

Quality can come out of quantity through evaluation. The UGC may adopt innovative approaches such as: (i) grading and rewarding thesis and supervisors, (ii) approving research problems after scrutiny by a national expert committee, (iii) keeping track of progress in the thesis work, (iv) making the thesis available (for a fixed duration) on the UGC website for open discussion, (v) publishing at least three authentic Indian and one international publication before submission, and (vi) helping the candidate to publish the thesis as a book (if it is worth so).

Universities and research organizations need a feedback mechanism instead of simple memoranda of understanding. They should encourage more supervisors from the R&D departments of organizations and industry. More number of research journals, sponsored by research organizations, need to be introduced on university platforms.

Inadequate number of students joining for Ph D in India (compared to countries like China and Brazil) has been highlighted by Hasan *et al.*². It is therefore opined that the entrance test can adversely affect the development of research

in India and if there is a right to education, there should be a right to research.

1. UGC, Gazette of India, No. 28, Part III, Section 4, dated 11–17 July 2009.
2. Hasan, S. A., Khilnani, S. and Luthra, R., *Curr. Sci.*, 2010, **99**, 414–415.

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Ancient canal and stone quarries near Halebidu, Hassan District, Karnataka

The Hoysala period (10–13 century AD), culturally an active period in the Malnad region of Karnataka, is known for exceptional engineering projects like construction of large temple complexes, canal irrigation systems and water tanks. We focus here on an ancient network of canals and a quarry located near Halebidu, Belur Taluk, Hassan District (Figure 1a), dating to the Hoysala period. The Hoysala capital was initially located at Belur and later moved to Halebidu¹. We report here the features of these ancient symbols of craftsmanship and ingenuity around Halebidu so as to advocate for their preservation, as they are part of our common heritage. It would be a pity if they become silent victims of the ever-growing demands on land from the so called ‘developers’.

The canal, locally called the Yagachi Nalla, is part of an interconnected waterway and it is meant to bring water from River Yagachi to the freshwater lake at Halebidu, the later capital of the Hoysala dynasty (Figure 1a). The 18-m-wide Yagachi Nalla is about 15 km long and seems to extend through villages of Rannagatta, Lakshimpura, C. Hosahalli, Kallusettihalli, Mughuhalli, Baigowda Koppalu, Ramachandrapura and Mallikharjunapura (Figure 1b). This canal was first mentioned by Captain Mackenzie², who observes that, ‘*the engineers of the Belala kings did not confine their attention to building alone but irrigation works were also taken in hand. Tradition*

has it that the water of the Yagachi, which flows through a valley of distant 10 miles and divided by a range of hills from the Halabid Valley, were brought by a channel to supply the capital with water and fill the neighbouring tanks: a deep cutting on the Hassan–Bailur road at the 16th mile, marks the spot where the channel crossed the saddle of the hills.’

The Yagachi ‘aqueduct’ also acts as the connecting channel between the water tanks at Karian Katta, Hajjanhalli, Devihalli, Pandithan halli, Hribihalli, Rajakere and Halebidu, finally reaching Belvadi and joining the Bhadravathi river. At Ranaghatta, a small, fortified, medieval village (an inscription refers to the reign of King Vinayaditya who built Rannagatta), the Yagachi Nalla, 18 m in width flows in a northwest direction starting from here, and is located on the right bank of River Yagachi at Ranakatta vatu (the name itself indicates ‘check dam’ in Kannada). The remains of a brick-built dam with some stone masonry spillway are still visible. This spillway was probably meant to divert water to Halebidu. In many places remnants of the channel are now obscured by cultivation and natural vegetation. It is remarkable that at Kallusettihalli (13°07′51.2″N; 75°55′28.6″E), the channel has been made by cutting deep into the hard rock. The excavated soil is found heaped on both sides of the canal (maximum height of these mounds is 10 m from the

canal floor) throughout its length, masquerading as part of the natural topography (Figure 1c). This is an early example of anthropogenically modified landscape.

A water tank built during the Hoysala period was located at Kumaranahalli, situated 4 km southeast of Halebidu. This is a rainfed tank located in front of the Narasimha Temple. This tank was further connected with the big tank at Halebidu through Kayatha halla. Another tank is located in Viradevanahalli, situated 7 km west of Halebidu. An inscription in this village refers to the construction of four reservoirs, namely Rudrasamudra, Gangasamudra, Achyutasamudra and Virasamudra, a project piloted by Virayadanda Nayaka, minister of Viraballala, the Hoysala King.

We have also identified a few other surviving remains of stone quarries of the Hoysala period (Figures 1a and 2a). These quarries are dominated by chlorite schist stones which were used for the construction of temples and forts in Halebidu (Figure 2b and c). Remarkable examples of exquisite Hoysala craftsmanship can be seen at Parshvanatha Temple (13°12′33.4″N; 75°59′41.8″E), known locally as Jain Basti (Figure 3), near an ancient quarry at Pushpagiri (13°11′31.4″N; 75°59′27.3″E). The stones for these temples came mainly from four spatially clustered quarries, where the metamorphic rocks of chlorite schists were quarried using iron tools, including

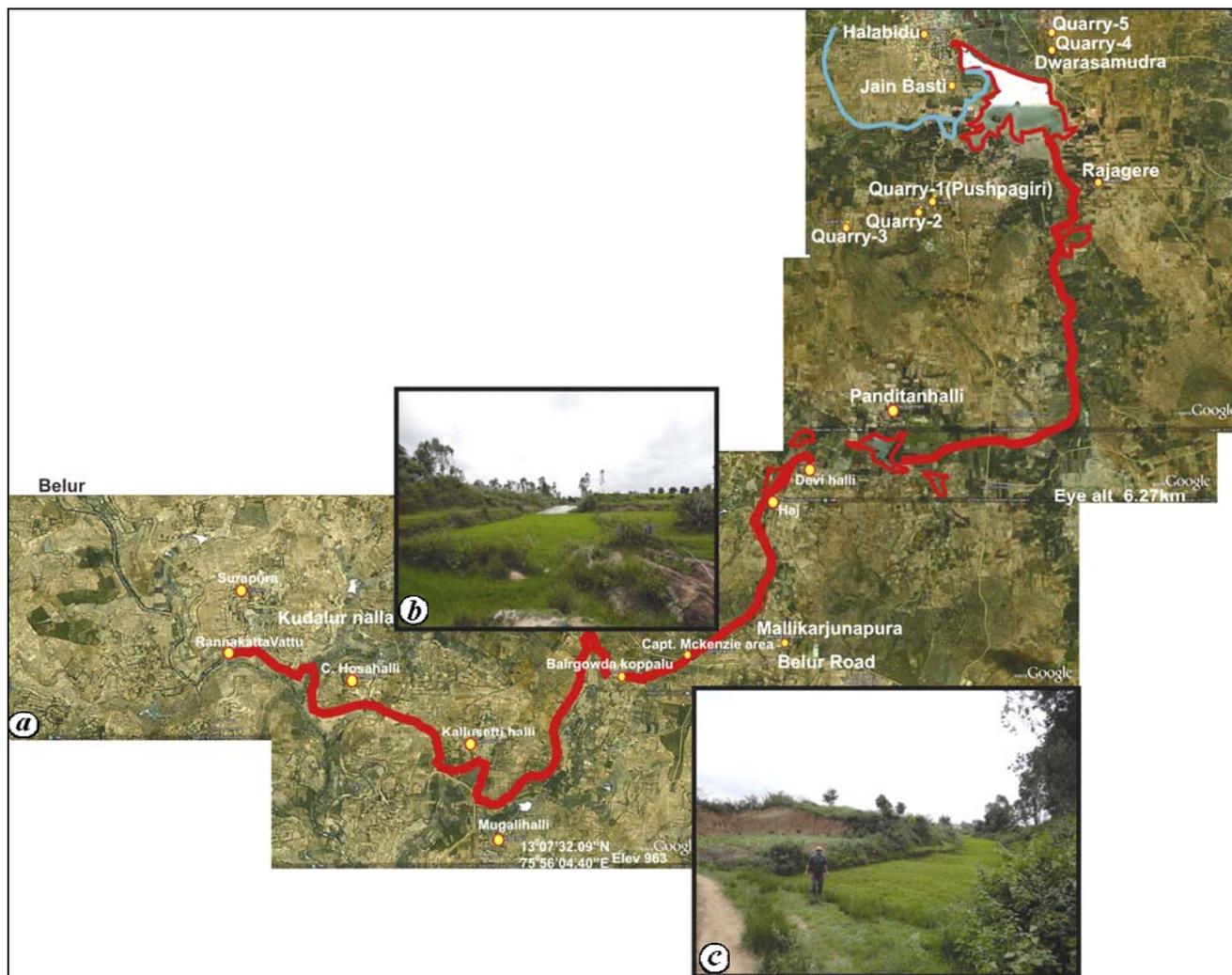


Figure 1. *a*, Google image of the area showing Yagachi canal and locations of ancient quarries. The thick red band marks the course of the canal, the thinner red lines mark the outlines of water tanks located along its course and the blue line denotes the remnant fortification around Halebidu. *b*, View of the Yagachi canal at Kallusetihalli. *c*, View of heaped soil at the location. C. Hosahalli, excavated during the construction of the canal.



Figure 2. *a*, View of the Hoysala stone quarry at Pushpagiri (see Figure 1 for location). *b*, Rock specimen of chlorite schist from the quarry. Note the chisel marks of the Hoysala craftsmen. *c*, Microscopic view of the thin section (under cross-nicols) of a rock specimen from the quarry.

sledge hammers, chisels and wedges. The chisel marks could be seen on the quarry wastes heaped at the sites, which are now partially covered by soil (Figure

2 *b*). Extracting the blocks from the bed-rock was probably done along a line of wedge-shaped holes made by chiselling the rock surface. These holes were

probably widened using wedges until the rock split along the line of the holes. These techniques still used by the present quarry workers have not changed for



Figure 3. An interior view of the Parshvanatha Temple (Jain Basti; see Figure 1 for location) constructed from the stones (chlorite schist) mined from the nearby quarries.

thousands of years. Fine chiselling may have been done at the building site itself. Quarrying was done in open pits dug into the weathered soil overlying the bedrock, the thickness varying from 5 to 10 m.

It is possible that the large pieces of quarried stones were transported to the temple building sites by teams of men or carts pulled by draft animals through the cleared tracts around the quarries whose surfaces were hardened by laying stones. These quarries have also changed the natural landscape. These sites could have been in use by the craftsmen continuously for many years, where inscriptions, pottery and other archaeological remains can be recovered. Thus, ancient quarries are more than just sources of stones, but are also rich archaeological sites with

ruins and other cultural remains³. Mackenzie², having seen the magnificent Hoysala temples near Halebidu, marvelled somewhat wistfully at their craftsmanship: *'It is difficult, when looking at this fine temple to believe that the builders of the neighboring huts are the descendants of the great masons whose brains planned, and whose hands fashioned this monument of their skill and taste. What become of them, and where have they gone, are questions which though hard to answer, are none the less interesting, and may well form the subject of antiquarian research'* – a sentiment we all may share with him.

Given their importance as a window to the past, these vestiges of our heritage are important study materials because

they may provide a unique perspective on social life of ordinary people during the Hoysala period, the most significant period in the history of Karnataka. It is also our submission that the entire stretch of canal system should be preserved as a historical walkway, with exhibitions of Hoysala craftsmanship and engineering skills arranged along its banks. The canal bed itself can be used to plant indigenous and endangered trees.

1. Keay, J., *India: A History*, Harper Collins Publishers, London, 2000, p. 576.
2. Mackenzie, J. S. F., *Indian Antiquary*, 1872, 1, 44.
3. Abu-Jaber, N. *et al.* (eds), *Quarryscapes: Ancient Stone Quarry Landscapes in the Eastern Mediterranean*, Geological Survey, Norway Publ. No. 12, 2009, p. 170.

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