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PERDITA POHLE & WILLIBALD HAFFNER

KĀGBENI CONTRIBUTIONS TO THE VILLAGE'S HISTORY AND GEOGRAPHY

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DENDROCHRONOLOGICAL DATING OF TIMBER: A CONTRIBUTION TO THE ARCHITECTURAL HISTORY AND SETTLEMENT PROCESSES AT KAGBENI

Burghart Schmidt, Wolfgang Gruhle, Elisabeth Thomalla, Mitra Khalessi and Kuber Malla

In 1986, we started dendrochronological investigations in the area between Tukce and Muktināth. Samples (*Pinus wallichiana, Cupressus torulosa*) were taken from living trees from various sites. A tree-ring calendar was built up and extended by samples taken from the timber of houses, monasteries and castles in Jhārkoṭ (Dzar), Kāgbeni and Garab Dzoṅ (Old Thini) (SCHMIDT, 1993). This chronology is based on a large number of trees (about 1500 samples) and now spans the entire period back to 1327 AD. In 1993 we selected samples from the castle and neighbouring old houses in Kāgbeni, in order to investigate aspects of their architecture and history (cf. GUTSCHOW, in the same volume). A graphical presentation of the data illustrates the time fluctuation of timber samples taken from the individual buildings (Fig. 1-4).

DENDROCHRONOLOGY AND BUILDING HISTORY

Under certain conditions dendrochronological data can give a precise dating of a building. If the tree ring pattern extends to the bark then the last ring represents the year the tree was felled. Many examples of old buildings in Germany with known starting dates for their construction have been dated dendrochronologically and have supported the following rule:

year of felling + 1 year = year of construction

(after felling in fall or winter, construction started in the following spring). If this principle is applied, the construction of house No. 6 (Samdruk) was probably started in 1573 (Fig. 3). Not until 200 years later - in 1772 - a second floor was added. We further analysed the noble house of Palgen Thakuri in the adjoining village of Jhārkoṭ and established a single felling date of 1779 for the timber in all floors (SCHMIDT, 1993). Only freshly-cut pines of high quality were used here (no re-used timbers could be found). These results suggest that construction was started in 1780. On the other hand, the castle of Kāgbeni cannot be dated precisely. As can be seen from the time fluctuations of the dates, there is a high percentage of re-used timbers (Fig. 1). The felling years of the wood in the first floor, for example, span the period from 1586 to 1621, in the second and third floors from 1568 to 1621/22. If freshly felled trees (in 1621 and 1622) were also used, the construction of the castle could not have begun before 1623, the addition of the fourth floor not before 1780 (felling year: 1779).

Timber has always been a valuable material in the arid area of South Mustān. It can be used over longer periods than in humid areas where wood rots more rapidly. It can be concluded that the dendrochronological dating of single samples can be misleading in the dating of buildings.

Tree-ring width and timber size

The diameters of the round logs used vary between 8 and 20 cm depending on the static load. On the whole, the age of the trees when felled was between 40 and 100 years (Fig. 5) which means an average annual growth of 1 mm. We can conclude that the timber used in the dry KE Gaṇḍakī Valley which has no forest was probably felled in the side valleys between Jomson and Kāgbeni from the beginning of the 16th century.

DENDROCHRONOLOGICAL DATING AS AN INDICATOR OF THE SETTLEMEN! PROCESSES IN KĀGBENI

The dendrochronologically dated houses in Kāgbeni have been arranged chronologically of GUTSCHOW (in the same volume) to show the development of the village. Because the proportion of re-used timber is not known only the felling years of all 91 samples were taken into consideration. Most of the dated samples from Kāgbeni include the last ring corresponding to the felling year. The missing rings up to the bark had to be estimated for some of the timbers. During the period of house construction between 1550 and 1650 a relatively large amount wood was needed, as shown in Fig. 6. After an interruption around 1700, the need for timber increased again from 1800 to 1900.

This seems to indicate differences of building activity in Kāgbeni. About 20 km to the south Kāgbeni is the abandoned settlement of Garab Dzoń (Old Thini) which is presently becaused by E. POHL (University of Bonn). So far we have been able to date 68 samples from this site. The dates show similar tendencies to Kāgbeni.

Obviously there was more construction activity around 1600 than around 1700. The reason is this may be the influence of climatic factors. The tree ring chronology for South Mustān reveaustrong fluctuations in tree-growth during that period (Fig. 6). The ring widths indicating the annual growth intensity decrease between 1540 and 1700. From then on the reverse trend can be observed: there is a long-term increase in growth until 1820, together with increased tree-felling activity.

An initial comparative analysis shows that ring-width is clearly linked to precipitation data for Jomsom. More detailed investigation has yet to be untertaken. It is not yet known which exogenous factors induce the observed long-term growth trends (e.g. 1540-1700 and 1700-1820). The following dendrochronological article presents a new method for the further investigation of long-term fluctuations in tree-ring growth over the last centuries.

REFERENCES

- SCHMIDT, B., 1993: Dendrochronological Research in South Mustang. Ancient Nepal, 130-133:20-33. Kathmandu.
- GUTSCHOW, N., 1994: Structural Analysis of Dendrochronological Data. Ancient Nepal, 136:23-50. Kathmandu.

	1450	1500	1550	1600	1650	1700	1750	1779
FIRST FLOOR:					•			
NOTHERN ENTRANCE:								
1/LONG PILLAR	1525 n.Chr.	-1586 n.Chr.						
2/LONG PILLAR	1540 n.	Chr1596 n.Cl	ır.					
3/CEILING JOIST	1536 n.C	hr1581 n.Chr						
4/LINTEL		1568 n.Chr	1622 n.Chr.					
WESTERN ENTRANCE:								
5/PILLAR	1536 n.C	hr1572 n.Chr						
6/LINTEL	1547	n.Chr1600 n.	Chr.					
7/LINTEL			1837 n.(Thr1663 a.Chr.				
SECOND FLOOR:								
35/CEILING JOIST	1496 n.Chr1566 n.	Chr.						
36/LINTEL		1567 a.C	hr1622 n.Ch	r				
37/CEILING JOIST	1539 n.C	Chr1568 n.Ch	r					
38/CEILING JOIST	1524 n.Chr.	-1568 a.Chr. [
39/SHUTTERING	1513 n.Chr15	68 n.Chr.						
THIRD FLOOR:								
49/LINTEL	1535 n.Ch	ır1568 n.Chr	· []					
50/CEILING JOIST	1526 n.Chr.	-1596 a.Chr.						
51/PILLAR	146	34 a.Chr1572	n.Chr.					
52/PILLAR	1544 n	.Chr1621 n.C	hr.					
53/PILLAR	1534 n.Ch	r1621 a.Chr.						
FOURTH FLOOR:								
57/WINDOW LINTEL			1642 n	.Chr1665 n.Chr				
58/WALL						1679 n.Chr	1779 a.Chr.	
59/WINDOW LINTEL					1727 a.Chr.	-1779 n.Chr.		
60/SHUTTERING	1500 n.Chr1566 n	.Chr.						
	1450	1500	1550	1600	1650	1700	1750	1770

Fig. 1: Palace of Kāgbeni: The two dates of each sample represent the beginning and the end of growth (year of felling). First, second and third floor were probably built about 1623. About 1780 the fourth floor was added.

	1550	1600	1650	1700	1750	1800	1850	1887
NOTHERN GATE:								
24/PILLAR			1717 n.Chr.	-1770 n.Chr.				
SOUTHERN GATE:								
34/BEAM					1823 n.Chr.	-1 86 5 n.Chr.		
MONASTERY:								
61/SILL						1776 n.Chr16	60 n.Chr.	
62/SILL					1811 n.Chr186	O n.Chr.		
HOUSE 1								
FIRST FLOOR:								
28/BEAM, LANE				1778 n.Cl	ar1856 m.Chr. [
29/BEAM, STABLE				1768 n.Chr.	-1848 n.Chr.			
30/PILLAR,COURTYARD					1830 n.Chr	1867 n.Chr.		
31/BEAM, COURTYARD					1829 n.Chr.	1886 n.Chr.		
32/BEAM, COURTYARD					1	773 n.Chr185	6 n.Chr.	
33/CEILING			[1672 n.Chr17	75 n.Chr.			
SECOND FLOOR:			-					
46/PILLAR				17	96 n.Chr1858 n.C	Chr.		
47/BEAM					1841 n.	Chr1886 n.C	hr.	
48/CEILING					1822 n.Chr	-1859 n.Chr.		
HOUSE 2								
8/LINTEL	1537 n.Chr.	-1680 n.Chr.]				
HOUSE 3								
9/BEAM			1723 n.Chr	1770 n.Chr.				
HOUSE 4								
10/LINTEL			1733 n.	Chr1814 n.Chr				
	1550	1600	1650	1700	1750	1800	1850	1887

Fig. 2: The dated samples of the northern gate of the monastery and the houses No. 1-4.

	1500	1600	17,00	1600	1887
HOUSE 5			;		
FIRST FLOOR:					
11/BEAM		1730	n.Chr1770 n.Chr.	7	
SECOND FLOOR:					
40/CEILING JOIST		1712 n.C	hr1770 n.Chr.	7	
THIRD FLOOR:			<u> </u>		
54/PILLAR			1823 n.Chr.	-1867 n.Chr.	
55/PILLAR			1802 n.Chr185		
HOUSE 6					_
FIRST FLOOR:					
12/MIDDLE LINTEL	1527 n.Chr1572 n.Chr.				
13/FRONT LINTEL	1543 n.Chr1572 n.Chr.				
14/CEILING JOIST	1535 n.Chr1572 n.Chr.				
SECOND FLOOR:					
41/CEILING JOIST		1699 n.Chr.	-1771 n.Chr.		
42/PILLAR		173	4 n.Chr1771 n.Chr.		
43/CEILING JOIST			1746 n.Chr1771 n.Chr.		
44/CEILING JOIST			1752 n.Chr1771 n.Chr.		
HOUSE 7					
15/CEILING JOIST	1536 n.Chr1630 n.Chr.				
HOUSE 8		•			
16/BEAM			1843 n.	Chr1886 n.Chr.	
17/BEAM	1573 n.Chr1605 n.Chr.				
18/BEAM	1576 n.Chr1605 n.Chr.				
	1500	1600	1700	1600	1887

Fig. 3: The dated samples of the houses No. 5-8.

	1650	1700	1750	1800	1850	1900	196 1950
HOUSE 9							
19/LINTEL			1814 n.Chr	1855 n.Chr.			
HOUSE 10							
20/CEILING JOIST 16	99 n.Chr1730	n.Chr.					
HOUSE 11							
21/PILLAR			176	3 n.Chr1920	n.Chr.		
HOUSE 12							
22/LINTEL			1799 n.Chr1847	n.Chr.			
HOUSE 13							
23/LINTEL	1637 n.Chr.	-1770 n.Chr.					
HOUSE 14							
FIRST FLOOR:							
25/CEILING JOIST		1753 n.Chr182	7 n.Chr.				
SECOND FLOOR:							
45/CEILING JOIST			1805 n.Chr185	8 n.Chr.			
THIRD FLOOR:							
56/CEILING JOIST					1911 n.Chr	1963 n.Chr.	
HOUSE 15							
26/CEILING JOIST			1811 n.Chr1	853 n.Chr.			
HOUSE 16					_		
27/BEAM		179	1 n.Chr1848 n.C	hr.			
	1650	1700	1750	1800	1850	1900	1950 1963

Fig. 4: The dated samples of the houses No. 9-16.

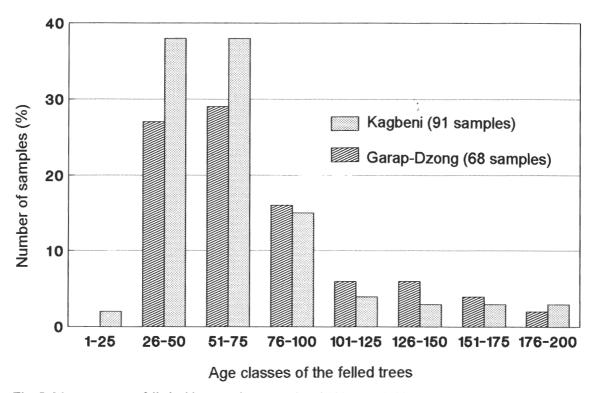


Fig. 5: Most trees were felled with an age between 40 and 100 years (with a diameter between 8-20cm).

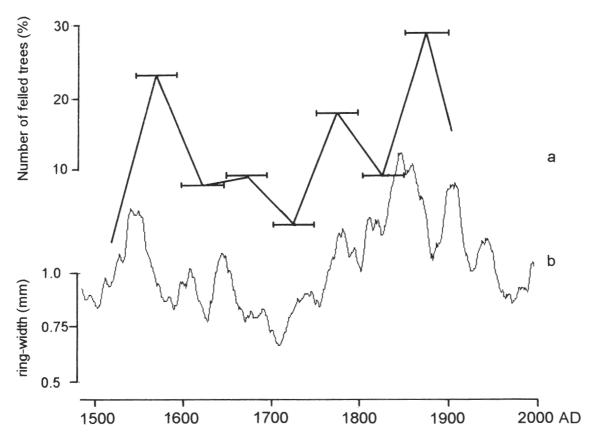


Fig. 6, a: The felling years of the analysed timbers in classes of 50 years. About 1550/1600 more trees were felled than about 1700/1750. (Decreasing building-activity).

b: Tree-ring calendar "South Mustān'" (*Pinus wallichiana*). Long-term growth trends (1540-1700; 1700-1850) correlates with the number of felled trees (settlement-activities).