

THE NEPAL-GERMAN RESEARCH PROGRAMME ON SETTLEMENT PROCESSES IN MUSTĀÑ (NEPĀL) AND THE CASE OF KĀGBENI

Willibald Haffner and Perdita Pohle

1. TOPIC AND AIMS

With the beginning of the year 1992, an interdisciplinary research programme was started by the Nepalese Department of Archaeology and the German Research Council (Deutsche Forschungsgemeinschaft). The topic of this Nepal-German research programme dealt with settlement processes and the formation of states in the High Himālayas, characterized by Tibetan culture and tradition, a programme conceived to last for a period of at least 6 years. At the upper limit of habitation the establishment and decay of settlements as well as the rise and fall of state entities were studied as processes together with their effects on the structuring of space. This interdisciplinary programme, with a primary base in the humanities and cultural sciences, was initiated by Tibetologists and architectural historians, designed by representatives from the fields of settlement archaeology, historical settlement geography and ethnology, and methodologically rounded out by the disciplines in the natural and engineering sciences, e.g. dendrochronology and photogrammetry/cartography (Fig. 1). As far as the scope of inquiry and the thrust of research were concerned, the programme concentrated on the territory of the whole Tibetan Himālayas, while the field work was carried out on exemplary areas in:

- the Mustāñ District of northern Nepāl, well known for its old trade- and pilgrimage routes,
- and in the high-mountain valley of the Indus in Ladakh (Fig. 2).

Reasons both scientific and pragmatic in nature led to this decision: for all areas of scholarly study concerned with Tibet and its culture, the Tibetan Himālayas are currently the most important region for conducting research. There, Tibetan culture continues to be kept alive, lived out in practice and is further developed. A number of things favoured the choice of Mustāñ and Ladakh as the sites for field research - in particular, their settlement history, which dates back to prehistoric times, and their great amount of historically exploitable sources, chiefly written sources but also ones bearing on archaeology and architectural and settlement history.

The studies in the Tibetan Himālayas thus bear witness to several thousand years of settlement and cultural history, during which extensive migration and cultural assimilation, along with warfare and other forms of conflict took place. In the beginning of the research programme the fundamental facts were unknown, starting with the most elementary ones: the chronological specification of the various settlement phases. What the research programme envisaged, however, was not so much documentation surveys being carried out by projects of interest to archaeology and settlement geography as rather resolving unanswered questions concerning the rise and fall of settlements and states, that is, the close connection between settlement processes and the formation of states.

The settlement processes and the formation of states in the Tibetan Himālayas, particularly in the highest elevations of the habitational zone, should not be viewed in isolation from the likewise constantly changing natural environment; the dependencies and reciprocal relations between man and the not seldom threatening aspects of nature in the high mountains are all too obvious. In a systematic approach, therefore, the concern was first to analyze the numerous relations between the growth of settlements and the stages of social and economic development, and secondly to pursue the implications of the dependence of man on an environment that can truly be called extreme.

Methodologically, the project embraced a twofold approach (cf. POHLE, 2000a:17ff.). The intention on the one hand was for archaeologists, Tibetologists, historical settlement geographers and dendrochronologists, among others, to study the past by evaluating as broad a spectrum of sources as possible. Secondly, starting from a perspective in the present, the development of the settlement area was followed step by step back into the past (retrospective method) - an approach that is used primarily by settlement geographers, but also by architectural historians, architects and ethnologists. Furthermore, the attempts were made to achieve the application of methods and working procedures of historical-genetic settlement research (settlement archaeology and geography, dendrochronology, architectural history), whose use has previously centered for the most part on Central Europe, to the Tibetan Himālayas, that is, to a cultural domain that has hitherto been neglected by historical research, it being at the same time a natural domain whose ecological conditions are extreme.

Beyond these somewhat more methodologically oriented aims, however, a further concern of the research programme was to maneuver established, highly specialized disciplines out of their isolation by selecting themes and research topics that can be dealt with only through an interdisciplinary approach. Thinking that reaches beyond the borders of single disciplines should be considered not as an overstepping of specialized competence but as a challenge to engage in interdisciplinary cooperation. Research carried on in isolation, as the studies have shown, very soon reach the limits of what is possible in terms of method and content, and also in terms of the practical conduct of research. The energy expended on planning, organizing and carrying out research work under extreme conditions often cease to bear any relation to the results achieved.

2. THE REGION UNDER STUDY

With its extreme elevations, its dry climate and its high-lying mountain valleys inhabited by Tibetan ethnic groups, the Tibetan Himālayas form a geographic unit that extends in the west as far as Ladakh and in the east as far as Bhutan (Fig. 2); its natural and cultural features set it off clearly from the surrounding regions.

Among the characteristics of this habitat are:

- its unique natural setting: extreme elevations, climatic aridity, sparse vegetational covering,
- its unique location on the periphery, as seen from the governmental centers, and
- its situation at the point of interaction between two high cultures: the Tibetan-Buddhistic in the north and the Nepalese/Indic-Hindu in the south.

Thus, while the main crest of the Himālayas represents a sharp natural divide between the southern side of the range, moistened by monsoon rains, and the arid northern side, which is protected from the rains, it in no way forms a cultural divide. In the central Himālayas, ethnic groups of Tibetan origin and tradition also have settled in the high-mountain valleys on the south side of the range, particularly in transverse valleys and along mountain passes. The following points pertaining to the ecology and culture were crucial for the decision to concentrate efforts spatially on the region of the Tibetan Himālayas:

Ecologically, the Tibetan Himālayas are a habitat of extreme living conditions for humans. The rough topography, the inhospitable features of the high-mountain climate, the threat posed by natural hazards (earthquakes, landslides, outburst of glacier-lakes) are ecologically limiting factors for the economy of the high-mountain dwellers (Fig. 3). They limit the area available to human life pursuits to island-like valleys and basins. The ecologically favoured zones lie principally at the foot of glaciated mountain ranges, whose flow-off of water ensures the irrigation of fields. As the relation between man and environment must be considered to be particularly sensitive in the ecological border regions, the thesis was put forward in the programme committee, that a deeper understanding of the processes of settlement rise and decay can only be achieved if one starts out on the basis of an environmental analysis that is relevant to present conditions and integrates questions concerning the history of the ecological environment into the overall picture.

From a *cultural point of view*, the transverse valleys of the Tibetan Himālayas have been traditional transit areas, but due to their remoteness, areas of cultural isolation at the same time - an approach not only to explain the ethnic, linguistic and religious diversity but also to explain the conservation of cultural relics, both documented within the cultural landscape. The Tibetan Himālayas today represent the most significant refuge for Tibetan religion and livelihood (Fig. 4 and 5). Given the destruction of monastic culture and the drastic changes in social and economic structures in Tibet, Tibetan tradition and high culture, documented in a unique form of architecture, and in a rich literature, has been preserved mainly here, being available for study by Tibetological research. The Tibetan Himālayas were doubtless an unexplored field of research for the disciplines integrated into the research programme.

3. HIGH-MOUNTAIN ENVIRONMENT AND SETTLEMENT PROCESSES

The first field research begun in the autumn of 1991, in the southern Mustāñ District. The work, combining the disciplines of cartography, architectural history and above all settlement geography, concentrated at first on the example offered by the village of Kāgbeni situated at the confluence of the Dzoñ Chu into the Kāli Gaṇḍakī river.

The aerial photograph (attached to this article) taken from a helicopter shows the village of Kāgbeni, the surrounding fields and countryside in the valley of the Kāli Gaṇḍakī in northern Nepāl. The predominating grey and brown sand colours are reminiscent of the dry Tibetan plateau. The view extends far down the valley southwards to the main crest of the Himālayas with the glaciated 8167-metre pyramidal summit of Dhaulāgiri. Situated in the rain shadow of the High Himālayas, the region experiences so little precipitation (200-300 mm/year) that the

cultivation of crops is only possible in artificially watered oases. Fluvial fan plains that project out from side valleys into the main valley of the Kāli Gaṇḍakī are favoured locations for settlement and irrigated agriculture. This applies in particular to the village of Kāgbeni (2820 m), located on the fan plain of the Dzoñ Chu (Fig. 6): sediments recently deposited on the fan plain can as a rule be easily tilled; the slightly inclined surface facilitates the layout of a network of irrigation channels sufficiently supplied with water the whole year round by the glacier-fed Dzoñ Chu. A suitably long vegetational period allows for two harvests in the fields: winter barley and buckwheat (cf. POHLE, 2001). Harvest yields on the calciferous, well fertilized and irrigated soils are strikingly high, attaining not seldom a 15-fold return on the initial seed. Still, they are not enough to feed a family for the entire year, as the cultivated plots are extraordinarily small, and do not exceed an average of 0.6 ha. For this reason, besides animal husbandry, trade with Tibet has traditionally been important, and since the 1970ies tourism offered additional income. Apple trees have been cultivated over the past three decades with astonishing success, but except for pilgrims and tourist trekkers who stop over in Kāgbeni, there is little demand.

The landscape, redolent of Tibet, obviously exercises a particular fascination over trekkers. The village of Kāgbeni with its densely crowded houses, carefully parcelled and terraced fields, the palace ruin and the red gompa, a Buddhist temple visible for miles around, attracts large numbers of tourists. The harmony of a natural and cultural landscape offered by the photograph taken from the air in autumn 1991 is nevertheless misleading: the mountain village of Kāgbeni has had to fight against ecological problems and natural hazards that may occasionally take on catastrophic proportions - and this since many centuries.

What has proved to be a special kind of ecological handicap in climatic terms, and is regarded as unpleasant both by the native population and by tourists, are the daily recurring valley winds that are familiar to the transverse valleys of the Himālayas. These thermal induced anabatic winds compensate the horizontal gradient of temperature respective of air pressure between the Himālayan foreland and the Tibetan high plateau north of the main Himālayan range. The valley wind, which in the summer sets in around 10 o'clock, and in the winter around 12 o'clock, quickly and uniformly attains storm-force values of between 70 and 90 km/h, subsiding only towards sunset (cf. HAFFNER, 2001). One constant peril, for example, is represented by the stones set rolling by the wind onto the path that leads along the cliff opposite Kāgbeni (Fig. 6). It was only to be expected that the modern wind generators should have since been torn to pieces by the strong, gusty winds. The only oases of windlessness during the day are the zigzag village lanes and the enclosed inner courtyards of the houses.

Along with the wind, the erosive power of the water plays an important role in ecological terms. Annually, during the monsoon period in summer, and coinciding with the melting of snow in the high mountains, the flow of water in the Kāli Gaṇḍakī rises to from 12 to 14 times its former rate, and the erosive power of the river increases correspondingly. It is particularly parts of the settlement, including the gompa, as well as entire portions of the agricultural land, that are most at risk from the regular erosive undercutting of river terrace rims.

Of catastrophic effort, finally, is the sudden outburst of glacier- or moraine lakes. According to our information, the last bursting of a glacier lake occurred at Thoroñ Pass in the early 1960ies.

The flood produced thereby considerably widened the bed of the Dzoñ Chu, as can still be clearly seen today (Fig. 6), and also swept away groups of houses and portions of the farmland. A similar type of catastrophic flood occurred in August 1987, in this case caused by a flooding of the Kāli Gañḍakī. The outburst of lakes dammed by glaciers or moraines and the resulting flood wave are not only a constant source of danger for settlements in valley locations, but also can alter or destroy the traditional irrigation systems by shifting or deepening the channel beds.

4. ABANDONED SITES AS EVIDENCE OF SETTLEMENT PROCESSES

Whether it is the case, though, that the numerous deserted settlement sites and abandoned fields in Mustāñ are the result of natural hazards or whether other reasons (economic, political, religious) were the decisive ones is a question that engaged the energies of the research programme during the years. The ruins of settlements, fortresses, palaces and monasteries, abandoned fields and deserted groups of once inhabited caves are a striking feature of the cultural landscape of the Tibetan Himālayas, being common in northern Nepāl, Ladakh and Tibet. As the most important evidence for past cultural conditions alongside historical texts (e.g. legal documents, village chronicles; e.g. PANT & PIERCE, 1989; SCHUH, 1990, 1994, 1995), they may provide an idea of who the one-time inhabitants were and the latter's economic way of life, their territorial conflicts and the past phases of settlement rise and decay. The climatic aridity and low settlement density have been essential contributing reasons why settlement ruins have been well preserved and clearly visible up to the present, and thus subject to mapping by means of field surveys and aerial photographic analysis. If there is still a long way to go in the study of the causes of the abandonment, nevertheless, from the distribution and typology of the abandoned sites, preliminary statements can already be made as to why such a heavy concentration of relic-related elements occur where they do - for example, in the Muktināth valley. An explanatory approach based on a single cause may certainly be ruled out from the start: the joint influence of natural and cultural factors in this region is too complicated.

If one takes a look at the map (Fig. 7), the large concentration of abandoned sites in the region of Bārāgāū in southern Mustāñ is immediately apparent. Highly diverse types of such sites (anthropogenic caves, abandoned settlements and fields, fortress/palace and monastery ruins) lie along rivers between 2800 and 3700 m as well as in the valley basins of the side valleys of the Kāli Gañḍakī, where conditions are favourable for settlements. The valley of the Dzoñ Chu with its more than 58 documented abandoned sites within a stretch of only 10 km displays a particularly high concentration of such sites.

Archaeological investigations of *cave systems* and *terrace settlements* in southern Mustāñ (Fig. 8) provide evidence of at least three thousand years of history (SIMONS & SCHÖN, 1998). The most striking relics are the anthropogenic caves, formerly serving various functions, e.g. as burial places, habitations, places of refuge, storage facilities. Numerous separate caves were here combined into complexes, hollowed out of the conglomeratic cliffs into storeys one over the other. Today they are preserved for the most part as fragmentary systems, the steep walls of conglomerate from the glacial period being extremely subject to erosion. One needs to ask how the caves were accessible in the first place to their former dwellers, as nowadays they are

mostly located at unattainable heights. The location of the bigger cave systems, with their favourable exposure to the sun, is striking - an indication that the early cultures had climatic and ecological considerations in mind when choosing the sites. Cave systems of this type are common not only in Mustāñ District, but also in south-western Tibet, particularly in the former kingdoms of Guge and Purang. Only excavational and related research work undertaken by archaeologists will be able to produce secure results concerning the prehistoric use of these caves. Their present-day scattered use as meditation caves and buddhist temples (Purang), together with numerous wall paintings and reliquaries, point to a more recent, religious motivated phase of use, which must have begun at the earliest during the introduction of Buddhist teaching in Tibet in the 7th century AD.

Settlement ruins are situated in front of the two largest cave systems (Phudzeliñ, Mebrak) of the Dzoñ Chu valley, and in the case of Phudzeliñ (Fig. 7 and 8) there are also abandoned fields (cf. SCHÖN, 2001; SIMONS, 2001). According to the present state of research the earliest proofs of settlement activity were not gained from the caves but from the terrace settlements in front of the caves dating back until 1200 BC (Mebrak) and even 1500 BC in the case of Phudzeliñ (SIMONS & SCHÖN, 1998). In contrast, the ¹⁴C-datings of the caves go back only until around 800 BC. The remains of the two settlements still visible today, were most probably intact and inhabited during the period from 900 - 1600 AD. The remaining walls show that the buildings were constructed right up against each other, as is still current practice in the villages of Mustāñ today.

Whereas about the establishment and abandonment of the cave systems nothing has been handed down, either in the written or in the oral tradition, there is extensive oral and written material available concerning the founding of the *fortresses/ castles* of the Muktināth valley that today lie in ruins (cf. KRETSCHMAR, 1985; JACKSON, 1978, 1984; SCHUH, 1990, 1994, 1995). The fortresses of the Muktināth valley (Fig. 7) - Dzoñ, Kak (Kāgbeni) and Dzar (Jhārkoṭ) - presumably were constructed in the middle of the 16th century by members of a Tibetan noble family. They are situated at strategically favourable locations - the fortress of Dzoñ is one example of this (Fig. 9) - and expressed the political and economic power of the local territorial princes, who reigned for over three centuries. With the campaigns of conquest undertaken by the Gorkhā kings at the end of the 18th century, the rise of the kingdom of Nepāl and, above all, the suspension of taxation authority during the 19th century (Rānā rule; cf. REGMI, 1970-89; SCHUH, 1994:52), the territorial princes were deprived of their economic and political preeminence. A visible expression of the gradual loss of power was the decay of the fortresses and palaces, which in Kāgbeni was speeded along by an earthquake. Closely associated with the change of local political power structures were the founding of new settlements and the abandonment of old ones. In comparison with the case of fortresses, the reasons for these settlement processes are far less understood. Similarly fragmentary is the present level of knowledge concerning the numerous decayed *monasteries* (Fig. 7) in that region. Muktināth is still today one of the most significant Hindu and Buddhist pilgrimage centers of the Himālayan region, but formerly it attracted not only pilgrims but also representatives of a wide variety of religious schools, which established there an institutional presence for themselves (cf. EHRHARD, 1993). Numerous monasteries that today lie in ruins bear testimony to the former period of Buddhist flowering.

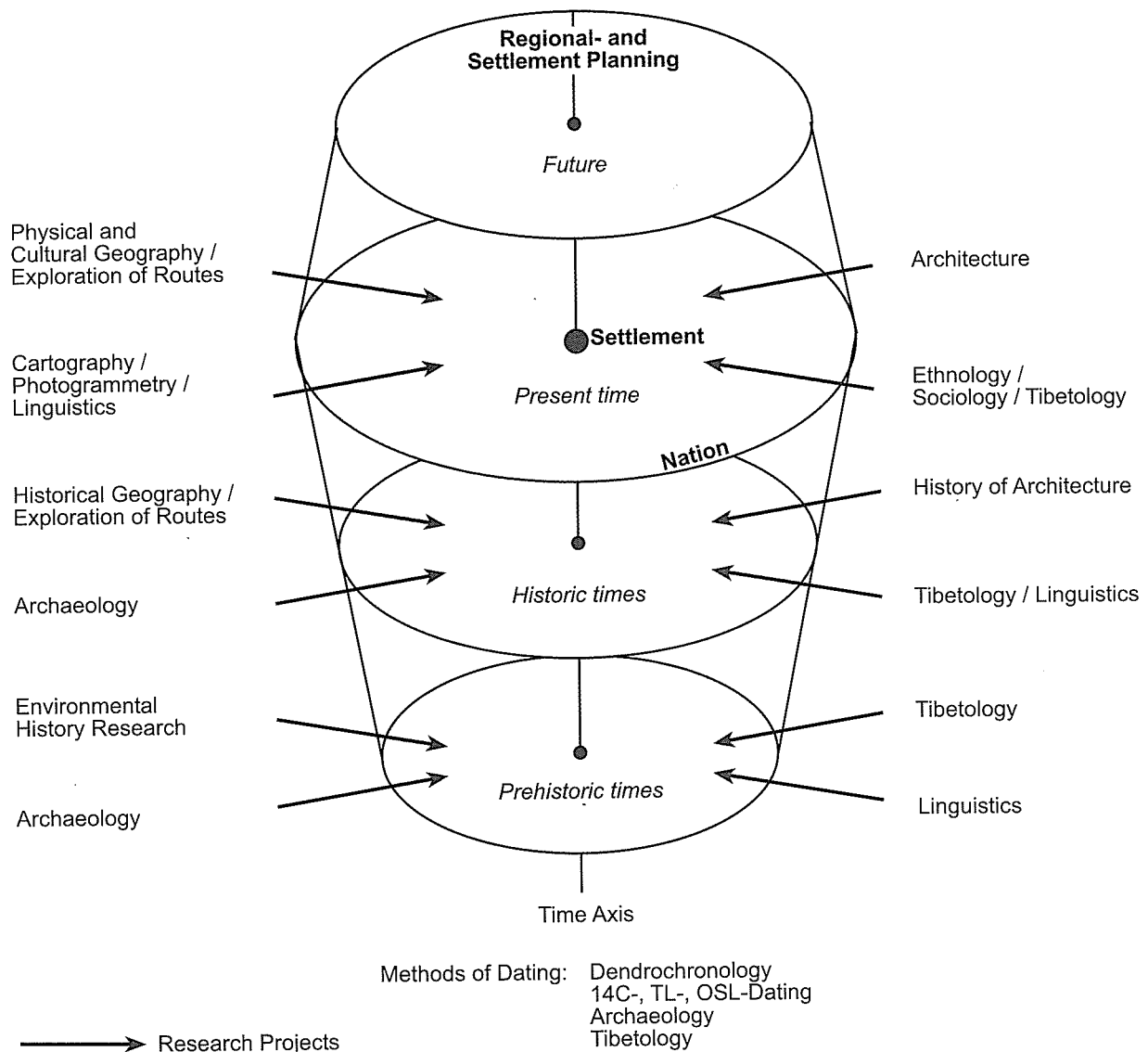
Besides the abandoned sites, other important elements of the cultural landscape of Mustān are the *rock engravings* (Fig. 10), providing a unique source for research in cultural history and geography (cf. POHLE, 2000a,b). Only a few rock art sites are so far known to exist in the Himālayas. They are located in northern India, in Ladakh and Zaskar. These two regions are part of the Tibetan Himālayas (Fig. 2). Considering the scarcity of known rock art in the Himālayas, the discovery of the rock engravings of Kak Nyiñba in southern Mustān (Fig. 7) was an important one, especially in view of the fact that no rock art had been documented in Nepāl up until then. The petroglyphs of Kak Nyiñba were found in 1993, two further sites of rock engravings (Samar, Te) were found during field trips to northern Mustān in 1995. The rocks of Kak Nyiñba must have been used as a "writing surface" over a long period of time. This is indicated not only by the different degrees of weathering and repatination of the engraved rock surfaces, but also by the high variability in the rock art motifs, styles, and techniques represented. Indeed, further features suggest that the Kak Nyiñba petroglyphs go back to prehistoric times - for example, the use of stone tools in making the pictures and the large number of superimpositions of rock art figures, signs and symbols.

In summary, it may be said that we are dealing with a high-mountain region which has been inhabited for thousands of years and been culturally influenced by different ethnic and cultural groups, and which has had a very chequered history, including military conflicts, periods of economic and religious prosperity, but also periods of decline. The reason why Mustān has repeatedly seen the site of military conflict during its history is presumably connected with its geographical location. In extending from north to south along the Kāli Gaṇḍakī valley, the region joins in an ideal manner the high plateau of Tibet with the Nepālese Himālayan foothills and so with India. Even in earlier times, the Kāli Gaṇḍakī was thus a favoured route of trade (FÜRER-HAIMENDORF, 1975; GRAAFEN & SEEBER, 1992-93) along which primarily grain from the south was transported in large caravans to Tibet, and salt from the north to Nepāl and India. The ability to exercise control over such a route has meant from times long past political power on the one hand and economic gain on the other. If settlement remains of the most diverse type and age are massed in this region, and if all rock art sites hitherto discovered in Nepāl are situated there, then this is only one more indication of the special historical dynamics at work in the Himālayan transverse valley of the Kāli Gaṇḍakī.

REFERENCES

- EHRHARD, F.K., 1993: Tibetan Sources on Muktinath. *Ancient Nepal - Journal of the Department of Archaeology*, 134:23-41. Kathmandu.
- FÜRER-HAIMENDORF, C. v., 1975: *Himalayan Traders. Life in Highland Nepal*. London.
- GRAAFEN, R. & SEEBER, C., 1992-93: Important Trade Routes in Nepal and Their Importance to the Settlement Process. *Ancient Nepal*, 130-133:34-48. Kathmandu.
- HAFFNER, W., 2001: Kāgbeni - Contributions to the geocology of a typical village in the Kāli Gaṇḍakī valley. In: POHLE, P. & HAFFNER, W. (eds.): *Kāgbeni - Contributions to the village's history and geography*. Giessener Geographische Schriften, 77. Giessen.
- JACKSON, D.P., 1978: Notes on the History of Se-rib, and nearby Places in the Upper Kali Gandaki Valley. *Kailash*, 6(3):195-227. Kathmandu.
- JACKSON, D.P., 1984: *The Mollas of Mustang. Historical, Religious and Oratorical Traditions of the Nepalese-Tibetan Borderland*. Dharmasala.
- KOSTKA, R., 1993: Cartographic Activities in the Mustang District. *Ancient Nepal - Journal of the Department of Archaeology*, 134:82-88. Kathmandu.
- KRETSCHMAR, M., 1985: *Südmustangs Erzählgut und seine mündlich überlieferte Geschichte*. (manuscript)
- LIENAU, C., 1986: *Ländliche Siedlungen*. Das Geographische Seminar. Braunschweig.
- PANT, M.R. & PIERCE, P.H., 1989: *Administrative Documents of the Shah Dynasty Concerning Mustang and its Periphery (1789-1844 A.D.)*. *Archiv für Zentralasiatische Geschichtsforschung*, 10. Bonn.
- POHLE, P., 2000a: *Historisch-geographische Untersuchungen im Tibetischen Himalaya. Felsbilder und Wüstungen als Quelle zur Besiedlungs- und Kulturgeschichte von Mustang (Nepal)*. Giessener Geographische Schriften, 76/1 Text, 76/2 Abbildungen. Giessen.
- POHLE, P., 2000b: *Rock engravings of Mustang (Nepal) - a unique source for research in cultural history and geography*. In: THAPA, R.P. & BAADEN, J. (eds.): *Nepal - Myths & Realities*: 521-536. Delhi.
- POHLE, P., 2001: *The cultural landscape of Kāgbeni - Geographical investigations into the present-day land use system*. In: POHLE, P. & HAFFNER, W. (eds.): *Kāgbeni - Contributions to the village's history and geography*. Giessener Geographische Schriften, 77. Giessen.
- REGMI, M.C. (ed.): *REGMI RESEARCH SERIES 1970-89*. Kathmandu.
- SCHÖN, W., 2001: *Archaeological investigations in the open settlement site of Phudzeliñ*. In: POHLE, P. & HAFFNER, W. (eds.): *Kāgbeni - Contributions to the village's history and geography*. Giessener Geographische Schriften, 77. Giessen.
- SCHUH, D., 1990: *The Political Organisation of Southern Mustang During the 17th and 18th Centuries*. *Ancient Nepal*, 119:1-7. Kathmandu.
- SCHUH, D., 1994: *Investigations in the History of the Muktinath Valley and Adjacent Areas, Part I*. *Ancient Nepal - Journal of the Department of Archaeology*, 137:9-92. Kathmandu.
- SCHUH, D., 1995: *Investigations in the History of the Muktinath Valley and Adjacent Areas, Part II*. *Ancient Nepal - Journal of the Department of Archaeology*, 138:5-54. Kathmandu.
- SIMONS, A., 2001: *Phudzeliñ: The cave system and its occupation from prehistoric times onwards*. In: POHLE, P. & HAFFNER, W. (eds.): *Kāgbeni - Contributions to the village's history and geography*. Giessener Geographische Schriften, 77. Giessen.
- SIMONS, A. & SCHÖN, W., 1998: *Cave Systems and Terrace Settlements in Mustang, Nepal. Settlement Periods from Prehistoric Times up to the Present Day*. In: *Beiträge zur Allgemeinen und Vergleichenden Archäologie*, 18:27-47. Mainz.

Settlement Dynamics and Nation Building as Interdisciplinary Research Task



Draft: W. Haffner, P. Pohle

Fig. 1: Settlement processes and the formation of states as interdisciplinary research task (altered draft of LIENAU, 1986).

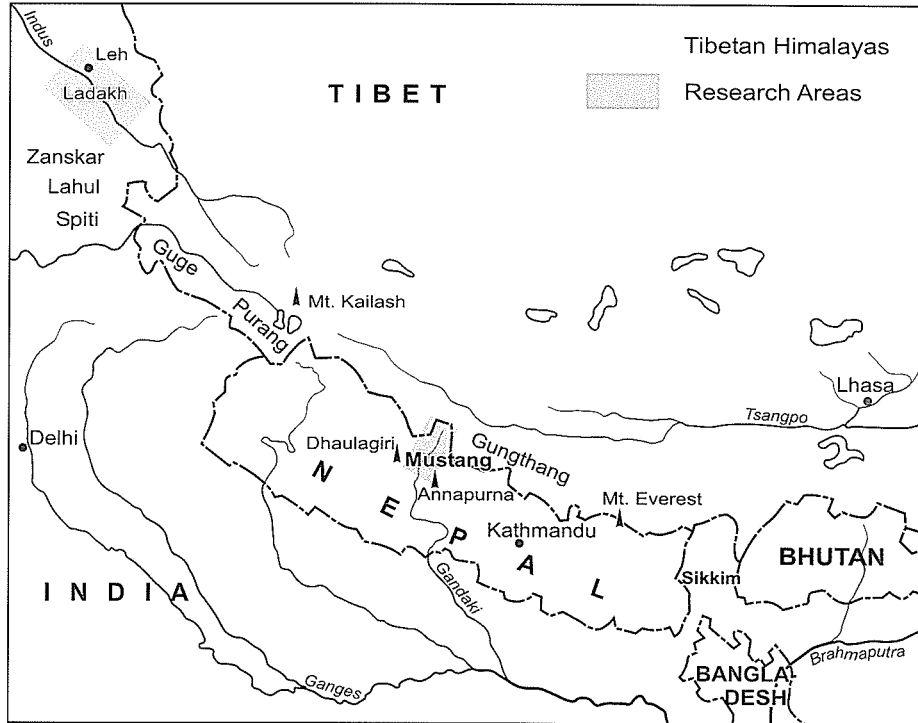


Fig. 2: The Tibetan Himālayas as spatial frame of the Nepal-German research programme and the particular research areas.



Fig. 3: The inhospitable natural landscape of northern Mustān with the Kāli Gaṇḍakī river cutting through the Mustān-Graben. Climatic aridity, sparse vegetation cover and strong winds cause a deeply eroded landscape with only scattered settlements in irrigated oases (Photo: P. Pohle, Oct. 1995).



Fig. 4: Woman on the roof top of the Red House Lodge in Kāgbeni. In the background the ruins of the Kāgbeni palace (Photo: G. Kasperek, Sept. 2000).



Fig. 5: "Meme" Tsering from Kāgbeni with a Lopa friend (Photo: P. Pohle, Oct. 1993).

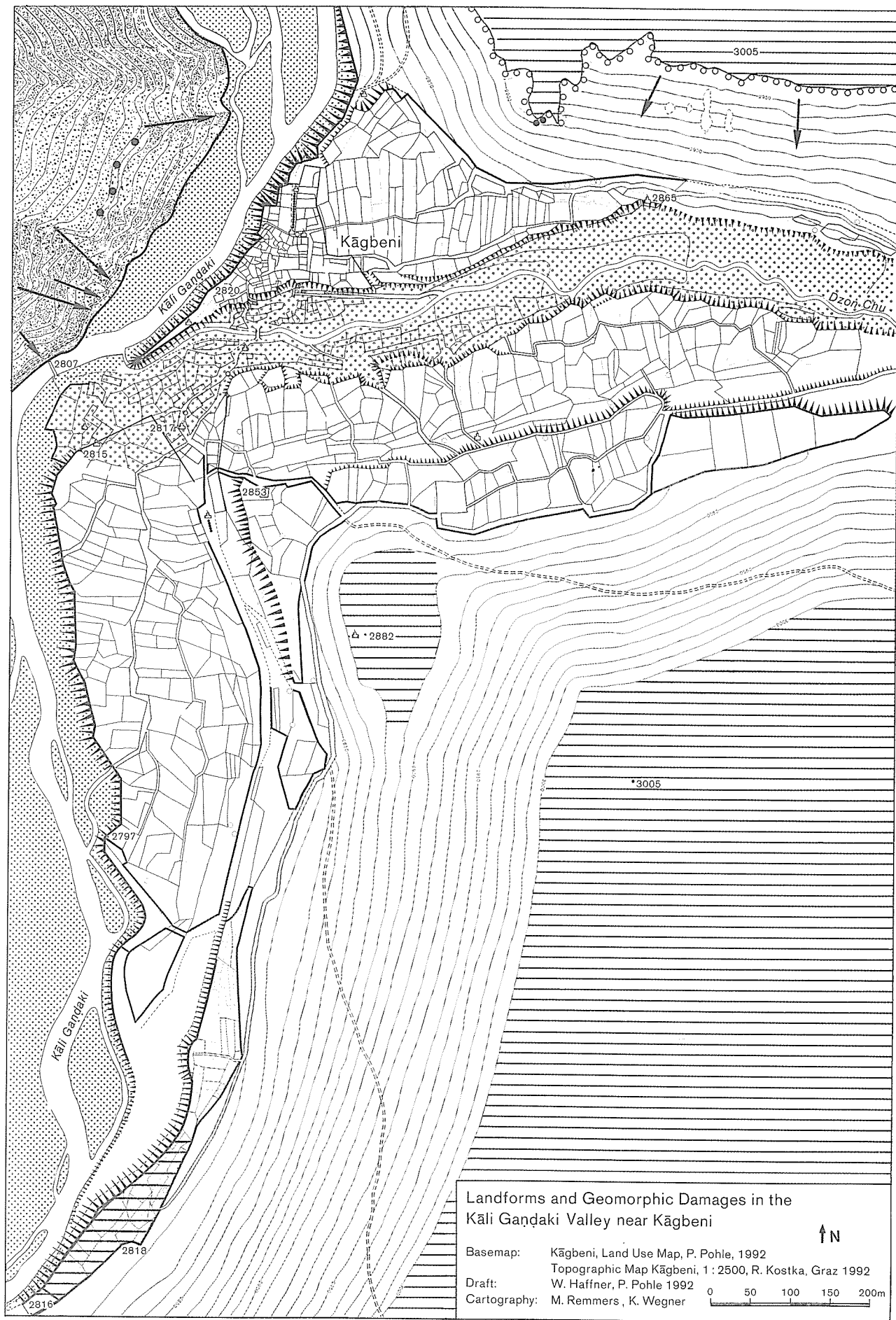













Fig. 6: Landforms and geomorphic damages in the Kāli Gaṇḍakī valley near Kāgbeni.

Landforms and geomorphic damages in the Kāli Gaṇḍaki valley near Kāgbeni

	Geologic/geomorphic units	Erosion processes by:	
		running water	wind
	Active recent flood plain and river deposits of Kāli Gaṇḍaki	Lateral erosion, shifting of river channel caused by flood and by outburst of moraine-dammed or fluvial-wash-dammed lakes	Deflation of sand and silt
	Edge of fluvial terrace deposits	Endangered by river erosion	
	Recent river deposits of Dzoñ Chu	Shift of river channel, extremely endangered by outburst of lakes	
	Edge of fluvial terrace	Endangered by river erosion	
	Alluvial fan plain of Dzoñ Chu	Endangered by migrating river channels and extreme floods caused by outburst of moraine-dammed or fluvial-wash-dammed lakes	
	Quaternary sediments (conglomerates, silty sediments, loess etc.)	Stone and boulder fall, regressive erosion of the face of the slope	Wind erosion
	Quaternary slope sediments covered with slope debris	Slope debris slides	Wind erosion
	River terraces		Wind erosion
	Quaternary conglomerates/ remnants of an older river terrace/ anthropogenic caves	Stone and boulder fall	Wind erosion
	Bedrock of cretaceous age (Neocom/Aptien)	 Slope debris, slides, stone fall	Stone fall partly induced by wind

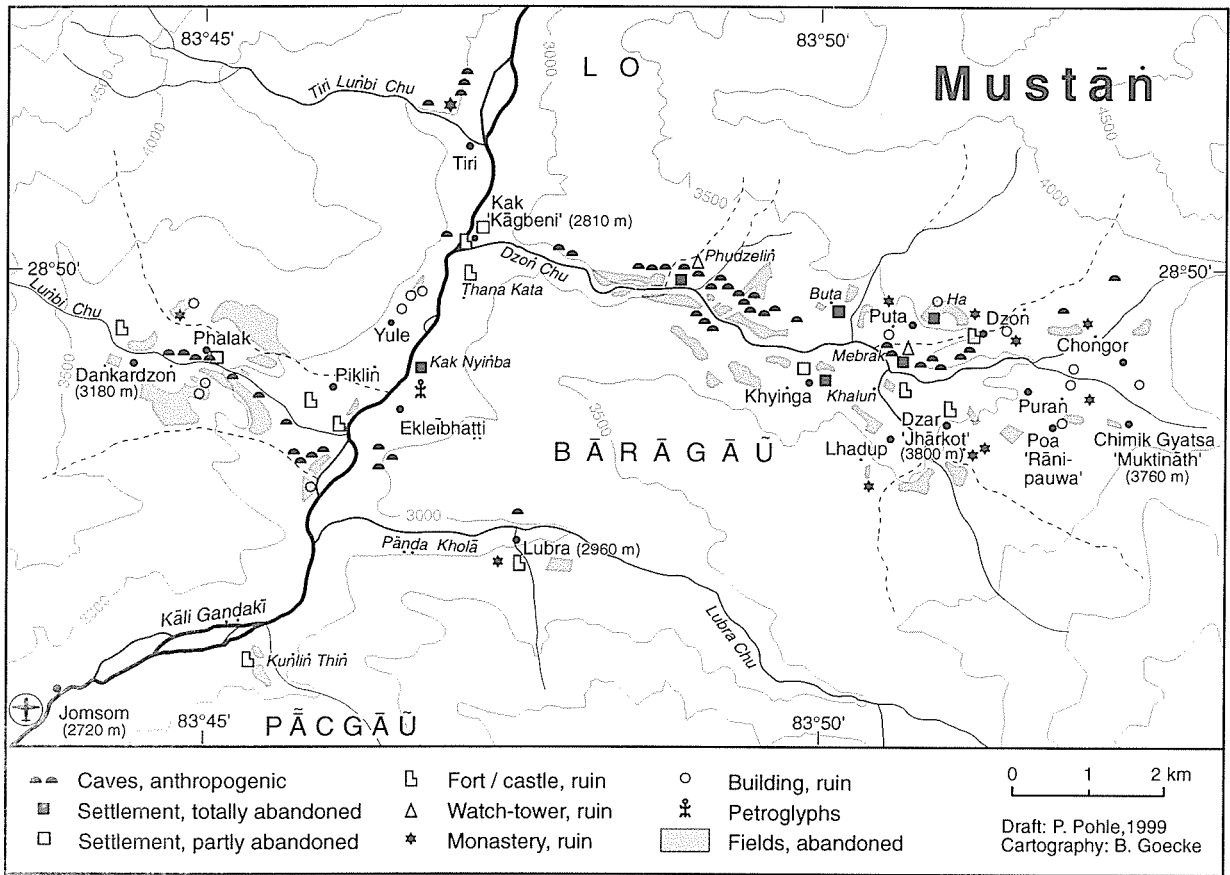


Fig. 7: Abandoned sites in Bārāgāū, their classification and regional distribution.

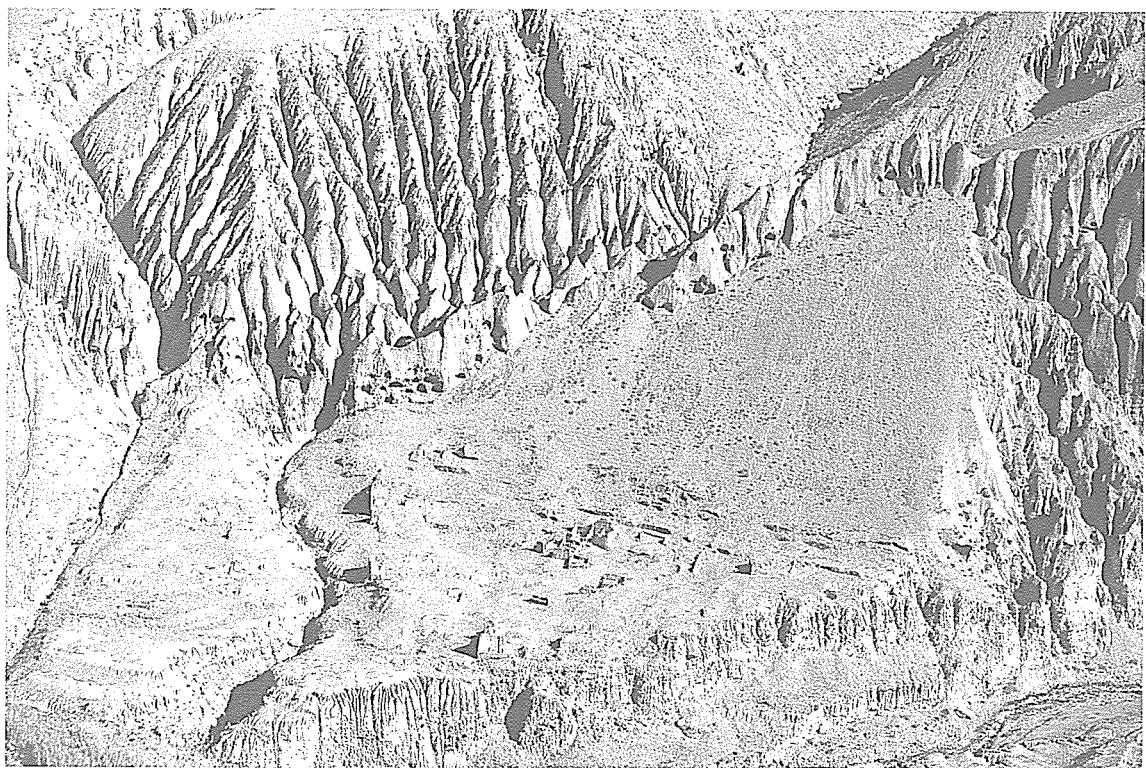


Fig. 8: Cave complexes, settlement ruins and deserted fields of Phudzeliñ (3060 m) in the Muktināth valley (Photo: P. Pohle, Oct. 1987).



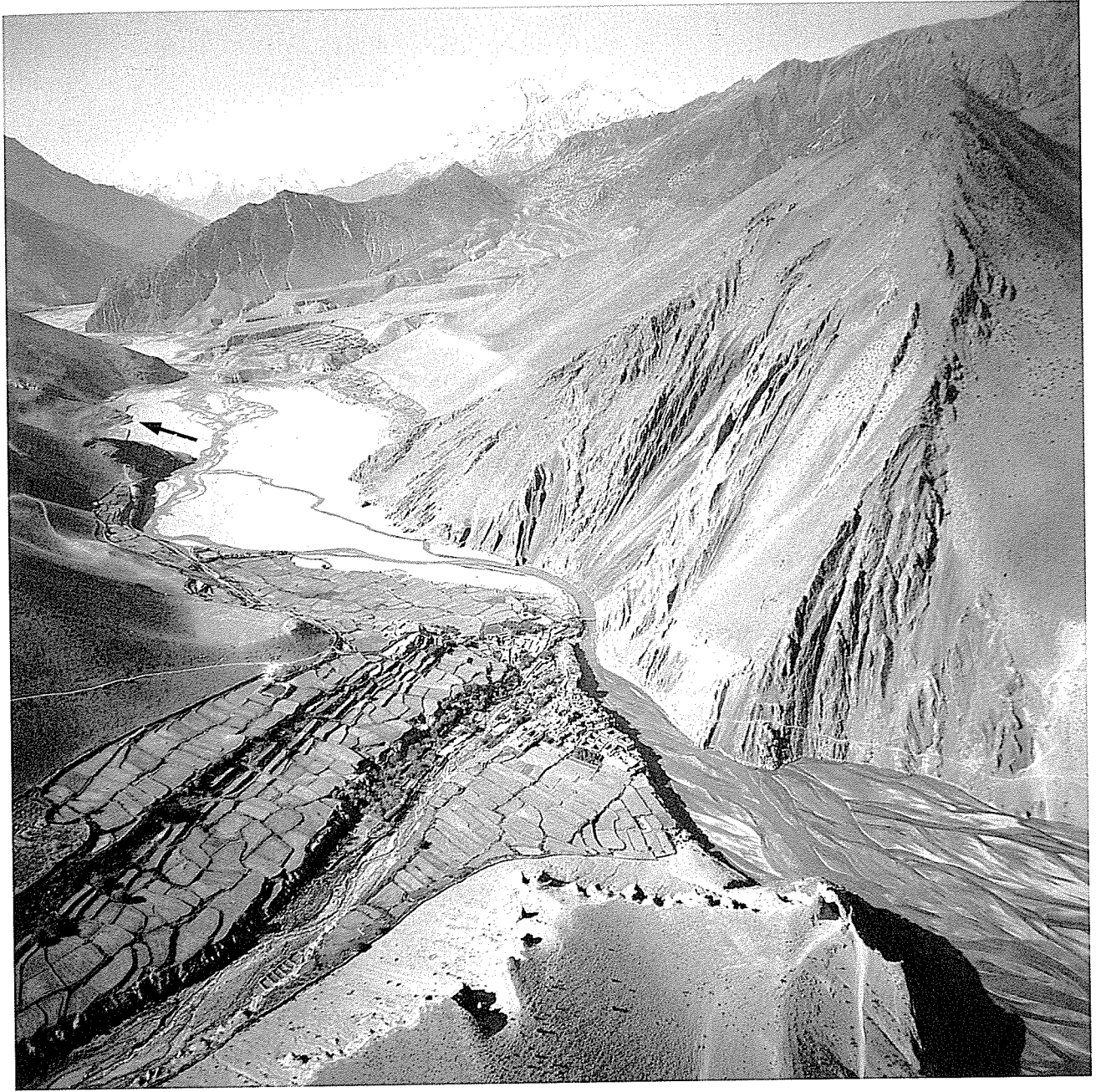
Fig. 9: The ruins of the fortress of Dzoñ (3580 m) in the upper Muktināth valley with the Dhaulāgiri (8167 m) in the background (Photo: P. Pohle, Oct. 1991).

Figures	Symbolic representations	Symbolic representations
Humans, anthropomorphic figures 	Footprints, handprints 	Serpents
Anthropomorphic figures 	Hoofprints, 	Spirals, labyrinths
Rider on horseback / on yak 	Circles, half round 	Axes
Blue sheep, wild sheep (?), goat (?) 	Circles, partly open 	Flowers, suns (?)
Wild yak, domesticated yak, cattle (?) 	Geometric signs 	Various symbols (e.g. buddhist, pre-buddhist)
Deer, horse, dog 	Lines 	Buddhist symbols
	Serpents 	Cup-marks, animal prints

Fig. 10: Repertoire and typology of rock art motifs in Kak Nyinba (Draft: P. Pohle).

Opposite page:

Aerial photograph of Kāgbeni (2820 m). The arrow marks the location of the petroglyph site of Kak Nyiñba.



Aerial photograph of Kāgbeni (2820 m) in the Kāli Gaṇḍakī valley with the Dhaulāgiri Himāl (R. Kostka, Nov. 1991)