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

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In 1986, we started dendrochronological investigations in the area between Ṭukce 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 Mustāṅ. 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 Kāli Gaṇḍakī Valley which has no forest was probably felled in the side valleys between Jomsom and Kāgbeni from the beginning of the 16th century.

DENDROCHRONOLOGICAL DATING AS AN INDICATOR OF THE SETTLEMENT PROCESSES IN KĀGBENI

The dendrochronologically dated houses in Kāgbeni have been arranged chronologically by 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 of 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 of Kāgbeni is the abandoned settlement of Garab Dzoń (Old Thini) which is presently being excavated 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 for this may be the influence of climatic factors. The tree ring chronology for South Mustāń reveals strong 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.

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GUTSCHOW, N., 1994: Structural Analysis of Dendrochronological Data. Ancient Nepal, 136:23-50. Kathmandu.

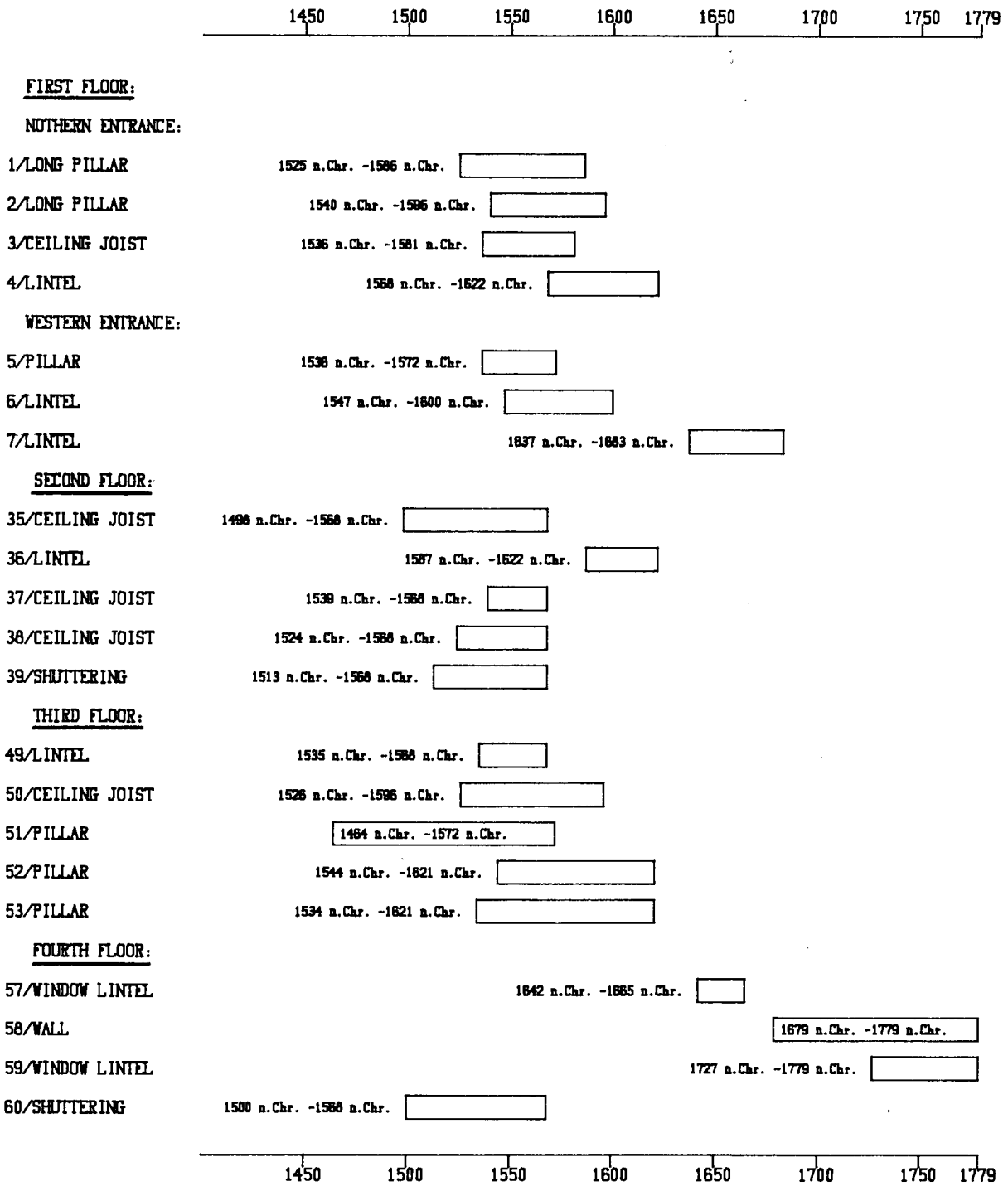

Fig. 1: Palace of Kāgbeni: The two dates of each sample represent the beginning and the end of growth (year of felling). First, second and third floor were probably built about 1623. About 1780 the fourth floor was added.

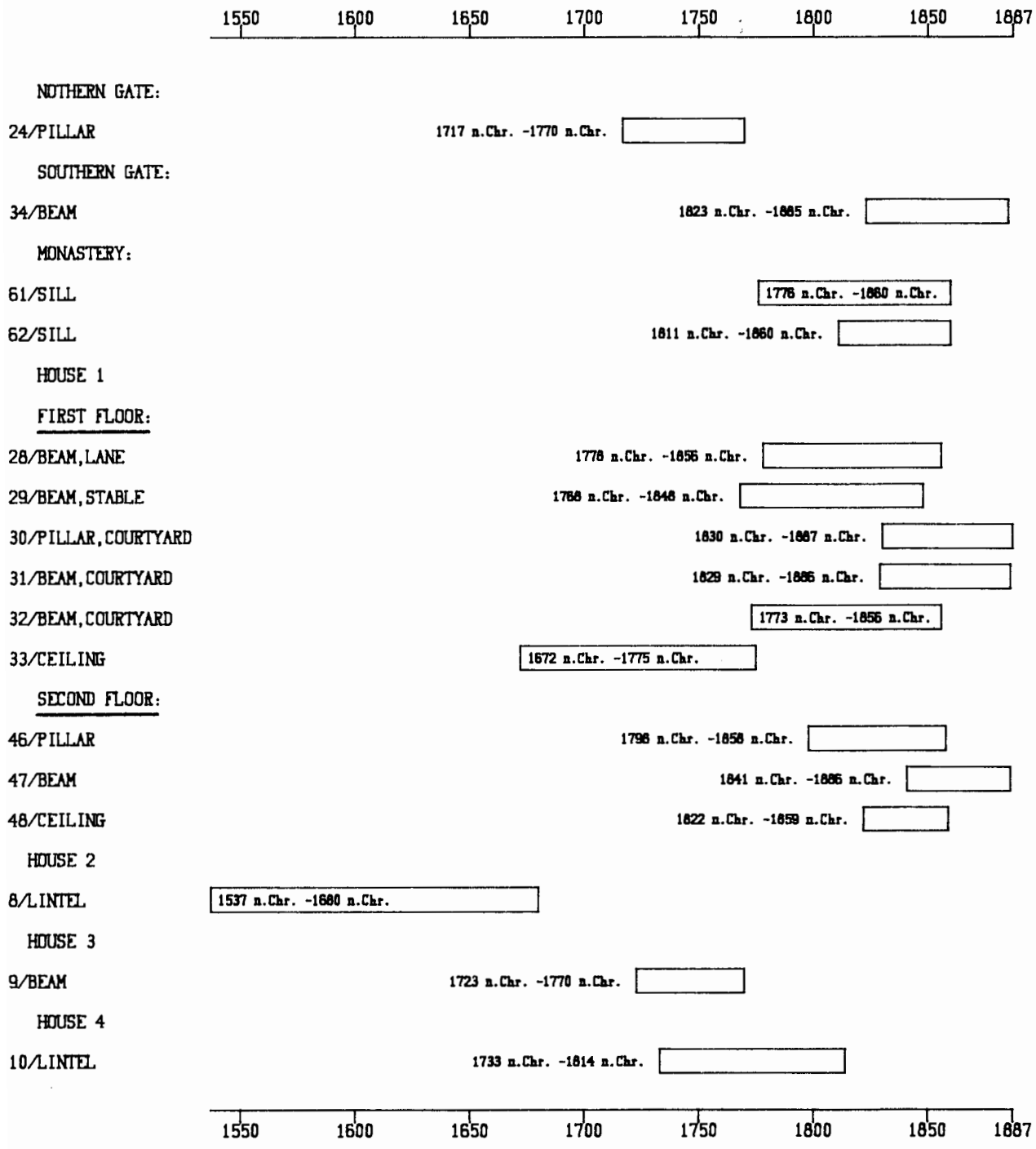

Fig. 2: The dated samples of the northern gate of the monastery and the houses No. 1-4.

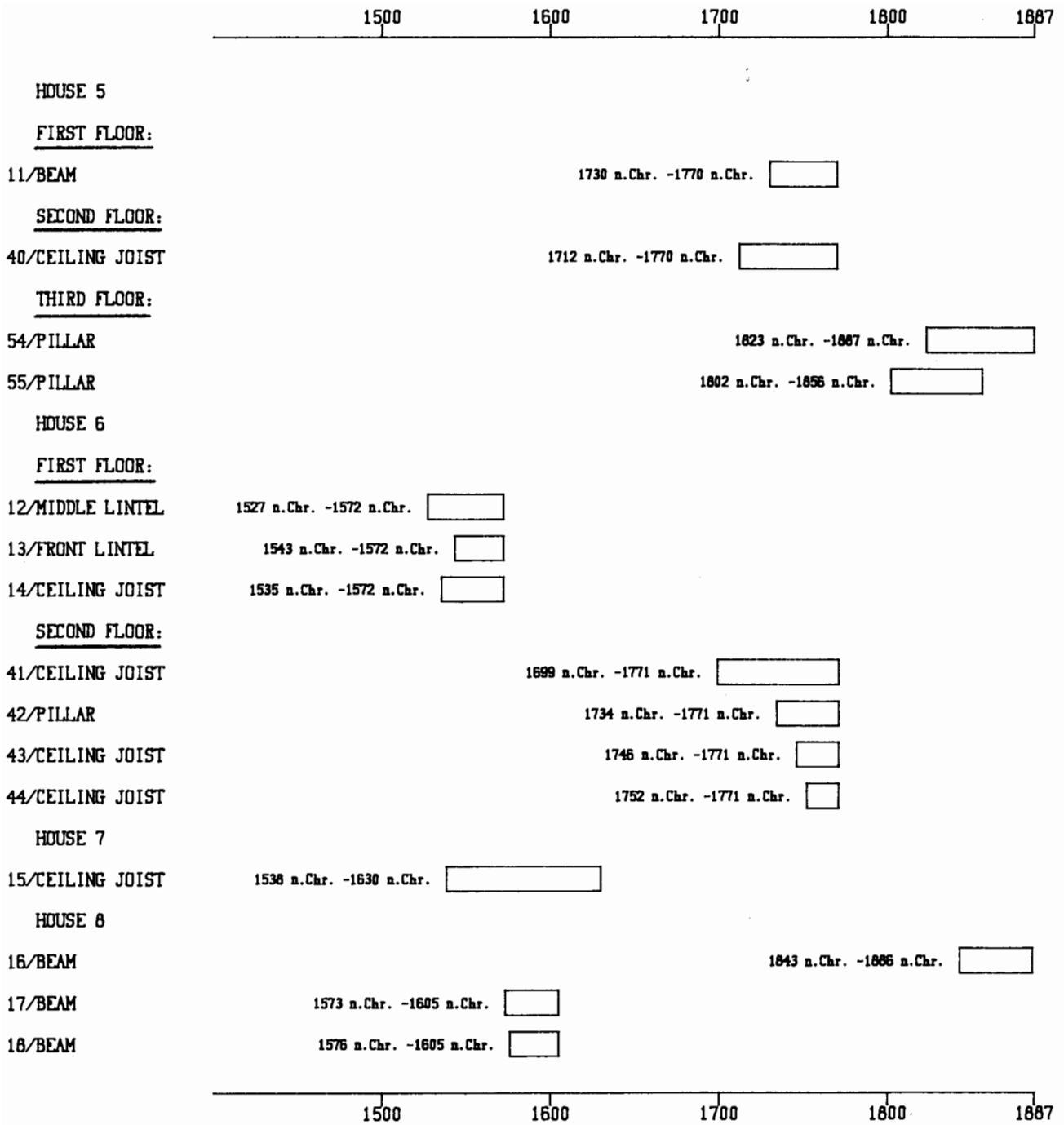

Fig. 3: The dated samples of the houses No. 5-8.

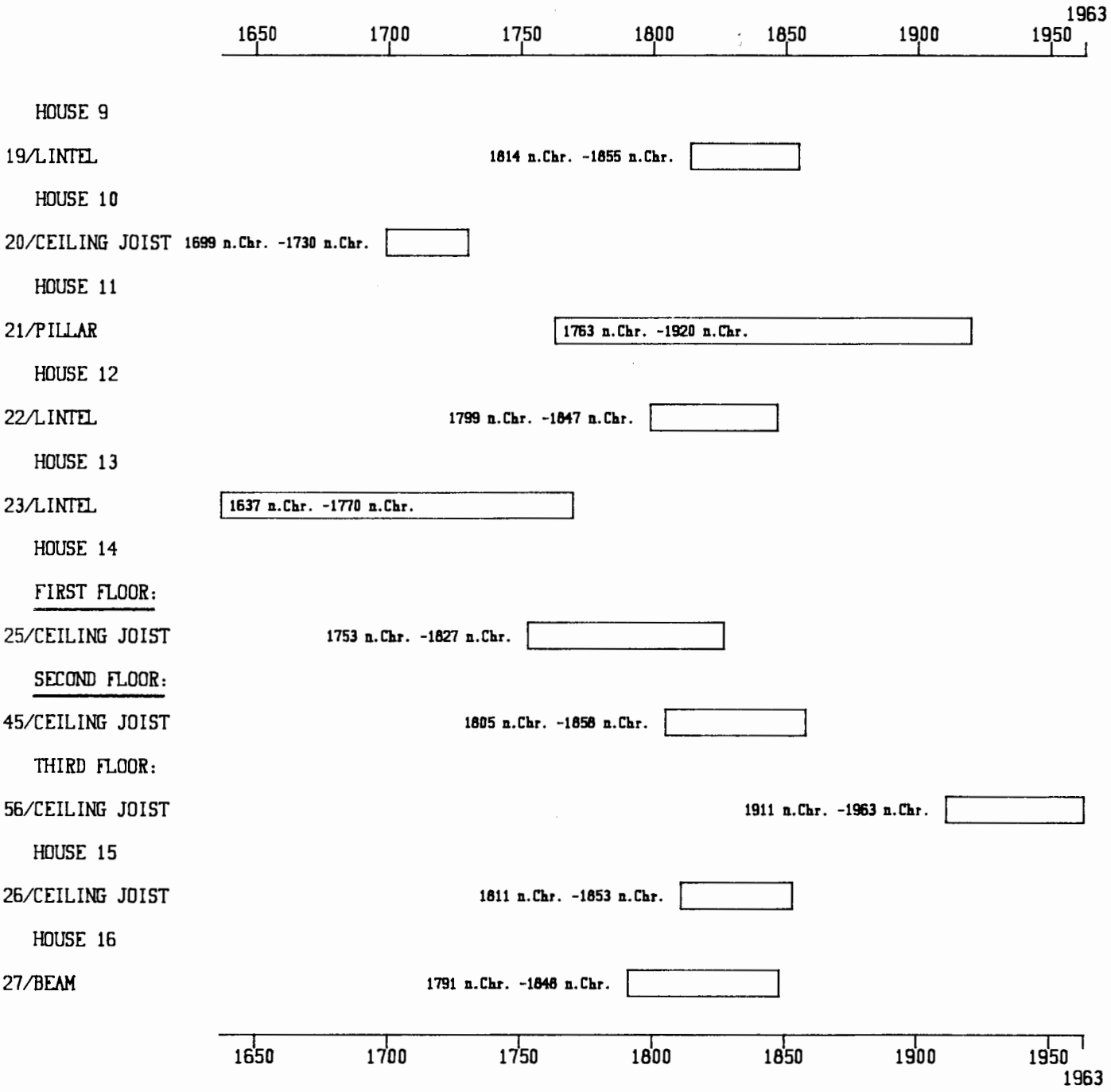

Fig. 4: The dated samples of the houses No. 9-16.

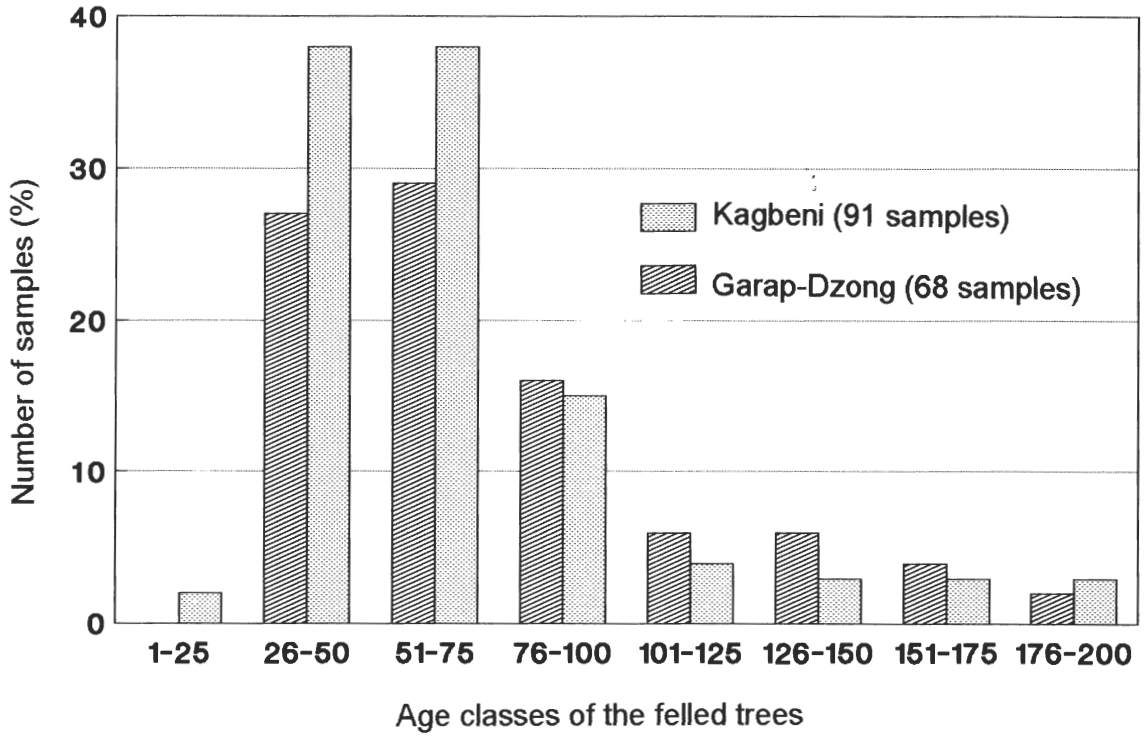

Fig. 5: Most trees were felled with an age between 40 and 100 years (with a diameter between 8-20cm).

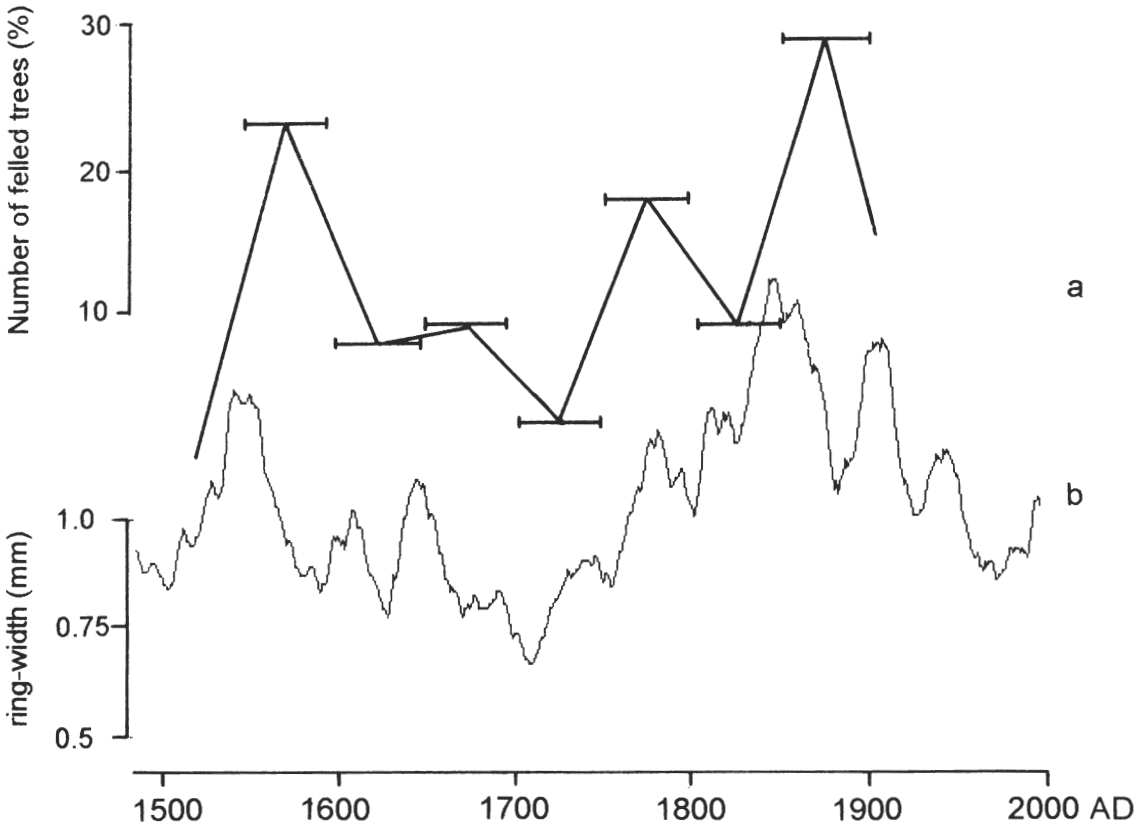

Fig. 6, a: The felling years of the analysed timbers in classes of 50 years. About 1550/1600 more trees were felled than about 1700/1750. (Decreasing building-activity).

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