

## **Geological Constraints on Extraction Technology, from the Chain of Operation to the Ritualized Giving Back Processes**

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Chert extraction in the Wallkill Valley is impossible without glacial boulders/cobbles serving as extraction tools. The Silurian Shawangunk Formation is a belt of meta-sedimentary rock to the north/northwest of the study area, along the path of Wisconsin glacial advance. Inspection of Shawangunk outcrops reveals fining upwards cycles of basal conglomerates, overlain by alternating arkoses and quartz sandstones, feldspathic siltstones and caps of argillic shales. The cycles represent a bajada complex of alluvial conglomerates eroded from the Taconic Highlands.

Sedimentological/stratigraphic characteristics of fan-delta complexes mandate that conglomeratic lenses are the thickest deposits; overlain by arkosic sands, meta- and orthoquartzite lenses and thinly bedded argillites. Glacial erratics derived from the Shawangunk conform to the differential thicknesses of the fan-delta sediments. Metaconglomerates occur as large boulders, arkosic sands as smaller boulders, meta- and orthoquartzites as cobbles and argillites as smaller cobbles.

Impact objects of metaconglomerates occur in quarry zone 1. Ore milling stations employ large equant boulders of arkosic sandstones. Ore processing stations use ortho- and metaquartzite hammers. Workshops contain ruptured impactors as non-portable anvils. Minor components of the quarry tool inventory include focal chisels, beaked hammers and wedges fashioned from metaquartzites and scaling bars, lap anvils, beaked hammers and wedges from ortho- and metaquartzites. Quarry instruments also occur in spatially discrete, radial clusters in front of quarry faces and associated with specific concentrations of tailings.

Excavation/mapping revealed a one-to-one correlation between quarry instruments of a restricted sedimentological range and entire classes of chert/dolomite tailings. The resulting chain of operation includes thirty/forty steps of lithic refinement towards the production of bifaces, bifacial cores and flakes. Termination of quarry activity appears associated with the selection of the most durable raw material, metaquartzite, which is pecked, flaked and ground into oval, circular and crescentic forms, vitrified, and placed in empty overhangs of extraction zone 1.