

Did traditional stone-quarrying techniques Survive until today? Results from an Ethnoarchaeological study

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Introduction

Ancient stoneworkers knew different techniques to separate stone blocks from parent rock. Rock exposures with bedded layers, natural foliations or mechanical weathering fractures were preferred starting points for stone quarrying (Dworakowska 1975; Heldal 2009; Kelany et al. 2009; Schierhold 2009). When such joints did not occur naturally, fractures were created by chiselling holes and creating a fracture line by inserting wedges and exert pressure by a hammer, as well as removing bedrock material by channelling, sawing or heating the

bedrock surface with fire and then imposing pressure on the rock through percussion (Rockwell 1993; Heldal 2009; Kelany et al. 2009; Dworakowska 1983).

On respect to archaeological monuments in the ancient city of Anuradhapura, stone was extensively utilized as a construction material. Evidence in ancient rock quarries located close to the ancient city, provide evidence of the extensive application of the chiselled holes and wedge quarrying technique (Wagalawatta et al. 2015; Jayasingha and Wagalawatta

2010). This quarrying technique is mainly based on the creation of a series of holes along the margin of the block to be separated and generate a fracture through the holes and historical examples show that ancient stoneworkers mostly favoured parent rocks with natural bedding planes or joints, which helped them to induce fracture and separation either horizontally or vertically.

After separation, these holes frequently appear as half-holes in the parent rock and are mirrored on the separated blocks. However, it is still not known in detail what kinds of tools were used for the quarrying process and how the splitting fractures were generated. More importantly, it is still unclear why the chiseled holes are mostly oval and what the time expenditure was for the splitting process. This ethnoarchaeological investigation has been conducted to fill these gaps.

Methods

The ethnographic study is based on the observation and interviewing of a modern stone craftsman who quarries stones using traditional techniques. A rock boulder with a

horizontal running foliation plane was chosen for experimental splitting. The ethnographic investigation is based on the assumption of a cultural connectivity or historical relationship between the living and the past culture (Steward 1942). The interview covered ethnographic elements such as explicit purposes, ethnographic explanations, and ethnographic questions (Spradley 1979).

Results and discussions

Pointed cylinder-shaped iron chisels and hammers were the tools used to bore the quarry holes, and flat wedges and iron feathers were applied to produce pressure from the holes into the rock.

The modern craftsman purposely made oval-shaped holes using a cylinder-shaped chisel. The oval holes are particularly capable of transferring pressure directly from a single corner of each hole to the corner of the nearest neighbouring hole, creating a straight line linking pressure connectivity between neighbouring holes. The resulting straight crack creates a better surface on the block, which makes

the secondary work of trimming and polishing easier.

The time of 2.5 hours that it took to separate a block 50 cm by 120 cm by 40 cm in size from the parent material applies to foliated rocks. When the rock does not have natural foliation planes, the time expenditure would be doubled.

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