

## ACCOMPANYING TEXT FOR THE "HUNZA-KARAKORUM 1:100 000" MAP

With 1 supplement (III)

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*Zusammenfassung:* Begleitworte zur Karte „Hunza-Karakorum 1:100 000“

Der Deutsche Alpenverein brachte im vergangenen Jahr (1995) eine topographische Karte „Hunza-Karakorum 1:100 000“ heraus, die sowohl als Touristenkarte als auch als Basiskarte für geographische Forschungen in diesem Gebiet dienen soll. Die topographischen Grundlagen für diese Karte wurden im Rahmen zweier bergsteigerisch-wissenschaftlicher Expeditionen in den Jahren 1954 und 1959 geschaffen. In dem kurzen Begleitwort wird die Entstehungsgeschichte der Karte geschildert und ein Hinweis auf die angewandten kartographischen Darstellungsmittel gegeben.

### 1 Introduction

Notwithstanding geographical information systems, aerial photographs and satellite pictures, the topographical map remains the most important aid when it is a matter of supplying the spatial context for geographical statements. Official topographic maps exist to undertake this, as well as other tasks. Such maps are not yet available for many countries in the Third World, be it because topographical map series are incomplete or do not exist there at all, or that they are not generally available for reasons of state security. This applies particularly to the high mountain regions of Central Asia.

A modest contribution towards filling the cartographical lacunae in the high mountain regions of the world has been made by the German and the Austrian Alpenverein (FINSTERWALDER 1994). Working within its statutory terms of reference "to extend knowledge of the Alps (and other high mountain regions)", it has repeatedly applied itself to cartography as a part of its scientific mountaineering expeditions, and has published a series of maps of high mountain regions outside the Alps. Most of these map sheets continue to be sold as so-called "Alpenverein sheets". They include (with the year of publication in brackets):

1. From the Andes: Cordillera Blanca North 1:100 000 (1935), Cordillera Blanca South (1941), Cordillera Huayuash 1:50 000 (1939), Cordillera Real North 1:50 000 (1987), Cordillera Real South 1:50 000 (1990).

2. From the Pamir and Hindukush: Koh-e-Pamir 1:50 000 (1978), Koh-e-Keshnikan 1:25 000 (1978).
3. From the Himalaya: Nanga Parbat Group 1:50 000 (1936), Chomolongma-Mount Everest 1:25 000 (1957), Langtang Himal East 1:50 000 (1990), Langtang Himal West 1:50 000 (1990).

It should also be mentioned that the Nepal map series conducted by the Society for Comparative Research in High Mountain Regions (Arbeitsgemeinschaft für Vergleichende Hochgebirgsforschung e.V.), Munich, is greatly influenced by the cartography of the Alpenverein. The links were, and still are, chiefly of a personal nature. The Alpenverein cartographer, E. SCHNEIDER, has carried out the major part of mapping in the field, and F. EBSTER, another cartographer with the Alpenverein, played a leading role in the design of some of the sheets. The three last sheets "Kathmandu Valley 1:50 000", "Helambu-Lantang 1:50 000" and "Annapurna 1:100 000" are the result of work directed by the author of this contribution, who had for many years been in charge of German Alpenverein maps. This personal link does of course manifest itself in the production of maps, so that the conception and cartographic detail of the map sheets bear a close resemblance to those issued by the Alpenverein (FINSTERWALDER 1987).

Here the most recent Alpenverein map project for expeditions, the sheet "Hunza-Karakorum 1:100 000" (cf. supplement III) is to be briefly introduced. The presentation of the map and its commentary in this place is justified in part by the fact that the area shown in the map is one currently under geographical investigation, thus providing the topographical basis for it (cf. further contributions in this issue), and partly by its very long and involved history, an acquaintance which might prove helpful to its users.

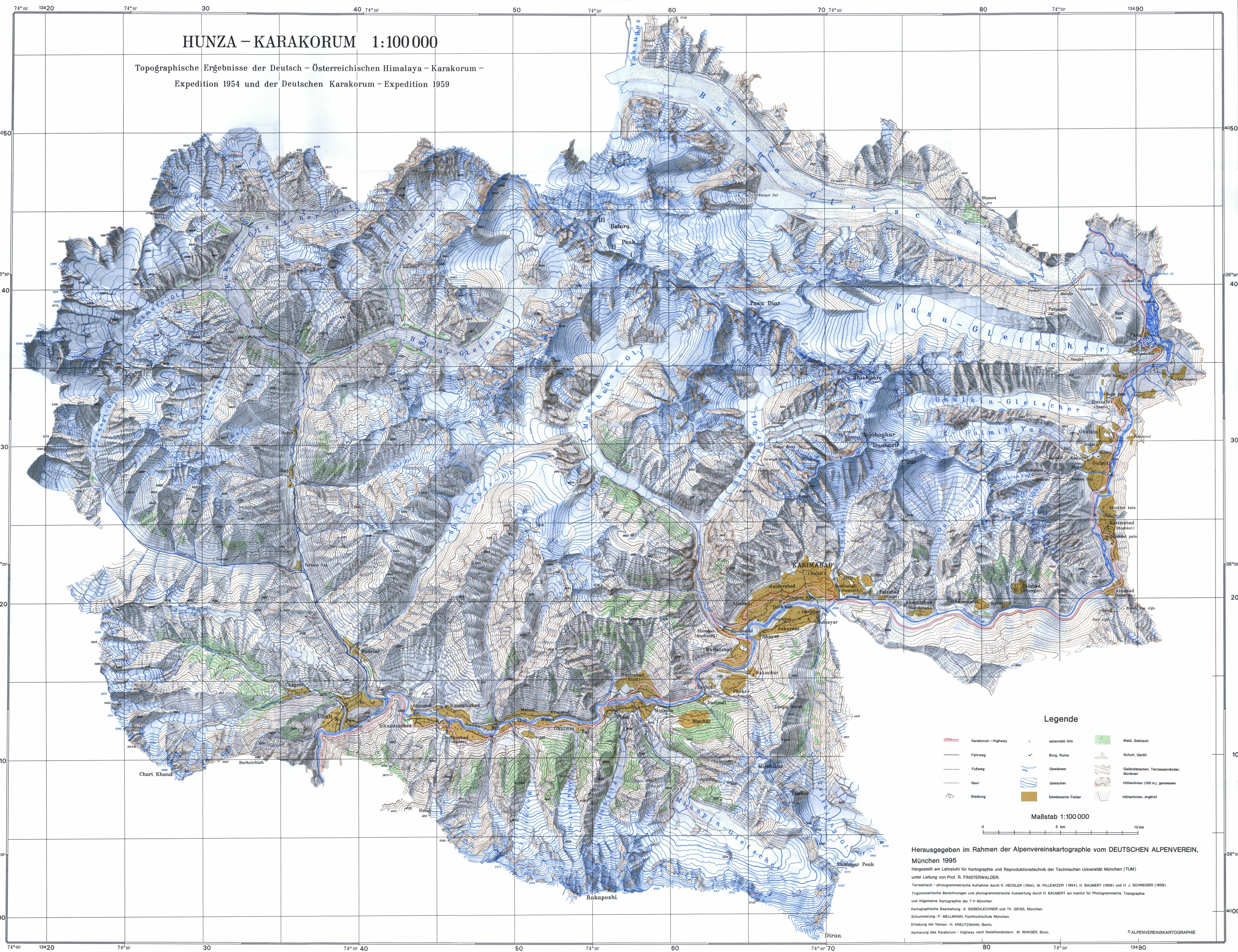
### 2 Origins

The origins of the map go back to the old tradition of the Alpenverein to combine mountaineering aims with scientific ones when mounting foreign expeditions, and to include mountaineers and scientists in the team.



# HUNZA – KARAKORUM 1:100 000

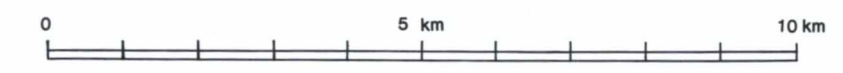
Topographische Ergebnisse der Deutsch – Österreichischen Himalaya – Karakorum – Expedition 1954 und der Deutschen Karakorum – Expedition 1959



### Legende

- Karakorum – Highway
- Fahweg
- Fußweg
- Spur
- Siedlung
- saisonale Alm
- Burg, Ruine
- Gewässer
- Gletscher
- bewässerte Felder
- Wald, Gebüsch
- Schutt, Geröll
- Geländekanten, Terrassenränder, Moränen
- Höhenlinien (100 m), gemessen
- Höhenlinien, ergänzt

Maßstab 1:100 000



Herausgegeben im Rahmen der Alpenvereinskartographie vom DEUTSCHEN ALPENVEREIN, München 1995  
 Hergestellt am Lehrstuhl für Kartographie und Reproduktionstechnik der Technischen Universität München (TUM) unter Leitung von Prof. R. FINSTERWALDER.  
 Terrestrisch – photogrammetrische Aufnahme durch K. HECKLER (1954), W. PILLEWIZER (1954), H. BAUMERT (1959) und H. J. SCHNEIDER (1959).  
 Trigonometrische Berechnungen und photogrammetrische Auswertung durch H. BAUMERT am Institut für Photogrammetrie, Topographie und Allgemeine Kartographie der TUM München.  
 Kartographische Bearbeitung: A. SIEBENLECHNER und Th. GEISS, München.  
 Schummerung: P. MELLMANN, Fachhochschule München.  
 Erhebung der Namen: H. KREUTZMANN, Berlin.  
 Kartierung des Karakorum – Highway nach Satellitenbildern: M. WINGER, Bonn.



This policy came into particular prominence in the joint German-Austrian Himalaya and Karakorum Expedition of 1954, when great emphasis was placed on the scientific component. The scientific programme at the time also included among other things the topographic mapping of c. 3000 km<sup>2</sup> in the northwestern Karakorum, including the Hunza river gorge through the Batura-Mustagh and the main peaks: Rakaposhi (7788 m) and Batura (7785 m). The area under investigation was subsequently to be represented in a 1:100 000 topographical map, which was in turn to provide the spatial linkage for numerous other research results of the expedition (PAFFEN, PILLEWIZER, SCHNEIDER 1956). The method employed was terrestrial photogrammetry, which had already proved itself in similar tasks in the world's high mountain regions. A total of about 400 photo plates at 74 photogrammetric base lines were exposed. These photo plates have a documentary value beyond their original purpose and allow changes in the region's natural and the man-made landscapes to be recognized and, if necessary, even for measurements to be carried out.

The geodetic base for mapping was provided by points in a triangulation chain which had been established 1912–1913 by the Survey of India along the Hunza Valley in order to connect the Indian with the Russian triangulation networks. Based on four points in this triangulation chain, a network of triangles had been laid out around the Batura main ridge by K. HECKLER, the expedition member who later came to grief (PILLEWIZER 1955). This triangulation network in turn served to map the photogrammetric stations. Due to difficulties posed by the terrain, and the size of the area under investigation, it was neither possible to produce a complete areal coverage – some major gaps remained, chiefly in the area around the Baltar, Mouchuhar and Pasu glacier, as well as the region north of Chalt – nor possible to calculate all the points in the upper reaches of the Batura glacier. Consequently a major gap in the photogrammetric work arose. (The entire Batura glacier has in the meantime been surveyed by the Chinese side and been represented in a 1:60 000 map; SHI YAFENG et al. 1980).

In 1959, when another scientific-mountaineering expedition (1959 German Karakorum Expedition) travelled to the Hunza-Karakorum, it was one of its tasks to make good the gap mentioned above, in order to achieve as homogeneous a mapping for the entire area as possible. Unfortunately the expedition was not granted permission to enter the area north of the Batura main ridge, so that verification and supplementary measurements in the Batura and the Pasu glacier

area could not be undertaken. To compensate for this, the area to be represented in the map was somewhat extended to the south and west.

The trigonometric calculations and the photogrammetric evaluations of the photo plates from 1954 and 1959 were carried out by H. BAUMERT, of the Institute of Photogrammetry, Topography and General Cartography at Munich Technical University. They resulted in five polychrome contour line plans at 1:50 000 with a 50 m equidistance between contours. What had been unavoidable in the process of terrestrial photogrammetric data collection, recurred here: there are considerable gaps even in these plans. Due to the extremely difficult terrain conditions, they are in part more than averagely substantial here. In order to close the gaps, the Indian Quarter Inch Map 1:253 440 was drawn on; thanks to data collected during the expeditions led by VISSER in 1925 and by SHIPTON in 1939, they presented a higher degree of accuracy than is customary in sheets of high mountain regions. In the contour plan, and in the 1:100 000 map that derives from it, the interpolations were indicated by broken contour lines.

A complete cartographic interpretation of the contour plans did not, however, take place. Only the "Minapin" part-sheet, which showed the least gaps, was completed as a sample sheet, and published as an Alpenverein 1:50 000 map (SCHNEIDER u. BAUMERT, 1968).

Interest in a map of the entire area covered by the expedition and at the scale originally planned only resurfaced when the Karakorum Highway had been completed and Hunzaland had been discovered for tourism, and become the object of numerous geoscientific projects. The German Alpenverein decided to publish a "Hunza-Karakorum 1:100 000" map, which is intended to serve tourism, to document the topographical results of both its expeditions, and last not least to serve as a base for further geographical research.

### 3 Cartographic work

The map was produced under the aegis of the Chair of Cartography and Reproductive Techniques at the Technical University of Munich, under the direction of the author. It is accompanied by a few notes on some of its particular elements.

*Framework and projection:* The starting points of the Survey of India had been based on geographical coordinates, which refer to the Hayford ellipsoid (BAUMERT 1960). These geographical coordinates have

been transferred into projection coordinates, Gauß-Krüger coordinates to be precise (central meridian 75° E, 3° strips, Bessel ellipsoid). All subsequent calculations, as well as entry of points, took place within this system of coordinates, which is the reason for entering the grid lines of the Gauß-Krüger system in the map at 5 cm intervals, corresponding to 5 km in nature; they are in black and numbered. The sectioning of the map, on the other hand, followed geographical co-ordinates, the limits being the latitudes  $\varphi_1 = 36^\circ 07'$ ,  $\varphi_2 = 36^\circ 39' N$  and the longitudes  $\lambda_1 = 74^\circ 05'$ ,  $\lambda_2 = 74^\circ 57' E$ . This map is thus one showing the earth's surface between two meridians on a Gauß-Krüger projection. The pervading grid system has the effect of making the irregularly shaped area represented by the map ("Island Map") also seen optically as fixed in coordinates.

*Presentation of the terrain:* The presentation of the terrain is primarily determined by the contour lines. This ensures that the relief of the map, which is, after all, also intended to serve research, appears throughout as open to measurement. The equidistance between contours was uniformly set at 100 m. The 50 m contour lines of the 1:50 000 photogrammetric contour line plans had to be omitted, since, in view of the steepness of the terrain, it would have been graphically impossible to reproduce the lines at a scale of 1:100 000. In places even the 100 m lines had to be slightly shifted, and the thickness of the line had to be reduced in order to facilitate their separate recognition. On the other hand, the 500 m index contours are shown boldly, thus permitting easier registration of the altitudinal differentiation of the terrain.

Rock drawing is omitted, as it would have involved a very considerable amount of work, and also because boundaries of the rock had been incompletely noted in the contour line plans. For the same reason the choice of colour for contour lines fell on a uniform brown, except for the glacier region. However, small features in the terrain which were either insufficiently picked out or omitted altogether by the 100 m contour (terrace edges, moraines etc.), could often be presented as hatchings, again coloured in brown.

When the presentation of the terrain by contour lines nonetheless looked a little abstract, it was decided to bring it a little more to life by adding a strong shading, with the light coming from the northwest. This has been done in very fine detail; to a certain degree it

even classifies the terrain forms in the rock, though the main requirement of illuminating the macro-forms of the terrain was fully met. The colour chosen for the shading is a uniform grey, seemingly veering towards blue on the glaciers, thanks to the blue contour lines.

*Groundcover, vegetation:* In the case of snow and (glacier) ice the kind of groundcover is shown by blue contour lines and a dotted borderline. Areas with a covering of boulders and scree are characterized by irregularly applied dots in brown.<sup>1)</sup>

Regarding vegetation, areas with forest or shrub were shown, as were irrigated agriculturally utilized ones. Woodland and shrub are combined in accordance with the photogrammetric evaluation, and indicated by a green, irregular screen. The structural screen points to the fact that the woodlands tend to be discontinuous somewhat rather than uniform vegetation covers. That is also the reason for not indicating a forest line in the form of a continuous line.

The irrigated areas surrounding the settlements along the Hunza valley are indicated by an ochre hue and a dotted green line. Not unlike the glacier blue before, the ochre hue contributes in the sense of a hypsometric tinting. The cultivated areas have been brought up to date according to data supplied by H. KREUTZMANN.

*Settlements, transport network and names:* settlements were represented in accordance with the photogrammetric mapping (state as in 1954 and 1959), and show individual houses. A special symbol (triangle) was adopted to mark seasonal pastures, which are a common feature in the map area. Their individual positions and names were subsequently determined by H. KREUTZMANN, so that in this respect, the map shows a more up to date state than for the permanent settlements.

Insofar as it is based on photogrammetric mapping, the road network is rendered in black, whereas the Karakorum Highway, a rough sketch of which was supplied by M. WINIGER in accordance with spot satellite pictures, appears in red, in order to differentiate it from the old transport network. The same applies to feeder roads in the Karimabad District. Since costs prevented the implementation of a systematic comparison in the field for the area under investigation, the road network's representation in the map is as full of gaps as the visibility in the photo plates.

The names which appear in the map have, however, recently been investigated and actualized by H. KREUTZMANN. The classification and spelling of names in the map stem from him. Bearing in mind the recent re-naming of places, the new name was given precedence with the former one appearing in brackets behind – as in Karimabad (Baltit). The choice of script

<sup>1)</sup> The extent of glaciers, especially in the case of tongue regions, show their state in 1954 and 1959. Some glacier positions (the Hassanabad glacier, for example) may well be quite different now.

was also intended to point up the distinction between objects. Vertical *antiqua* lettering thus marks settlements, vertical *italics* mountains and glaciers, while thin *antiqua* with a slant to the right was chosen for seasonal pastures, and thin *grotesque* lettering for field

names. Names for waters and glaciers continue the practice of rendering them, as well as the heights of firn-peaks, in blue. A total of seven colours was employed in the printing of the map: black, blue, brown, red, green, ochre and grey.

### References

- BAUMERT, H. (1960): Die Vermessungsarbeiten im NW-Karakorum 1959. In: Zeitschr. f. Vermessungswesen 10, S. 292–295.
- FINSTERWALDER, R. (1987) The new Sheet HELAMBU-LANGTANG of the Nepal Map Series produced by the Arbeitsgemeinschaft für Vergleichende Hochgebirgsforschung. In: Mountain Research and Development 7, S. 347–351.
- (1994): 25 Jahre Kartographie beim Deutschen Alpenverein. In: 125 Jahre Deutscher Alpenverein – Schlaglichter auf die Entwicklung von 1969–1994. Deutscher Alpenverein, München, S. 83–92.
- PAFFEN, K. H.; PILLEWIZER, W. u. SCHNEIDER, H. J. (1956): Forschungen im Hunza-Karakorum. In: Erdkunde 10, S. 1–32.
- PILLEWIZER, W. (1955): Das Werk Karl Hecklers im Karakorum. In: Bildmessung und Luftwesen 23, S. 45–48.
- SCHNEIDER, H.-J. u. BAUMERT, H. (1968): Die Expeditions-karte Minapin/NW-Karakorum 1:50 000. In: Zeitschr. f. Vermessungswesen 93, S. 446–457.
- SHI YAFENG et al. (1980): Professional Papers on the Batura Glacier, Karakorum Mountains. Lanchow (China).