Water-power in North Africa and the development of the horizontal water-wheel

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Ulrike Hess, "Die römische Bagrada-Brucke" pp. 93-94, and Josef und Gertrud Röder, "Die antike Turbinenmühle in Chemtou" pp. 95-102, in FRIEDRICH RAKOB (ed.), *SIMITTHUS*, Band 1: DIE STEINBRÜCKE UND DIE ANTIKE STADT (Philipp von Zabern, Mainz 1993). Pp. xxii + 103; 24 figures, 35 colour ills., 307 black-and-white ills., 8 plans. ISBN 3-8053-1500-7. DM 248.

Introduction

A recent article by K. Greene in this journal has re-addressed the issue of the level of technological development achieved in classical antiquity.[1] Crucial to the debate is the development and use of the water-mill. Not only does it represent the harnessing of a natural force as a prime mover, but it has economic implications for the scale of food-processing and the centralisation of production. The basic mechanism may also be adapted for other purposes.[2] In numerous publications Wikander has argued for a much earlier widespread application of water-power than was formerly thought;[3] while the general picture he presents is convincing, the exact nature of the technology's spread and development remains unclear. One of the outstanding questions is the developmental relationship between mills whose water-wheel is set vertically on a horizontal axle (vertical-wheeled mills), and those in which the water-wheel is set horizontally on a vertical axle (horizontal-wheeled mills). The geographical and chronological distribution of different types of water-mill is likely to be influenced by both geographical and social factors, but is as yet little understood. Our knowledge of the development of the water mill in its different forms remains hampered by a basic lack of scientifically excavated, securely dated and well published mills.

The Chemtou bridge and mill

In this context the publication of the extraordinary milling installation at Chemtou (*Simitthus*) in Tunisia is very important. The mill's significance is threefold: it lies on the one perennial river in an area where water resources are not abundant and are seasonally variable; it utilises a highly-sophisticated turbine drive not otherwise attested until A.D. 1577; and it has not one but three mill-wheels, implying production of flour on a sizeable scale.

The building lies among the ruins of the Trajanic bridge at Chemtou, on the N bank of the Oued Medjerda (*Bagrada*). A preliminary summary of research on the bridge is given by U. Hess (pp. 93-94), in advance of a full-scale monograph to appear in the series of *Simitthus* re-

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1 "Technology and innovation in context," *JRA* 7 (1994) 22-33.

2 In the late 4th c. A.D. water-powered marble sawing is mentioned by Ausonius (*Mos.* 359-64; see Ö. Wikander, "Ausonius' saw-mills – once more," *OpRom* 17 (1989) 185-90), and Gregory of Nyssa (*In Eccl.* 3, 656A, Migne); dough mixing by water power has been suggested by L. Moritz, "Vitruvius' water-mill," *CR* n.s. 6 (1956) 193-96, and Ö. Wikander, "The use of water-power in antiquity," *OpRom* 13 (1981) 95-96, although he has reservations about the extent of its practical application.

3 Ö. Wikander, *Vattenmöllor och möllare i det romerska riket* (Lund 1980); id., *Exploitation of water-power or technological stagnation?* (Lund 1984); "Archaeological evidence for early water-mills – an interim report," *History of Technology* 10 (1985) 151-79; "Water-power and technical progress in classical antiquity," in *Ancient Technology. Symposium 1987* (Helsinki 1990) 68-84; "Water-mills in Europe: their early frequence and diffusion," in *Medieval Europe 1992. Pre-printed papers* (York 1992) 3: *Technology and innovation*, 9-14. See also Wikander 1981 (supra n. 2).