in the 1980s the US Government restricted the public sale of these charts.

[6] *Ibid.*
[7] *Ibid.*, p. 107.
[8] M. A. Stein, "Note on maps illustrating Dr Stein's explorations in Chinese Turkestan and Kansu", *Geographical Journal* (1911), p. 278.
[9] *Ibid.*
[10] N. P. Ambolt and E. Norin, *Memoir on Maps*, i (Stockholm, 1967).

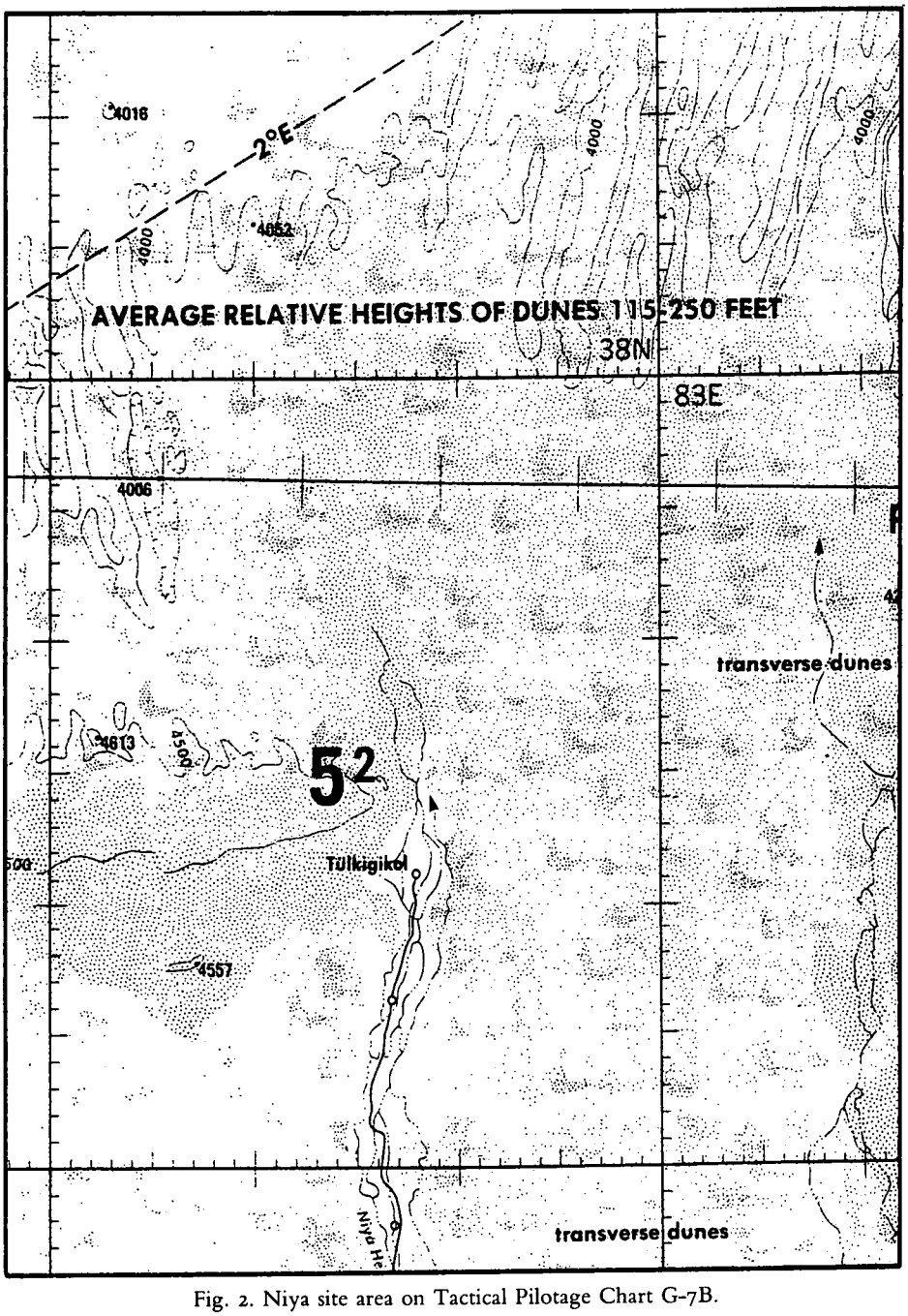


Fig. 2. Niya site area on Tactical Pilotage Chart G-7B.

https://doi.org/10.1017/S1356186300004302 Published online by Cambridge University Press

PRC Maps of Western China

PRC maps of Western China can be generally characterised as small-scale maps. Most PRC maps consist of small-scale province maps; specific exceptions occur in various special-needs maps such as large-scale tourist maps of cities and scenic spots, but these lack the detail of topography to be expected of such large-scale maps. While the absence of native large-scale maps of China is not so important in terms of the representation of its physical geography – nowadays this can be mapped in sufficient detail with remote-sensing techniques – the one field where a great deal is still not known is that of local place names.

Finally, mention should be made of the various large-scale maps and diagrams that occur in PRC academic journals depicting archaeological sites. A survey of recent PRC archaeology journals reveals that in no case is a large-scale map provided with precise latitude and longitude coordinates, thus preventing specific sites from being accurately relocated on the best available map of the area. In other cases a textual description of a site location may be given. While such maps and texts constitute a definite contribution to the study of Central Asian historical geography, they do not in themselves form a map series of geographical reference value.

Place names

Before concluding this brief overview of map series of relevance to the study of Stein's archaeological surveys, it is important that the history of the treatment of place names on maps depicting this area be examined. The main problem for archaeologists is twofold: how to correlate the place names of ancient places and natural features with their possible existing contemporary place names, and how to handle the vast number of variant spellings in different languages of the same place name. The diversity of languages spoken in Eastern Turkistan is reflected in the variety of spelling systems that were employed by map makers. While the majority of place names are of Turkic origin (recorded in the Arabic alphabet), others are derived from Chinese, Mongol, Iranian and Tibetan languages and dialects. Stein's maps employed a place-name system that transcribed each name as it was actually pronounced by the local inhabitants, refraining from any attempt to spell the name in accordance with its correct Turkic etymology.[11] Later maps often made no improvement in this respect, as the compilers usually employed their own favoured place-name system. And as the areal coverage of these maps was mostly incomplete and scattered, no single completely satisfactory source for place names existed. An attempt was made by the United States Board on Geographic Names (BGN) to standardise the treatment of place names in Xinjiang during the 1940s and early 1950s. But its publication of a gazetteer of Xinjiang in 1955 produced little improvement over Stein's "Index of Local Names" that appeared in his *Memoirs on Maps of Chinese Turkistan and Kansu* (1923). The BGN came to the conclusion through an examination of available linguistic studies of the Eastern Turkic language that it has a great many vowel distinctions that were never accurately recorded in the various orthographies used in geographical sources, and that

[11] Stein, *Geographical Journal*, p. 277.

without field work it would be impossible to restore the real linguistic form of these names.[12]

The quality of Eastern Turkistan place-name work in the United States actually deteriorated by the late 1950s after US recognition of Taiwan's claim to the region resulted in the use of Chinese Wade–Giles names on US maps and charts of the region. Place names in Chinese characters on Nationalist and PRC maps of mainland China were romanised according to the Wade–Giles system for use on US sources. Except for genuine Chinese place names in Eastern Turkistan the place names that resulted are of dubious value for the purpose of correlating with Turkic place names from Stein's maps.

In 1979 the US government's recognition of the PRC as China's sole legitimate government resulted in the use of official PRC place names on US maps and charts. This change in policy is significant, because the PRC place-name system for Xinjiang is based on the native written forms of place names. To date the PRC has special place-name systems for Uighur, Mongolian and Tibetan.[13] In each case the place names are both rendered into Chinese characters and transcribed into a Roman script form. These romanisation systems are fairly recent and are not widely known in the west. However, the new Roman spellings are an improvement over the Wade–Giles spellings because they more accurately reflect the actual pronunciations of the names.

After 1979 place names on the TPCs continued to be employed with little regard to BGN standards by the Defense Mapping Agency's Aerospace Center in St Louis. As a result the best available map series of the Xinjiang–Gansu region still does not employ a standardised place-name system. Until a better map series is available Stein's maps will continue to be the only available source for the transcription of Turkic names of many places and natural features in the region. While it is no secret that PRC surveying and mapping work units have extensively collected Uighur place names in the field,[14] the small scale of available PRC maps prevents foreign scholars from obtaining all but a few of these names in a romanised form. Detailed Chinese maps and gazetteers are "neibu" ('work-unit-internal') and thus limited in their accessibility.

III Relocating Ancient Sites from Sir Aurel Stein's Archaeological Surveys on Later Maps

The Niya site

The Niya site is located in an area once occupied by the terminal oases of the Niya river, containing many ruins of farmsteads dating to the early centuries of the Christian era. The main ruins of historical interest are those of 45 buildings, a temple, a stupa and a bridge.[15]

[12] "Directions for the treatment of geographical names in Sinkiang", Tentative, Board on Geographical Names, US Department of the Interior (1944).

[13] See "Announcement concerning the promulgation of Mongolian, Uighur, and Tibetan (Lhasa dialect) place name transcription rules" ("Guanyu Banfa 'Mongol, Uygur, yu Zang Yu (Lhasa Hua) Diming Yiyin Guize' de Tongzhi"). General Staff Ministry (in conjunction with) National Survey Institute (1982), Directive No. 336.

[14] See "Place name work in retrospect (by the) Place Name Office of Xinjiang" ("Diming Gongzuo de Huigu–Xinjiang Diming Bangongshi"). *Place Name Knowledge* (Diming Zhishi), (1990), p. 19.

[15] G. Gropp, *Archäologische Funde aus Khotan* (Bremen, 1974), p. 25.

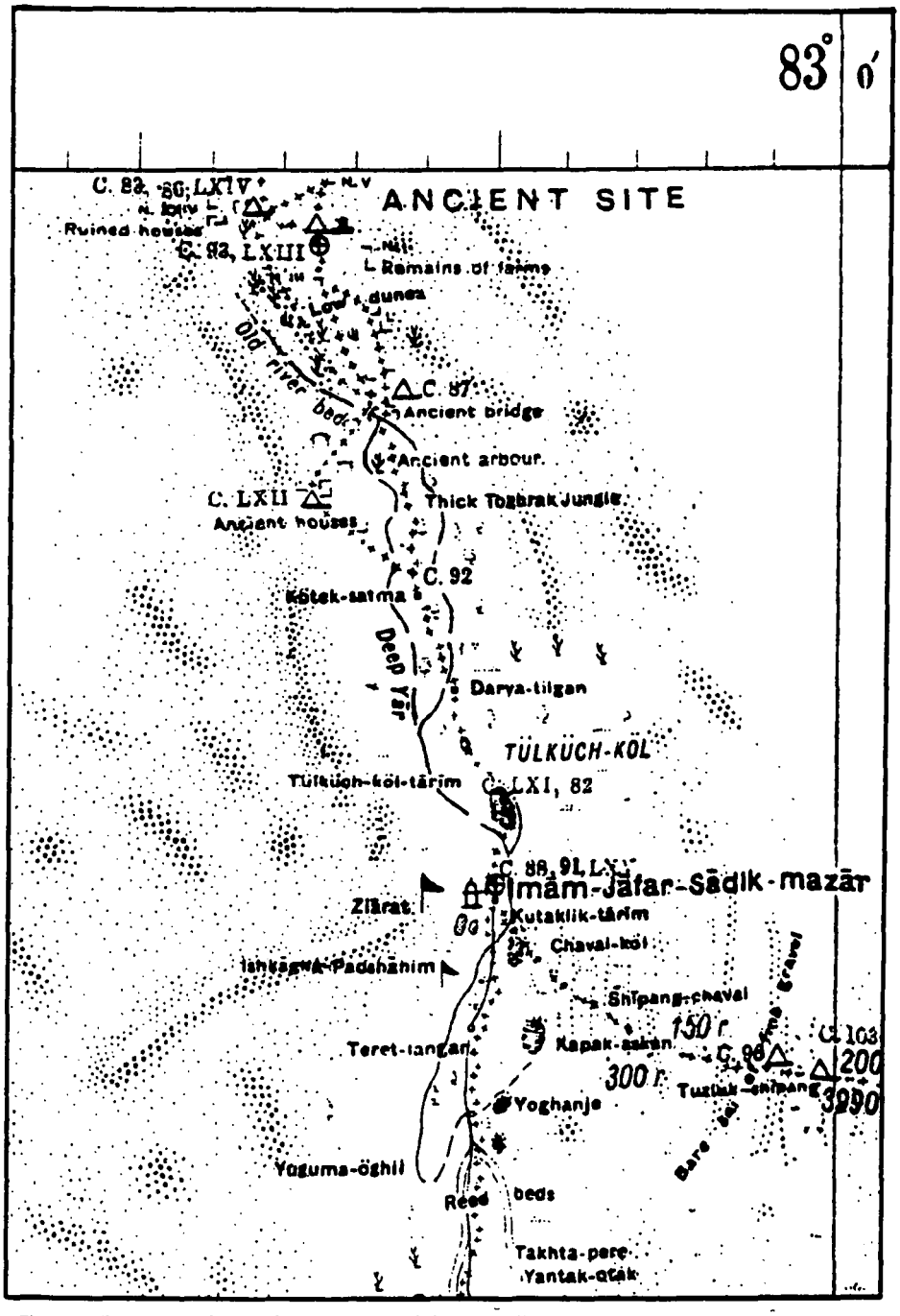


Fig. 3. Niya site as depicted on map 19 of the atlas illustrating the findings of Stein's third expedition.

https://doi.org/10.1017/S1356186300004302 Published online by Cambridge University Press

The remains of ancient vineyards occur near some sites. This area ceased to be reached by irrigation no later than the period of Tang dynasty Chinese rule. The small patches of cultivation noted by Stein near the present end of the Niya river were constantly threatened with extinction owing to the vagaries of the dying river-course, which creates the only interruption in the otherwise continuous drift-sands of the Taklamakan desert. Surveys were made of this area on all three expeditions.

The extent of change in local landform, streams and vegetation cover noted by Stein that has occurred in the time between his surveys and the compilation of the TPCs, which constitute the best available topographic source for this study, is important to determine in order to relocate specific sites. The area of the Niya site in the ancient terminal oases of the Niya river can best be located on TPC sheet G-7B (see Fig. 2) through a comparison with Stein's map 19 (see Fig. 3) of his third expedition. Larger-scale maps of this area were provided by Stein as Plan XVII of *Ancient Khotan* and Plan IV of *Innermost Asia*. On TPC sheet G-7B local landform features are not depicted. While contour intervals of 500 feet are shown, a statement is provided giving the average height of sand-dunes in each general area of the map surface. Stein's maps only provided roughly approximate relief contouring for areas of high relief. No contouring was attempted by Stein for the Taklamakan desert.[16] Also, the TPC sheet provides greater detail in the delineation of both perennial and intermittent streams because of its total coverage of this section of the southern Tarim basin within the limitations of the scale of 1:500,000. It is important to note that Stein's maps also record the locations of ancient streambeds noticed during the surveys.[17] However, the TPCs only depict areas of prominent vegetation.[18]

Due to the previously mentioned fact that the latitude and longitude coordinates of features on Stein's maps are not completely accurate, the first step that needs to be considered in terms of precisely relocating the sites of specific ruins is to determine if any feature on Stein's maps is also depicted on the corresponding TPC sheet. Because the main physical features of the Tarim Basin previously mentioned are of a very dynamic nature, the only relatively local features that we can be sure have not vanished or changed position since the time of Stein's surveys are the main mountain masses bordering the Tarim Basin.[19] A brief comparison between the positions of the highest peaks on the northern

[16] M. A. Stein, *Memoirs on Maps of Chinese Turkistan and Kansu*, p. 57.

[17] See for example sheet 29 (*Innermost Asia*, 1928) that depicts the remains of streambeds in the ancient delta of the Kuruk-darya (the Konqi He of contemporary PRC sources), where the Lou-lan sites are located.

[18] The legend of TPC sheet G-7B contains a note stating "no prominent vegetation is known to exist within the area of this chart".

[19] Concerning the rate of the shifting of sand-dunes covering ancient sites, the observations of Dr Emil Trinkler concerning the Rawak Stupe (see map 14 in the atlas volume of *Innermost Asia*, 1928) during the archaeological surveys of the German Central Asian Expedition of 1927–8 are particularly informative. "Wie sehr die Dünen in diesem Teil der Wüste hin- und herwandern, zeigte mir der Vergleich der Stein'schen Spezialkarten vom Rawak-Stupe mit der Lage der Sanddünen z. Z. meines Besuchs. Als Sir Aurel Stein 1901 zum ersten Mal die Ruine besuchte, war die Westecke der Stupe-Anlage unter einer 15 fuß hohen Düne begraben. Sein Lager hatte er damals anscheinend auf derselben Tonterrasse, auf der auch wir Lager geschlagen hatten. Bei seinem zweiten Besuch im Jahre 1906 waren die Tonflächen unter Sand begraben, erst im Laufe der letzen Jahre sind sie wieder freigelegt. Die große Düne auf der Nordseite der Stupe-Anlage aber ist immer noch dominierend und macht jegliche Ausgrabungssarbeiten an dieser Seite auch heute noch fast unmöglich." (*Wissenschaftliche Ergebnis der Dr. Trinklerschen Zentralasien-Expedition*, Band 1, Berlin, 1932, p. 91.) The frequency of changing stream channels is noted in numerous cases throughout Stein's works. See also "River changes in the Eastern Tarim Basin", *Geographical Journal* (Dec. 1929), pp. 574–6.

edge of the Tibetan Plateau as depicted on both Stein's map 19 and TPC sheet G-7B reveals that while the latitude coordinates of each peak are the same on both maps the longitude coordinates are different. The peaks on Stein's maps are positioned too far to the East by at least one minute of longitude. This same comparison when applied to areas further away from the Khotan–Niya area, which is in close proximity to the earlier-mentioned triangulation system, reveals a greater degree of error in Stein's positions.

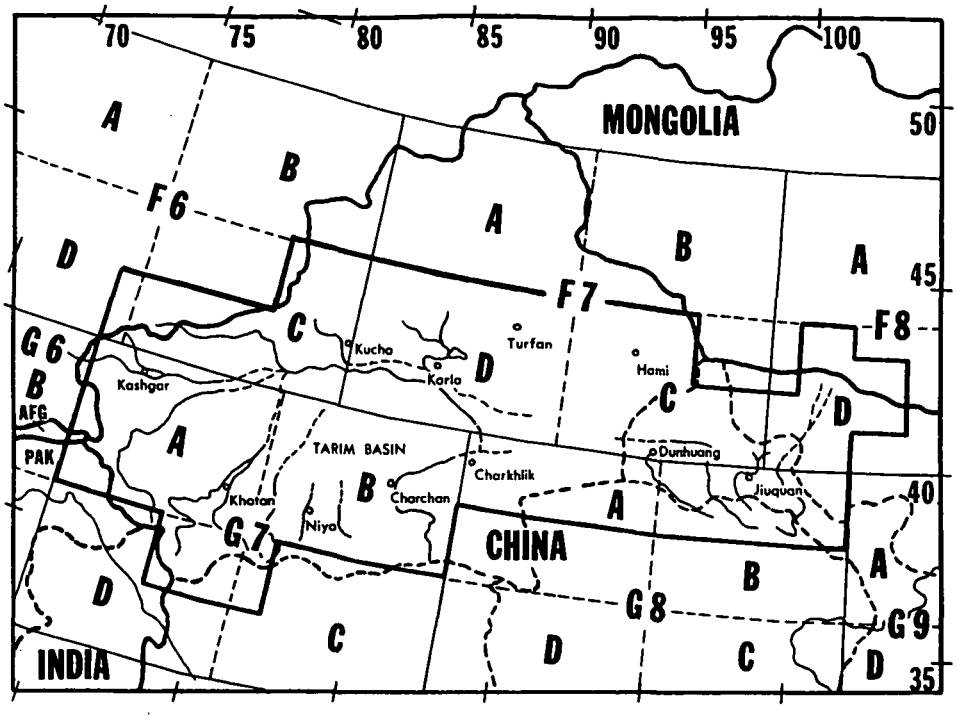
A comparison between the positions of villages and other named cultural features on both Stein's maps and TPC sheets is risky, because the same name is not always applied to the same place on these different maps of the same area. In other cases a place name on one of Stein's maps may not exactly correspond with a place name at the same location on the TPC sheet. TPC sheet G-7B employs the official PRC Uighur name of Tülkiqikol for the northernmost named populated place on the Niya river at 37° 41′ N and 82° 48′ E.[20] However, in this general area on Stein's map 19 several place names provide possible corresponding versions of Tülkiqikol. Because neither Stein's nor available PRC sources provide the native written form for this name, it is not possible to be sure which place on Stein's map the Tülkiqikol of the TPC sheet corresponds with. While one could argue that the place name of Tülküch-köl-tārīm from Stein's map is the most likely candidate, this hypothesis cannot be verified based on the materials available for the present study.

As the TPC series comprises the best available topographic map series covering the total area where Stein's archaeological surveys were conducted, this present study is confined to examining the present-day value of only the major features of Stein's surveys, due to the limitations imposed by the small scale of the TPCs. In this sense the value of Stein's surveys can also be evaluated in terms of the extent to which specific data can be transferred to the TPCs. It has been shown that the Niya site can be located on TPC sheet G-7B according to the coordinates from Stein's maps alone, as long as the slight eastward shift in longitude is accounted for. However, if large-scale maps were to become available, or if a new ground survey was conducted, the TPC sheet would be of little value beyond the preliminary planning stage. But this limitation should not detract from the great value of the TPCs for locating additional terminal oases in the southern Tarim Basin that have still to be surveyed for ancient ruins.

Potential areas of ancient ruins that can now be located at a glance were entirely unknown to Stein, dependent as he was on concise knowledge of only those areas that either he or his surveyors could walk or ride to. The terminal oasis of the lower reaches of the first major intermittent stream east of the Niya river, named on Stein's map 19 as the Yartungaz river,[21] presents a good example of an area where ancient ruins might be located. Stein visited the northernmost settlement of Yar-tungaz-tarim in the winter of 1901 while travelling from the Niya to the Endere site and remarked "I regret that the necessity of pushing on to Endere prevented me from giving time to a detailed inspection of the little colony and the surrounding ground; for... it presents on a small scale but in

[20] The 1990 edition of TPC sheet G-7B inaccurately records this place name as Tülkigikol. The official PRC spelling of this place name is to be found on page 221 of the *Zhongguo Diminglu* (*Gazetteer of China*, Shanghai, 1983). This gazetteer provides the romanised forms of more PRC Uighur place names than are shown on PRC maps of Xinjiang.

[21] The Yawatongguz He of official PRC sources.



Appendix A. Index to Tactical Pilotage Charts, depicted in relation to the area of Stein's archaeological surveys.

a typical form, the characteristic features of a terminal oasis such as we must suppose the Niya site to have been."[22] Consequently the probable area of the ancient terminal oases of the Yartungaz river further northward was never surveyed for archaeological sites.

Conclusion

As stated at the beginning of this article, the maps illustrating the archaeological surveys of Sir Aurel Stein in the Xinjiang–Gansu region consist of three main groups, each based on one of his Central Asian expeditions. The cartographic results of the first expedition to the ancient kingdom of Khotan are restricted to this particular area of the southern Tarim Basin, but the more extensive results of the second and third expeditions resulted in valuable atlases of Xinjiang and Gansu. The atlas of the third expedition of 1913–15, consisting of 47 sheets at the scale of 1:500,000, is still the more accurate map series concerning the location of ancient ruins, and the Turkic names of places and natural features. Although recent editions of Tactical Pilotage Charts, also at the scale of 1:500,000, provide more accurate depictions of the topography and hydrography of Xinjiang and Gansu, Stein's maps still provide the only source for many facets of the historical, physical, and cultural geography of this unique region.

[22] M. A. Stein, *Ancient Khotan* (Oxford, 1907), p. 419.