

REPORTS FROM THE SCIENTIFIC EXPEDITION TO THE NORTH-WESTERN
PROVINCES OF CHINA UNDER THE LEADERSHIP OF DR. SVEN HEDIN

- THE SINO-SWEDISH EXPEDITION -

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I. Geography

2

SVEN HEDIN
CENTRAL ASIA ATLAS

MEMOIR ON MAPS

Vol. I

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by

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INTRODUCTION

For a long time, the principal source of cartographical information about the mountain ranges and the vast deserts of Central Asia was the map of the southern border regions of Asiatic Russia to the scale of 1 : 1,680,000 (40 verst to an inch) issued by the war-topographical division of the Russian General Staff at the end of the last century, viz., the sheets XX (Kashgar) 1889, XXI (Hami) 1899, XIV (Urga) (1888, 1911, 1922), XXVIII (Leh) 1920, and XXIX (Lhasa) 1921. This map, based largely upon the reconnaissances of the great Russian pioneers in Central Asia, *inter alia* N. M. PRZHEVAL'SKIY, G. N. POTANIN, B. L. GROMCHEVSKIY, M. B. PEVTSOV, V. I. ROBOROVSKIY, P. K. KOZLOV, G. E. and M. E. GRUM—GRZHIMAYLO, V. A. OBRUCHEV, and K. I. BOGDANOVICH, was a remarkable achievement for its time, not least on account of the numerous determinations of latitude and several rather accurate astronomic determinations of absolute longitude.

In 1922, SVEN HEDIN published a map of Central Asia in 15 sheets to the scale of 1 : 1,000,000 compiled by H. BYSTRÖM, in which all the cartographical and geodetic material available at the time was critically utilized. The geodetic framework to the sheets covering K'unlun and Tibet was founded on surveys by J.-L. DUTREUIL DE RHINS and F. GRENARD 1890—95, by H. H. P. DEASY 1896—99, and numerous latitude determinations by S. HEDIN. A great part of the map was based on the beautiful map of the Tarim Basin, Tsaidam, K'unlun and northern Tibet drawn in a masterly way to the scale of 1 : 1,000,000 by B. HASSENSTEIN at Justus Perthes' Geographical institute in Gotha in 1900 to illustrate HEDIN's journeys in 1894—97.

A wealth of topographical information about the Central Asiatic basins and their mountainous border regions was collected and cartographically recorded during Sir AUREL STEIN's expeditions in the years 1900—01, 1906—08 and 1913—15. Large parts of Chinese Turkistan and Kansu were mapped topographically by the trained Indian surveyors RAI SAHIB RAM SINGH, Rai Bahadur LAL SINGH and AFRAZ-GUL KHAN under the supervision and direction of STEIN. As a result, an atlas of 47 sheets to the scale of 1 : 500,000 and a Memoir on Maps, were published in 1923.

Another atlas of 8 sheets, covering parts of the southern, middle, and northern T'ien Shan, was published by E. DISTEL to the scale of 1 : 500,000 in 1928. This atlas embodied the cartographic results of the expeditions under the leadership of G. MERZBACHER in 1902—04 and 1907—08, as well as other available cartographic material pertaining to the southern and middle T'ien Shan. During the first decades of this century large parts of the Russian southern T'ien Shan had already been covered with rather detailed governmental topographic surveys to various scales. The region between lat. 32°—40°N and long. 72°—104°E was covered by the Survey of India series, "India and Adjacent Countries", comprising 16 sheets to the scale of 1 : 1,000,000.

In Outer Mongolia, extensive explorations and mapping were undertaken by the expeditions of the American Museum of Natural History in 1921—30 under the leadership of ROY CHAPMAN ANDREWS. The cartographical results of W. FILCHNER's expedition in 1926—28 in Kansu, Tsaidam and Tibet were published in 1933 with an atlas of six sheets to the scale of 1 : 500,000, beautifully prepared by O. WAND at Justus Perthes' Geographical Institute, Gotha. Parts of the western K'unlun and the Karakoram were surveyed on modern lines by the expeditions of FILIPPO DE FILIPPI in 1913—14 and 1930, by the expeditions of PH. C. VISSER 1922, 1925 and 1929—30 and by E. SHIPTON *et al.* 1937 and 1939.

A new epoch in the exploration of Central Asia was inaugurated when, in 1926—27, Dr. SVEN HEDIN organized the Sino-Swedish Scientific Mission to the north-western provinces of China in close coop-

eration with Chinese scientists and Chinese scientific institutions. Since then, this kind of joint research has become obligatory for foreign participation in the exploration of the large unknown or little known outlying domains of the Chinese Republic. The arrangement has proved, on the whole, advantageous to both nations and has generally greatly contributed to the successful accomplishment of the research projects.

It was a plan long cherished by HEDIN to end up and complete his explorations of the deserts of innermost Asia, so difficult of access with caravans, by means of an aerial survey. This plan obtained effective support by the then director of the Dessau aircraft factories, Professor H. JUNKERS, to whom, however, the foremost object was the establishment of an air-line between Berlin and the Far East. According to an agreement reached between Dr. HEDIN and Professor JUNKERS in 1925, the latter was to meet all the expenses for this expedition, after the completion of which a couple of planes with their crews were to be placed at Dr. HEDIN's disposition for flights for scientific purposes. The subsequent taking over of the engagements of Professor JUNKERS by the Deutsche Luft-Hansa and the further agreement with the Chinese authorities have been fully recorded by Dr. HEDIN in Publikation No. 23 of this series.

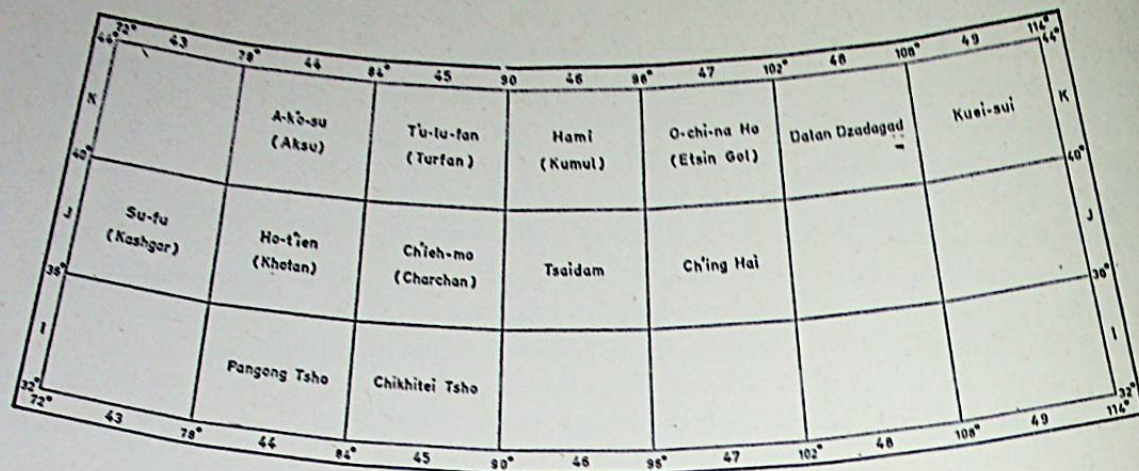
The preparatory expedition started from Peking in the spring of 1927 and reached Urumchi at the end of February next year. Here, faced by the provincial governor's veto on flights over Sinkiang territory, the Luft-Hansa withdrew its staff and further financial support. The expedition now became a purely scientific joint Sino-Swedish expedition, the costs being met mainly by the Swedish Government. Five years passed before the subsequently formed Sino-German Eurasia Aviation Corporation could perform its first flight across Central Asia, but even now survey operations by plane were still strictly prohibited.

During the field-work of the expedition in the years 1927—33, large parts of Central Asia were covered with topographical and geological reconnaissance surveys, the extent of which is shown on Pl. A of the Atlas. This coverage was further supplemented by the mapping made along the projected great motor roads across the Gobi and in Sinkiang by the Sui Yüan-Sinkiang Highway Expedition 1933—35 organized and led by Dr. HEDIN at the request of the Chinese National Government. Much of this cartographic material was subsequently embodied in the "Atlas of China" by V. K. TING and W. H. WONG of 1948, viz, in the sheets Nos. 49, 50 and 55.

All the cartographical source-material from Central Asia which had thus accumulated since the appearance of the BYSTRÖM and STEIN atlases motivated a compilation of all the material now available into a map on the suitable scale of the Carte Internationale du Monde (IMW). Accordingly, in 1938, Dr. HEDIN proposed to Justus Perthes' Geographical Institute in Gotha the construction and publication of a general map of Central Asia in 18 sheets to the scale of 1 : 1,000,000, according to the rules outlined by the Commission of the IMW of the 10th International Geographical Congress in Rome 1913. The work was begun in 1939 at Gotha under the direction of Professor H. HAACK in close collaboration with the topographers of the expedition. In 1940—45 the sheets K-43 (Alma Ata), K-44 (Aqsu), and K-45 (Turfan) were completed and printed. Unfortunately, further work on the project was interrupted by the collapse of Germany in 1945.

In this situation, Dr. HEDIN entered into negotiations with the then Minister of Culture of the Chinese National Government, Dr. WONG WEN-HAO, concerning continued publication of the atlas in Sweden, the costs to be born equally by China and Sweden. This project could not, however, be realized.

In 1946, Mr. MARTIN SHALLENBERGER approached Dr. HEDIN on behalf of the Library of Congress, Washington, D.C. with an offer to realize the project. In June the same year a contract was signed between Dr. HEDIN and the Army Map Service, Washington, D. C. to the effect that the latter undertook the construction and printing of the atlas in a reduced state, viz. 13 sheets of the IMW (Pl. A), the printed edition to be delivered to Dr. HEDIN without any cost to him. A special edition for the internal use of U.S. governmental institutions was to be printed also. The senior author was to act as



ready for the printers in 1965. In the meantime, we have obtained from the N.A.S.A. a number of excellent colour photographs taken during space-craft flights 1965 and 1966 which have furnished much geographical details in the area concerned. This map, reduced to the scale of 1 : 750,000 is planned to be included in Vol. III of the Memoir.

According to the instruction left by Dr. HEDIN, the Atlas is to be accompanied by a "Memoir on maps". Vol. I of this Memoir contains besides a history of reconnaissances and surveys carried out by Dr. HEDIN 1893—1908 and by members of the Sino-Swedish expeditions 1927—35, also the principal geodetical data pertaining to the Atlas so far as such have not been recorded in our earlier publications.

In connection with the preparation of the triangulation charts a recalculation of the barometric altitude of the principal meteorological stations serving as base for the field surveys has been made with the assistance of meteorologist of the Meteorological Institute in Uppsala. This has led to the discovery of an error in our earlier calculation of the altitude of Khotan relative to the station at Kuchar, an error the more calamitous because the Khotan station served as base to the triangulation in the Outer K'unlun. The corrected altitudes are given in the table of trigonometrically fixed points which accompanies the triangulation chart Serial NJ-44: V-VIII, e-h (Khotan).

Vol. II contains an alphabetical "Index of geographical names" with transliteration and toponymy by D. M. FARQUHAR (Mongolian) and G. JARRING (Turki, Persian and Arabian), compiled by E. NORIN.

Vol. III which is still in preparation, contains, for each sheet of the Atlas, an account of the source-material used in the construction of the sheet, and description of the principal geographic features. There is also recorded the results of later terrestrial and space-craft explorations in Central Asia and Tibet as at present available to us.

In the course of the last twenty years extensive explorations have been made by Soviet and Chinese expeditions and by Chinese governmental surveys in Central Asia. Thus, large parts of the areas labelled "Unexplored" on our Atlas sheets have been subjected to more or less extensive aerial or terrestrial surveys, *inter alia*, the deserts of the Tarim Basin and Tsaidam. However, maps embodying the results of these later surveys are still difficult of access or unavailable to the general student. Pending the appearance of a new edition of the Central Asia sheets of the IMW, the release of the present edition may be considered justified.

When the SVEN HEDIN — CENTRAL ASIA ATLAS is now being issued we are glad to have the opportunity to express our admiration for the compilatory work done by the ARMY MAP SERVICE on the very extensive source-material of much varying quality and to acknowledge with gratitude our great obliga-

tions for the effective help extended to us in carrying out our part in the realization of the project. We are especially indebted to the Chief of the Department of Technical Service Mr. DANIEL C. KENNEDY (1946) and, later, Mr. PAUL ALEXANDER (1947—58) who were our principal contacts with the AMS throughout the compilation project. Constant assistance was also rendered by Miss ELEANOR ROWELL of the Analysis Division. To Dr. JOHN A. O'KEEFE and COLLABORATORS then at the Research and Analysis Branch of the Department of Geodesy we are extremely grateful for the painstaking analysis of the merits of AMBOLT's triangulations in the K'unlun and north-western Tibet which involved a recalculation of the field-measurements from some 80 stations. The present Chief of the Department, Mr. D. S. MILLS, has greatly facilitated our work by placing at our disposal the geodetic memoranda pertaining to the separate sheets of the atlas with evaluation of the source-materials.

In this connection manifold help has been generously rendered to us since 1963 by Mrs. IRENE FISCHER of the same department.

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The cost of printing this volume has been borne by SVEN HEDIN FOUNDATION which has also financed the processing of the greater part of the large material of data. Generous grants for parts of the laboratory work have been obtained from the SWEDISH NATURAL SCIENCES RESEARCH COUNCIL, and these are herewith gratefully acknowledged. We are also greatly indebted to Professor G. LILJEQUIST and Docent E. TENGSTRÖM, the respective heads of the Meteorological and Geodetical Institutes of the University of Uppsala, for invaluable assistance in the processing of the meteorological and the geodetical material here presented. Hearty thanks are due to Professor H. RAMBERG, head of the Mineralogical-Geological Institute, and his technical staff for all facilities placed at our disposal, to Mr. DONALD BURTON for correcting the language, and to Mrs. ANNA NORIN for much help with the manuscript and the proof-reading.