

UNIVERSITÀ DEGLI STUDI DI NAPOLI “L’ORIENTALE”  
DIPARTIMENTO ASIA, AFRICA E MEDITERRANEO  
*Series Minor*  
LXXXVII.1

IRANIAN STUDIES  
IN HONOUR OF  
ADRIANO V. ROSSI

PART ONE

Edited by  
SABIR BADALKHAN, GIAN PIETRO BASELLO  
and MATTEO DE CHIARA



Napoli 2019

UNIVERSITÀ DEGLI STUDI DI NAPOLI “L’ORIENTALE”

DIPARTIMENTO ASIA, AFRICA E MEDITERRANEO

*Series Minor*

LXXXVII.1

Director

Francesco SFERRA

Editorial Committee

Giorgio BANTI, Riccardo CONTINI, Junichi OUE,

Roberto TOTTOLI, Giovanni VITIELLO

Scientific Committee

Anne BAYARD-SAKAI (INALCO), Stanislav BAZYLINSKI

(Facoltà teologica S. Bonaventura, Roma), Henrietta HARRISON

(University of Oxford), Harunaga ISAACSON (Universität Hamburg),

Barbara PIZZICONI (SOAS, University of London), Lucas VAN ROMPAY

(Duke University), Raffaele TORELLA (Sapienza, Università di Roma),

Judith T. ZEITLIN (The University of Chicago)

ISSN 1824-6109

ISBN 978-88-6719-171-0

© individual authors

Distributed by:

Dipartimento Asia, Africa e Mediterraneo

<[www.unior.it](http://www.unior.it)>

Printed by:



UniorPress

Università degli Studi di Napoli “L’Orientale”

Giugno 2020

## CONTENTS

<i>Prefazione</i> .....	XI
<i>Editors' Foreword</i> .....	XV
BRUNO GENITO	
<i>Adriano Valerio Rossi e "L'Orientale" di Napoli</i> .....	XIX
MATTEO DE CHIARA	
<i>Bibliography of Adriano Valerio Rossi</i> .....	XXV

### Part ONE

SALMAN ALIYARI BABOLGHANI	
<i>Is Lakī a Kurdish Dialect?</i> .....	3
VICTORIA ARAKELOVA	
<i>On the Names of God in the Yezidi Tradition</i> .....	21
GARNIK ASATRIAN	
<i>"Lightning" in Western New Iranian</i> .....	31
ALIREZA ASKARI CHAVERDI	
<i>A Joint Base for the Cultural Heritage of Fars</i> .....	49
SABIR BADALKHAN	
<i>Singer of Tales: Story of a Baloch Minstrel. How he was Discovered in his Early Age as a Future Epic Singer</i> .....	55
SARA BELELLI	
<i>'La ragazza di feltro' e 'La ragazza di legno': due fiabe kurde meridionali del tipo ATU 510B</i> .....	81
MARIA CARMELA BENVENUTO	
<i>Iranian Color Terms in Aramaic Documents from Ancient Bactria</i> .....	97
VAHE S. BOYAJIAN	
<i>Etymological Notes on Some Toponyms in Iranian Balochistan</i> .....	111
PIERFRANCESCO CALLIERI	
<i>Archaeological Notes on "Achaemenid" Anshan</i> .....	115
CARLO G. CERETI	
<i>Mithra nell'onomastica medio-iranica</i> .....	131

IRIS COLDITZ	
<i>Neues Licht auf ein altes Fragment: M20</i> .....	153
FRANCO CREVATIN	
<i>Ancora sulle ‘migrazioni’ indo-europee (e sui limiti della conoscenza)</i> .....	171
SIMONE CRISTOFORRETTI	
<i>L’era di Alessandro IV Aegus in un manoscritto pomponiano di fine Quattrocento</i> ....	197
JULIEN CUNY	
<i>A Short Note from the Louvre-DARIOSH Project: Cylindrical Column Bases from Achaemenid Susa and Elsewhere</i> .....	213
ROBERTO DAN	
<i>Il ruolo dei simboli nella costruzione dello stato: il caso di Bia/Urartu</i> .....	227
MATTEO DE CHIARA, ROBERTO MICHELI & LUCA MARIA OLIVIERI	
<i>Pašto mečán مېچن ‘hand-mill, quern’. Linguistic and archaeological notes on rotary querns</i> .....	255
JULIAN DEGEN & ROBERT ROLLINGER	
<i>How Greek the Medes were? Herodotus’ medikos logos, Athens and the transformation of empire from symmachia to arche</i> .....	273
ELA FILIPPONE	
<i>The Orders of the King: Reported Directive Quotations in the Achaemenid Royal Inscriptions</i> .....	291
MARIA VITTORIA FONTANA	
<i>Quṣayr ‘Amra, ca 740 CE: amīr al-Walīd Reclining and Dressed in Accordance with Iranian Fashion</i> .....	325
BRUNO GENITO	
<i>The Medes: Still an Historical-Archaeological Question</i> .....	343
PHILIPPE GIGNOUX	
<i>La refonte de la fonction d’Hērbed dans l’Iran sassanide et post-sassanide</i> .....	387
FRANTZ GRENET	
<i>Le contrat de mariage sogdien du Mont Mugh (Mugh Nov. 3 - 4) : quelques nouvelles hypothèses</i> .....	399
CARINA JAHANI	
<i>The Balochi Language as a Garden. An Attempt to Create a Standard for Written Balochi</i> .....	411
JEAN KELLENS	
<i>Exégèse et grammaire : le destin de l’Ahuna Vairia</i> .....	437
AGNES KORN	
<i>Kinship Terms in Balochi: A Patchwork Family</i> .....	449



GILBERT LAZARD	
<i>Traduire, transcrire en vieux-perse</i> .....	471
CLAUDIA LEURINI	
<i>Evidence of a Syriac Diatessaron in Mani's Šabūhragān</i> .....	473

## Plates

## PART TWO

ROMOLO LORETO	
<i>Gli Achemenidi e l'Arabia. Stato della questione</i> .....	495
PAVEL B. LURJE	
<i>Etymologies of Selected Terms for Weapons in Chorasmian</i> .....	511
MAURO MAGGI	
<i>Annotations on the Book of Zambasta, VI: Ronald E. Emmerick's *nvāta- and Persian navāxtan</i> .....	519
MARCO MANCINI	
<i>Middle-Persian Morphology and Old Persian Masks: Some Reflections on "Proto-Middle Persian"</i> .....	523
ENRICO MORANO	
<i>A Miserable Scrap</i> .....	567
ANTONELLA MURATGIA	
<i>The Asian Section of "L'Orientale" University Library: The Persian Manuscripts</i> .....	579
MARYAM NOURZAEI	
<i>The Emergence of Definiteness in Koroshi</i> .....	601
PAOLO OGNIBENE	
<i>Incontri e scontri di culture a nord del mar Nero. Sui cosiddetti nomi "barbarici" nelle iscrizioni del Ponto</i> .....	627
ANTONIO PANAINO	
<i>Il tempo e le sue "parti" nel mondo iranico antico. Avestico yār- "anno", aīiar-/aiian- e azan-/asn- "giorno"</i> .....	643
STEFANO PELLÒ	
<i>The Husayni Brahmins and Other Poor Persian Speakers: Standardizing Language and Devotion in Mīrzā Qatīl</i> .....	687
ANDREA PIRAS	
<i>Kirdār, Mani e la sigillografia. Autorità, potere e conflitti tra scritture nell'Iran sassanide</i> .....	705

FLAVIA POMPEO	
<i>Il persiano antico tra conservazione e innovazione: considerazioni sulle costruzioni impersonali nelle iscrizioni achemenidi.....</i>	721
ENRICO G. RAFFAELLI	
<i>Yašts and Bayān Yašts: Observations on the History of the Avestan Hymns.....</i>	741
HASSAN RAHSAZ	
<i>A Lapis Lazuli like Object Found during the Excavation of the Canals of the Persepolis Terrace in 1381 [2002-2003].....</i>	753
CÉLINE REDARD	
<i>« Y72.11 : un final qui n'en est pas un ! ».....</i>	757
HASSAN REZAI BAGHBIDI	
<i>The Commemorative Coin of Wahbarz, the Fratarak of Pārs .....</i>	769
GIORGIO ROTA	
<i>Storm in the Desert: Baluch against Safavids at the End of the 17th Century.....</i>	779
VELIZAR SADOVSKI	
<i>Performative Speech Acts in Indo-Iranian Sacred Jurisprudence. Between Ritual Formulation, Pragmatic Application and Political Resemanticization.....</i>	797
GIANCARLO SCHIRRU	
<i>Un processo di neutralizzazione dell'armeno orientale .....</i>	827
RÜDIGER SCHMITT	
<i>Zu den Personennamen der aramäischen Dokumente aus Baktrien.....</i>	849
MARTIN SCHWARTZ	
<i>On Gathic rāna- .....</i>	867
FRANCESCO SFERRA	
<i>CUL Add.1708.2: Frammento di un commento inedito alla Mañjuśrīnāmasaḡīti ....</i>	883
SHAUL SHAKED	
<i>Some lexical items in Middle Persian, I. pursišnīg .....</i>	901
GAGA SHURGAIA	
<i>L'edificante storia di Barlaam e Ioasaph: ὑπό, παρά oppure ὑπὲρ Εὐθυμίου? .....</i>	917
NICHOLAS SIMS-WILLIAMS	
<i>Dual and Numerative in Middle and New Iranian .....</i>	955
ANTONIA SORIENTE	
<i>I prestiti persiani in indonesiano. Bausani cinquant'anni dopo.....</i>	971
BRIAN SPOONER	
<i>Balochi and the Baloch. A Socio-Linguistic Puzzle.....</i>	1013

ROBERTO TOTTOLI	
<i>The Persian Language (al-fārisiyya) in Some Early Islamic Sources.....</i>	1029
AMIR ZEYGHAMI	
<i>Gēlakūn. An Armenian Place-Name in Niẓāmī's Khosrow u Šīrīn .....</i>	1043

**Plates**

MATTEO DE CHIARA, ROBERTO MICHELI & LUCA MARIA OLIVIERI  
Paris, Trieste & Saidu Sharif

**Pašto *mečán* مچن ‘hand-mill, quern’.**  
**Linguistic and archaeological notes on rotary querns**

**I**t is a great pleasure for me and for my colleagues and co-authors to dedicate this short note to Adriano. We all benefitted a lot from Adriano’s help and encouragement. My colleagues of the Italian Archaeological Mission benefitted Adriano’s continuous support to the Mission as President of ISMEO. I personally owe to him a great deal of gratitude for supporting my doctoral and current researches. In particular, during my PhD studies, thanks to him – and here the circle closes – I had the opportunity to enjoy a long period of study in Swāt (Khyber Pukhtunkhwa, Pakistan) at the historical Mission House at Saidu Sharif. The Italian Archaeological Mission, currently directed by Luca M. Olivieri, one of the co-authors of this article, was founded by Giuseppe Tucci in 1955. Initially under the auspices of ISMEO, then ISIAO, the Mission is now a research unit of ISMEO–The International Association for Mediterranean and Oriental Studies.

This paper, composed of two sections, linguistic and archaeological (the second dealing with materials excavated in Swāt by the Mission), is the result of a long and initially informal thread of exchanges of views, opinions, data, between a linguist and two archaeologists. The paper focuses on a simple but successful device called rotary quern, or *mečán* in Pashto. Basically, a rotary quern – as I learn from Roberto Micheli – consists of a lower circular stationary stone in the form of a low cone, the apex of which carried a metal or wooden spindle supporting the upper rotating stone. Rotary querns were very common in South Asia, including in Swat, only a few decades back. The sound of the upper stone of rotary querns revolving fast to grind the daily flour portion was the early morning signature sound in traditional village houses.

[Matteo De Chiara]

I. LINGUISTIC ANALYSIS: *mečən*, *žrānda*, THEIR MEANING AND THEIR ORIGIN

Pšt. *mečən* ‘hand-mill, quern’ (waziri *mēčan*, Morgenstierne 1932: 22) is attested for the first time in Dorn 1847 as “ميچن f. pl. ني – A mill. A millstone”, then in Raverty 1860: *mīchan* ‘a hand-mill’. Among the other Iranian languages of ancient, middle and modern epoch we cannot find any trace of similar forms, with a possible exception (see *infra*).

Only four comparisons seem recall the Pashto word: **1)** Greek μηχανή; **2)** Persian *maḥana*; **3)** English *machine*; **4)** Latin *machina*.

**1)** In 1928 (p. 200), G. Morgenstierne explained the term *mečən* as a loanword, through a \**mēkanī*-, from Gr. μηχανή, ‘moyen; machine, notamment pour une machine de guerre, ou la machinerie du théâtre, mais aussi toute espèce de moyen, de combinaison, d’invention, parfois pris en mauvaise part [...]’ (Chantraine 1968: 699).

Concerning  $\chi > \check{c}$ , Morgenstierne (1928: 200) pointed out that “The borrowing must have taken place after the change of intervoc. *k* towards *g*,  $\gamma$ , but before the loss of final *-ī*”. However, he left space to doubt: “It is impossible not to think of Gr. μηχανή as the ultimate source of this word; but the details are uncertain, as we do not know the word from any other Ir. language”.

About the vocalic change: “In Ir. Gr. *-η* (narrow *e*) would naturally be rendered by *-ī*, not by *-ā*; internal *η* could be rendered by *ē*” (*ibid.*).

The morphologic category is also explained by Morgenstierne (1942a: 93): “Original n. pl. forms have [...] been absorbed into this group [femini-nes in *ī*], which has been augmented, as well by ancient borrowings [and here he quotes in note Pashto *mečən*], as by quite recent loan-words, such as *paltən* ‘regiment’”.

Lastly, concerning the semantic aspect: “Prob. the word has been borrh. into Ir. in the wider sense of ‘machine, contrivance’. Through specialization it might easily come to denote ‘mill’, and finally the introduction of the Indian word *jaranda*, *žandra* for ‘water-mill, wind-mill, mill turned by camels or bullocks’ (...) has restricted the sense of *mēčan* still further” (Morgenstierne 1928: 200).

In 1940 (p. 143), he affirmed that this word “may have been taken over from the Greeks of Kabul”.

In 1970 (p. 350; cf. also Id. 2004: 48) the analysis of the loanword was by him rearranged and definitely established:

The word was probably adopted into Psht. as denoting an improved, revolving kind of quern. There is no trace of the word having passed through Parthian or some other WIr. language on its way. If it was taken over directly from Greek, this must have happened before the palatalization of Psht.  $k > č$ , which shows that the final  $-ī$  was still pronounced and rendered it natural that it should be included in the group of feminines in ancient  $-ī$ . The borrowing probably took place somewhere in eastern Afghanistan, but the absolute chronology cannot be determined.

Other loanwords from Pashto are: Ormuři *mēčīn*, *mučīn* 'handmill' (Morgenstierne 1932: 22); Palola *mēčīni* (Id. 1940: 143); Phalūra *mēčīni* (Id. 1941: 41); Dameli *mēčīni* (Id. 1942: 178); etc. Cf. also Albanian *mokere* 'hand-mill' (Id. 1940: 143) and Armenian *mek'enay* (stem in *i*) 'machine' (Id. 1929: 200).

The same P. Chantraine mentioned the proposal by G. Morgenstierne in his etymological dictionary of the Greek language (1968: 700): "Frisk [1960] rappelle pour l'iranien que Morgenstierne a tiré de μηχανή pashto *mēčān* 'moulin à bras'".

Cf. also the comparisons contained in Pokorny, p. 695, where the term  $\mu\eta\chi\omicron\varsigma$  is derived from the Indo-European root *\*magh-*: *māgh-* 'können, vermögen, helfen'. From Doric  $\mu\alpha\chi\alpha\nu\acute{\alpha}$  is without doubts derived Latin *machina* (see *infra*).

2) **Persian** مطحنة *maṭḥanat*, *maṭḥana* 'a mill' (Steingass) is in turn a loanword from Arabic *mitt'hhana* 'mill', root *ttahhana* 'grind' (Sem. ط ح ن): Ar. *miṭhana* 'a mill that is turned by water'; cf. also *tahhana* 'a mill that is turned by beast' (Lane).

Bellew (1967) makes of *mečān* 'a handmill' a loanword from Ar. *mījan*, probably thinking to this same root.

It should be noted that the Pashto word, mainly on account of the vowels, is nearer to Arabic than to Persian, at least on the formal ground (as it is quite common).

Even if from the semantic point of view the word seems to fit well, notwithstanding there remains a difficulty on the formal ground: Ar. ط is commonly kept in Pashto, then the outcome  $t > č$  is unexplainable.

Besides that, it should be noted also that this term, present in Steingass, does not appear in any other consulted Persian dictionary (Hayyim, Miller), and the current term for 'quern' is دست آس - دستاس (*dastas*) 'hand-mill, quern'. In Coletti, as a derivative of this root it is quoted only the term ( $\leftarrow$  Ar.) *mathun* 'macinato'.

As for the Arabic term, we cannot say much more than the trilateral root. It would be tempting to think to a contact with Gr. μηχανή, but this hypothesis does not seem to be corroborated by formal information.

**3) English *machine*** ‘structure of any kind’, obviously a loanword from the Romance languages, probably of 1540 (*Online Etymology Dictionary*), from Middle French *machine* ‘device, contrivance’, in turn a derivative of Lat. *machina*.

The contacts between English and local populations of Afghanistan and North West Frontier Province certainly brought new lexicon in Pashto, moreover in the technological fields. What remains unexplainable is why the mill and the quern, of which there are centuries of archaeological attestations (v. *infra*), should derive their names from a relatively recent loanword from English. Neither from the semantic point of view it is clear why a generic Engl. *machine* should indicate the mill. We should add that in Pashto there exists also another term for ‘mill’: *žrānda* (see *infra*).

Besides that, there is also a further difficulty of formal order: the outcome of *š* to Pashto *č* (Engl. *a* → Psht. *e* is more explainable as phonetic adaptation). See, for example, the corresponding English loanwords in Pashto *māšín* ‘1. machine; 2. motor, engine; 3. apparatus, instrument’ and derivatives (*māšingān* ‘machine gun’, *māšíní* ‘1. machine, mechanical; mechanized; 2. factory, industrial, manufacturing’, etc.: cf. Aslanov 1966 and its English translation, Pashtoon 2009), where Engl. *š* is maintained, as the same phoneme exists and is very productive in Pashto (Engl. *a* is rendered rather as *ā* in Pashto, with partial velarization, instead of palatalization, in accordance with the English pronunciation).

It should be pointed out, however, that *māšín* is not attested in the dictionaries of Dorn and Raverty, where we find the first attestations of *mečān*.

**4) Latin *māchīna*** ‘a machine, i.e. any artificial contrivance for performing work, an engine, fabric, frame, scaffolding, staging, easel, warlike engine, military machine’, is a loanword from Italian Greek Doric μαχανᾶ.

Tagliavini (1972<sup>6</sup>: 224) well explains the semantics of Latin:

Il lat. *mac[h]ina*, che indicava vari strumenti, varie macchine (da guerra o no), si è specializzato, in buona parte del territorio della Romania, per un solo tipo di queste macchine, e cioè per la mola da mulino (it. *mácina*, dalm. *mukna*), mentre conserva significati vari in altra parte del territorio romano (lucch. *máina* “macchina”, tarant. *macénila* “arcolajo”, ecc.). Ma il verbo *machinari*, divenuto di forma attiva (*mac[h]inare*) come tutti i deponenti nell’intero territorio della Romania, presenta concordemente il solo senso di “macinare” (oltre

l'italiano *macinare*, cfr. rum. *măcina*, dalm. *maknur*, sardo log. *maginare*).

Concerning the phonetic development, probably the aspirate *h* should have been faint since an ancient epoch. According to Sihler 1995: 158, "The sound written *h* in L[atin] was faintly sounded, and probably absent in colloquial speech from an early period".<sup>1</sup>

Until now nobody has related the Pashto term directly with Lat. *mac(h)ina*, even if this is the most fitting term from the phonetic (palatalization of *-ā-* due to the following *-ř-*) as well as the semantic point of views.<sup>2</sup> Archaeological data demonstrating a south-eastern origin of the "hand-mill" (see *infra*) corroborate this etymology, which presents no weak points.

On the contrary, none of the first three etymological proposals is free from doubts. The less convincing hypothesis is the juxtaposition with the English, but not even the second comparison with Persian is much plausible, and this above all due to the existence of a lonely attestation of the Persian term, in Steingass' dictionary.

The proposal of a Greek loanword seemed to be the more acceptable, but there are formal (*kh* → *č*) and semantic ('machine' → 'hand-mill') difficulties. And what above all calls upon prudence is the complete isolation of Pashto *mečən* among the Iranian languages as well as the Indo-Aryan languages (except direct loanwords from Pashto, as Ormuři *mečín*, *mučín*). Indeed, for 'hand-mill' we find *garāt* in Parači (← Pashai *garāt* ← IA., Lahndi *ghuraṭ*, etc., Morgenstierne 1944: 73, CDIAL 4451), *baṇḍux*, *liṅgōn* and *yurzuyo* in Yidya, *karksaṅg* in Sariqoli, etc.; for other kinds of mills, various terminology (cf. Morgenstierne 1938).

The only possible exception could be represented by Yaynobi *metin* 'hammer, mallet' (Mirzoev), even if apparently not semantically related. In this case, the Arabic word (n. 2 *supra*) seems to be more fitting.

Not even the other languages of the region belonging to different language families show terms ascribable to the same root of Pashto *mečən*.

For instance, in the Dravidian languages we find: Telugu *tirugali*, *tirugalli* 'a mill, handmill, gristmill' (DED 2655); Brahui *nusxal* 'handmill' < *nusing* 'to

<sup>1</sup> Cf. also Tagliavini 1972<sup>6</sup>: 243, stating that already in Cicero's epoch *h* was no more pronounced if not in words of Greek origin (written *ch*, *ph* and *th*), and only by educated people, influenced by the Greek pronunciation.

<sup>2</sup> Walde-Hofmann 1954: 4 remarks: "vlt. und rom. auch 'Mühlstein, Handmühle'".



crush, grind' and *xal* 'stone' (DED 3089). In Turkish, 'hand-mill' is *èl-dèghirméni* (Redhouses).

We mentioned the existence in Pashto of another root for 'mill', *žranda* ژرنده, 'water-mill or wind-mill; mill for grinding corn, whether worked by cattle or water'<sup>3</sup> (Raverty and Bellew; cf. also in different Pashto dialects: Waz. *žandra*, Swat *žranda*, Wan. *zranda* 'water mill' etc.; see also Morgenstierne 1927: 105).

Initially derived from a non-attested root *\*žaral* 'moudre' by J. Darmesteter (1888-1890: XLV), it has been definitely acknowledged as Indo-Aryan loanword by G. Morgenstierne (1923: 259ss. and 1927: 105), i.e. ← Lhd. *jan-dar* (cf. also Id. 2004: 105), < Sanskrit *yantrám* 'any instrument for holding or fastening, lock, tie' (cf. KEWA III 7 and CDIAL 10412 for other comparisons with the Indo-Aryan languages). This same loanword is found in other modern Iranian languages: Bal. *žandar*, *žantar*, *žanthir*, *žāthar*, *žathir* 'mill, millstone', Prs. *žandara* 'Mangelholz/second choice wood, caster' and the same Pšt. *žandra* 'padlock, instrument for drawing wire' (but described by Morgenstierne 1927: 105 as "a more recent lw. [respect to *žaranda*, etc.]"), as well as in the Indo-Aryan and Kafir languages, as Dameli *žandra*, *žan*, Pashai *žantr*, Wotapurī *yan*, Lahndi and Panjabi *žandar*, Sindhi *jaṇḍru*, etc.

We do not know the epoch of entering into Pashto of this loanword: according to the opinion of G. Morgenstierne (1928: 200), quoted *supra*, it should be successive to *mečən*, with resulting distribution of the semantic fields: 'water-mill' the first and 'hand-mill' the second.

In conclusion, we can safely state that Pashto *mečən* represents a loanword from Latin *mac(h)ina*. I am not fully convinced of Morgenstierne's statement, that *žranda* should be successive. On the contrary, as the root IA *yantra* is well attested in all the Indian languages, it should represent the inherited term for 'mill'. In this situation, the Romans, while bringing a

<sup>3</sup> "ZHRANDA [*žranda*]: Zhranda means a flour mill. It is sacred and one cleans himself before entering it. – In almost all places a ZHRANDA is now private property and the one who making flour pays for the use of the ZHRANDA. But one can still find a zhranda in common ownership of a tribe, where everybody makes flour without paying for it. – This is a left over from the time when all public property was owned in common. Through the development of private properties zhrandas were stamped as such. – I personally have seen a zhranda in common ownership in Nikah Khwar, Metay Tangay, Zadrán" (Atayee, n. 375, p. 110).

new type of mill, the *macina*, brought with them also its denomination,<sup>4</sup> which could have been retained by some populations in the North-West, but immediately abandoned for conservative reasons (see *infra*). We do not know when and whence the Pashtuns have reached their actual position: anyway, they should have found the *macina* and its denomination still living among the local population. The presence of this ancient loanword could even be a sign of a relatively earlier constitution of Pashtun ethnic and linguistic identity. The two terms, *mečán* and *žranda*, could be then loanwords from different sources but of the same epoch (or the latter even prior), and the semantic specialization and distribution should have occurred in the very beginning of their arrival and coexistence. As a consequence of the lack of a well-established tradition, there would have been no necessity of preservation of one or the other denomination: all this would then account for the maintaining of both terms, which occurs only in Pashto.

Lastly, concerning the semantic development, a final comparison can be quoted here. Linked to the same Pashto root *žandra*, we find in Grierson's dictionary Kashmiri हस्तयन्त्रम् [*hasta-yantram*] m. 'a hand machine; hence, a hand-mill; a lock or bolt of a door which can be opened by the hand without a key'. In Kashmiri, a Dardic language, we find both the meanings of the Pashto word, *i.e.* 'padlock' and 'hand-mill'. Grierson's remark seems to explicate this semantic evolution from generic "equipment" to "hand-mill". Cf. also what affirmed by Sankalia (1960: 485): "Thus in every one of these languages [i.e. the Indo-Aryan languages mentioned above], the rotary quern was recognized as a machine".

[Matteo De Chiara]

## II. ARCHAEOLOGICAL ANALYSIS: *mečán*-TYPE QUERNS IN ANCIENT SWAT

Stone tools for processing cereals are dated back to the Neolithic or before. The saddle quern is the older and most elementary device for grinding grains. The revolutionary innovation of applying the rotary motion to the grinding process produced the rotary quern (henceforth, RQ) (Childe 1943; Moritz 1958; Amouretti 1985). This device consisting of a pair of stacked circular stones, between which grains are placed and ground with a rotary

<sup>4</sup> The same, but in the opposite direction, could have been happened in Romani Syrian, where we find *jándri* 'mill' (cf. Sankalia 1960: 485).

motion, is an important technological innovation of ancient world as the first major application of static rotary motion since the invention of the potter's wheel. It is probable that RQ evolved, not from the saddle quern, but from grain-rubbers with spherical stones running in rimmed concave basins (Forbes 1956: 108).

RQs, invented probably somewhere in the western Mediterranean during the 5th century BCE (Alonso Martinez 2002), spread out later closely connected with the armies of Greece and Rome. The soldier of classical armies ground their own corn, and the portable RQ was an essential element of the equipment of the Roman army. Each *contubernium* (the smallest organized unit of soldiers in the Roman army: five to ten men) was equipped with one RQ.<sup>5</sup> Portable rotary querns were appropriate tools to grind grains on board on long route journeys (Childe 1943: 25; Forbes 1956: 109).<sup>6</sup>

A certain number of RQs (twentyone specimens) were discovered *in situ* in the Kushana layers of the Early Historic urban site of Barikot, in Swat (hereafter BKG).<sup>7</sup> Data from BKG evidence that RQs started being used only in Kushan times, and were used along with saddle querns (Q), which remained the dominant device. The following table (Table 1) shows the trend of stone grinding tools in trench 4-5 and 11 (Callieri et al. 1992, Olivieri et al. 2014) at BKG. The table below does not include legged querns (LQ),<sup>8</sup> and

<sup>5</sup> Portable small-size RQs were called in the Roman army with a specialized term: *mola manuaris*. Each Roman soldier carried with him enough flour for thirty days.

<sup>6</sup> In addition, we must not lose sight of the fact that RQs appear also in China during the Han Dynasty by 2nd century BCE (the earliest Chinese written evidence mentioning them can be dated to the 1st century BCE). The occurrence of RQs in China raises therefore the question whether the model of Chinese RQ came from West, or it was a simultaneous invention made on the two opposite ends of the Old World (Needham 1965: 185-191; Kidder et al. 2012).

<sup>7</sup> Barikot since 1984, is a major archaeological project of the Italian Archaeological Mission. The excavation was first directed by Pierfrancesco Callieri, then by Luca M. Olivieri. Barikot in Macrophase 4 was a rich Kushan city. In Macrophase 5 Barikot underwent a phase of deep crisis (second half of the 3rd century). Two successive earthquakes in the space of less than 50-70 years have been clearly documented in the coeval stratigraphy. This fact, alongside the political upheaval represented by the collapse of the Kushana empire, and the rise of the Kushano-Sasanian rule, would conceivably have led the city to its abandonment at the very beginning of the 4th century CE (Macrophase 6) (Olivieri 2012).

<sup>8</sup> LQs (or stool-querns) from BKG are luxury items, certainly not used for ordinary food preparation, rather to grind spices or pigments (Taddei 2004: 17). These

refers to plain querns = Q, and rotary querns = RQ, the latter corresponding in Pashto lexicon to *mečán*-type querns.

Q and RQ are two types of increasingly specialized cereal grinding utensils. Q is for individual use, the user kneeling and moving and partially rotating a horizontal pestle held in both hands; the flour thus produced, according to experimental archaeology studies, was very gritty, a factor that certainly must have had implications as regards dietary and health (e.g. teeth wear). Two types of Q querns are known from BKG: Q1, saddle-shaped, which is typical of Protohistory and Early Historic phases in Swat (and all over South Asia), and Q2, plain or flat-shaped, more common from Historic to Late Historic phases. RQ are more productive grinding devices and imply the involvement of several individuals (women? see Sankalia 1960: 489).

From the chronology point of view, one may note the progressive presence of RQ models from BKG Macrophase 4 (c. 50-200 CE) to Macrophase 5 (200-300 CE).<sup>9</sup> Q querns are still present even though saddle-shaped instruments (Q1) decrease in favour of plain types (Q2). Interestingly, RQs remained in use after the abandonment of the urban settlement. In the later post-urban settlement at BKG, RQ models are still well documented (BKG 2018-2019: two RQ in Macrophase 7: 400-600 CE, and three in Macrophase 8a-b: 700-1000 CE). Particularly important are the six RQ examples found in the Dardic/pre-Pashtun settlement in Macrophase 9b: 1300-1500 CE (data from BKG excavation 2018-2019; pers. comm. by L.M. Olivieri).

---

querns are made in talc-schist (small and miniature examples), or in red Mathura sandstone. The first type was certainly locally made, while the latter are imported from Mathura (*ibid.*).

<sup>9</sup> As far as the shape and technology evolution is concerned, the specimens of BKG match the evidence from Sirkap (Marshall 1951) and Nevasa (Sankalia 1960), since in the later types, the vertical handle tends to substitute the type with horizontal socket.



latter certainly an imitation/import of a well-known Greek technology.<sup>10</sup> Unfortunately the excavation report is not in position to determine with absolute certainty neither whether these materials were coeval, nor whether they belong to the Temple assemblage, or to the later settlement phase. Apparently the author, H.-P. Francfort is inclined to consider the latter hypothesis more probable. So far then, the trend recorded at BKG remains consistent with other data from South Asian<sup>11</sup> and South Indian sites, where RQs are present only after the first century CE and are distinctive of urban contexts.<sup>12</sup> RQ is not a traditional technology in South Asia, and it has been associated to international trades. Most probably this technology has been imported from the Mediterranean (see Sankalia 1959;<sup>13</sup> see also Sankalia 1960: 477-489), and most of the RQs assemblages were found in contexts not far from the coast all over South India.

At Nevasa (Maharashtra) the earliest RQs were dated to 2nd-1st BCE on the basis of their association to the so-called "Megarian" bowls (Sankalia 1960: 481-482). On these basis V. Gordon Childe thought that the introduction of RQs should have happened during the Indo-Greek times (quoted in Sankalia 1960: 482). Actually, this chronological association is possibly wrong, since moulded ware echoing the "Megarian" tradition is now known as a proper and slightly later Indian production (see Begley 1991). Moreover, as we know from BKG, where Indo-Greek layers and material culture were both very well excavated and documented, and RQs are absent, the import of RQ models started at earliest towards the end of the 1st century BCE. This period, that in NW India archaeology is called Saka-Parthian, saw the first commercial large scale contact phase with Roman traders. The presence of these RQs increased all over South Asia (and BKG) during the Kushana periods, when commercial trades with the West reached their peak.<sup>14</sup>

<sup>10</sup> A similar quern was found also at Sirkap, but not published in J. Marshall (see Francfort 1984: fn. 12). See also Stančo 2018.

<sup>11</sup> From Sirkap (see Marshall 1951) to Sonkh (see Härtel 1993).

<sup>12</sup> For distribution in India, see the – although outdated – map in Sankalia 1960: fig. 202.

<sup>13</sup> Although debated by someone, the hypothesis is still valid (Gosh 1989), and confirmed by the BKG evidence.

<sup>14</sup> At Sonkh RQs apparently were used only from later periods (Härtel 1993: 267-268, figs. 1-15 on pp. 270-272). "A few pieces originate from Maurya and Mitra levels, the bulk belong to Kuṣāṇa habitations. It looks as if in the earlier levels the

Once this grinding device was well established in proper India and in a big metropolis of the North-West like Sirkap, it started being common at BKG as well, as a typical acculturation phenomenon. The import of RQ models to BKG and Swat, is associated to a phase of “Kushanization” (or “Indianization”) that occurred in Macro-phases 4 and 5 (see Olivieri and Vidale 2006; Micheli, in press), when pottery forms and techniques, some form of technology, and luxury objects were imported or emulating the forms *en vogue* in the Gangetic plain, where the Kushanas had their main centres.

In general milling was always a family job in ancient societies of South Asia (Sankalia 1960: 489). Because of its non-commercial characteristics, milling was maintained as it was for centuries, and introduction of any change was slow and initially seen with a certain degree of reluctance. Changing device would have automatically implied a change in the working system and production line, which was certainly not an easy option in a traditional society.<sup>15</sup> The introduction of RQ occurred initially in urban environments, e.g. at BKG. It can be considered as a strong sign of emulation/acculturation of the urbanite groups, which – though – survived the collapse of the city, and of its social system. In fact, notwithstanding the later re-appearance of plain Q devices, RQs was a winning technology and remained in use for centuries in Swat, where are still used (called *mečān*) in remote villages on the granite outcrops of southern Swat, wherever commercial or communal water-mills (called *žandra*) are not established or possible (e.g. for scarcity of water or electricity).<sup>16</sup>

---

quern table [LQ] was in fashion while in the Kuṣāṇa times the quern plate (without legs) [Q] has been favoured. The circular or rotary quern [RQ] appears only in the late Kuṣāṇa to post-Gupta levels.” (*ibid.*: 267). One should remember that Sonkh (and Mathura) was a centre of production and exports of LQs a typically indigenous and tenacious technology. LQs are persistent in South Asia since Indian megaliths and Early Historic phases, to become extremely successful in South-East Asia in later periods (see Weisshaar 2014). Devices like LQs had a long-shelf life in sites such as Sonkh, probably because milling was linked to the ergonomics of a family work, *per se* extremely conservative. In general, the trend observed at BKG is the same documented by a recent study on the Late Historic Bactrian evidence (Stančo 2018: 119-120).

<sup>15</sup> See Francfort 1984: 88.

<sup>16</sup> Also in India RQ devices remained in randomly use throughout the centuries until modern times (wherever milling remained a family activity) (Sankalia 1960: 485).

In any case, if the earliest introduction of such technologically and ergonomically advanced foreign device was accompanied by a name, the latter must have been a foreign name, like *machina-macina*, probably its true name, in any case a name branding its foreign origin.<sup>17</sup>

[Luca Maria Olivieri]

#### REFERENCES

- Alonso Martinez, N. (2002) Le moulin rotatif manuel au nord-est de la Péninsule ibérique: une innovation technique dans le contexte domestique de la mouture des céréales. In: H. Procopiou & R. Treuil eds., *Moudre et Broyer. L'interprétation fonctionnelle de l'outillage de mouture et de broyage dans la Préhistoire et l'Antiquité. II. Archéologie et Histoire: du Paléolithique au Moyen Age*. Toulouse: 111-127.
- Amourretti, M.-C. (1986) *Le pain et l'huile dans la Grèce antique: de l'araire au moulin*. Paris.
- Aslanov, M.G. (1966) *Afgansko-russkij slovar' (pushtu)*. Moskva.
- Atayee, I.M. (1979) *A Dictionary of the Terminology of Pashtun's Tribal Customary Law and Usages*. English translation by A.M. Shinwary. Kabul.
- Begley, V. (1991) Ceramic Evidence for the Pre-Periplus Trade on the Indian Coasts. In: V. Begley & D. De Puma eds., *Rome and India. The Ancient Sea Trade*. Madison: The University of Wisconsin Press: 157-196.
- Bellew, H.W. (1867) *A Vocabulary of the Pukkhto or Pukshto Language*. London.
- Burrow, T. & M.B. Emeneau (1984) *A Dravidian Etymological Dictionary*. 2nd ed. Oxford.
- Callieri, P., P. Brocato, A. Filigenzi, M. Nascari & L.M. Olivieri (1992) *Bīr-koṭ-ghwaṇḍai 1990-1992. A Preliminary Report on the Excavations of the Italian Archaeological Mission, IsMEO (Annali [dell'Istituto Universitario Orientale di Napoli] 52/4, Suppl. 73)*.

<sup>17</sup> It is extremely interesting to note that if in the South Asian harbours and markets RQs were denoted by a name of foreign origin, at the other side of the trade route, in Syro-Roman ports for the same device is preserved a name of Indian origin (see above fn. 4). RQs became a status symbol, besides being an extremely functional technical device. Therefore, it is understandable that in the creolized lexicon of the merchants and seamen along the Indo-Roman trade routes, the foreign name was preferred.



- CDIAL: Turner, R.L. (1966) *A Comparative Dictionary of the Indo-Aryan Languages*. London.
- Chantraine, P. (1968) *Dictionnaire étymologique de la langue grecque*. Paris.
- Childe, V.C. (1943) Rotary Quern on the Continent and in the Mediterranean Basin. *Antiquity* 17: 19-26.
- Coletti, A. & H. Grünbaum (1978) *Dizionario persiano-italiano*. Roma.
- Darmesteter, J. (1888-1890) *Chants populaires des afghans*. Paris.
- Dorn, B. (1847) *A Chrestomathy of the Pushtū or Afghan Language*. St. Petersburg.
- Forbes, R.J. (1956) Food and drink. In: C. Singer, E.J. Holmyard, A.H. Hall & T.I. Williams eds., *A History of Technology. Volume II. The Mediterranean and the Middle Ages c. 700 BC to c. AD 1500*. New York – London: 101-146.
- Francfort, H.-P. (1984) *Fouilles d’Ai Khanoum, III. Le sanctuaire du temple a niches indentées. 2. Les trouvailles (MDAFA 27)*. Paris.
- Frisk, H. (1960) *Griechisches etymologisches Wörterbuch*. Heidelberg.
- Gosh, A. ed. (1998) *An Encyclopaedia of Indian Archaeology, I-II*, Indian Council of Historical Research. New Delhi: Munshiram Manoharlal Publishers.
- Grierson, G.A. (1932) *A dictionary of the Kashmiri language*. Calcutta.
- Härtel, H. (1993) *Excavations at Sonkh* (Monographien zur indischen Archäologie, Kunst und Philologie 9). Berlin.
- Hayyim, S. (1934-1936) *New Persian-English dictionary*. Teheran.
- KEWA: Mayrhofer, M. (1956-1980) *Kurzgefasstes etymologisches Wörterbuch des Altindischen, I-IV*. Heidelberg.
- Kidder, T.R., Haiwang Liu & Minglin Li (2012) Sanyangzhuang: early farming and a Han settlement preserved beneath Yellow River flood deposits. *Antiquity* 86: 30-47.
- Lane, E.W. (1863-1893) *An Arabic-English lexicon: derived from the best and the most copious Eastern sources*. London.
- Marshall, J. (1951) *Taxila. An illustrated account of archaeological excavations carried out at Taxila under the orders of the Government of India between the years 1913 and 1934, I-III*. Cambridge: Cambridge University Press.

- Micheli, R. (in press) Shell bangles, body adornment and 'Indianization' process: some insights from the late Kushan phase at Bīr-koṭ-ghwaṇḍai (Khyber Pakhtunkhwa, Pakistan). *Proceeding of the 22nd Conference of the European Association for South Asian Archaeology and Art* (Stockholm, 30th June - 4th July 2014).
- Miller, B.V. (1953) *Persidsko-russkij slovar'*. Moskva.
- Mirzoev, S. (2002) *Лугаму Яғнобӯ-Тоҷикӯ*. Душанбе. [English translation 2008.]
- Morgenstierne, G. (1923) Iranian notes. *Acta Orientalia* 1: 245-284.
- Morgenstierne, G. (1927) *An Etymological Vocabulary of Pashto*. Oslo.
- Morgenstierne, G. (1928) Notes on Professor Charpentier's article. *Acta Orientalia* 7: 198-200.
- Morgenstierne, G. (1932) Supplementary notes on Ormuri. *Norsk Tidsskrift for Sprogvidenskap* 5: 5-36.
- Morgenstierne, G. (1938) *Indo-Iranian Frontier Languages, II, Iranian Pamir Languages*. Oslo.
- Morgenstierne, G. (1940) 'Pashto', 'Pathan' and the treatment of *r* + sibilant in Pashto. *Acta Orientalia* 18: 138-144.
- Morgenstierne, G. (1941) *Notes on Phalūṛa, an unknown Dardic language of Chitral*. Oslo.
- Morgenstierne, G. (1942) Notes on Dameli, a Kafir-Dardic language of Chitral. *Norsk Tidsskrift for Sprogvidenskap* 12: 115-198.
- Morgenstierne, G. (1942a) Archaism and innovation in Pashto morphology. *Norsk Tidsskrift for Sprogvidenskap* 12: 88-114.
- Morgenstierne, G. (1944) *Indo-Iranian Frontier Languages, III, 2, The Pashai Language. Texts and translations*. Oslo.
- Morgenstierne, G. (1970) Istālif and other place-names of Afghanistan. *Bulletin of the School of Oriental and African Studies* 33: 350-352.
- Morgenstierne, G. (2004) *A New Etymological Vocabulary of Pashto*, compiled and edited by J. Elfenbein, D.N. MacKenzie & N. Sims-Williams. Wiesbaden.
- Moritz, L.A. (1958) *Grain-Mills and Flour in Classical Antiquity*. Oxford.
- Needham, J. (1965) *Science and Civilisation in China. Volume 4. Physics and Physical Technology. Part II: Mechanical Engineering*. Cambridge.

- Olivieri, L.M., M. Vidale et al. (2006) Archaeology and Settlement History in a Test-Area of the Swat Valley. Preliminary Report on the AMSV Project (1st Phase). *East and West* 44/1-4: 73-150.
- Olivieri, L.M. (2012) When and why the ancient town of Barikot was abandoned? A preliminary note based on the last archaeological data. *Pakistan Heritage* 4: 109-120.
- Olivieri, L.M., et al. (2014) *The Last Phases of the Urban site of Bir-kot-ghwandai (Barikot). The Buddhist sites of Gumbat and Amluk-dara (Barikot) (ACT Reports and Memoirs, II)*. Lahore: Sang-e-Meel Publisher.
- Pashtoon, Z.A. (2009) *Pashto-English Dictionary*. Hyatsville.
- Raverty, H.G. (1860) *A Vocabulary of the Pukhto, Pushto or Language of the Afghans*. London.
- Redhouse, J.W. (1890) *A Turkish and English lexicon*. Constantinople.
- Sankalia, H.D. (1959) Rotary querns from India. *Antiquity* 33, 130: 128-130.
- Sankalia, H.D. (1960) *From History to Pre-History at Nevasa. Report on the Excavations and Explorations in and around Nevasa 1954-56* (Department of Archaeology and Ancient Indian History, Deccan College University of Poona, Publication no. 1). Poona.
- Sihler, A.L. (1995) *New Comparative Grammar of Greek and Latin*. New York – Oxford.
- Stančo, S. (2018) Getting rotary: Introduction of rotary quern stones in Ancient Bactria. In: *The Problems of History, Archaeology and Ethnology of Central Asia*. Tashkent: The Ministry of Higher and Secondary Specialized Education of Uzbekistan. National University of Uzbekistan named after Mirzo Ulughbek: 118-128.
- Steingass, F.J. (1892) *A comprehensive Persian-English dictionary, including the Arabic words and phrases to be met with in Persian literature*. London.
- Taddei, M. (2004) Imported Artefacts from Bīr-koṭ-ghwaṇḍai. *Bīr-koṭ-ghwaṇḍai Interim Reports II* (IsIAO Reports and Memoirs, New Series 3). Rome: Istituto Italiano per l’Africa e l’Oriente: 11-24.
- Tagliavini, C. (1972<sup>6</sup>) *Le origini delle lingue neolatine*. Bologna. [1<sup>st</sup> ed. 1949.]
- Walde, A. & J.B. Hofmann (1954) *Lateinisches etymologisches Wörterbuch*, vol. 2. Heidelberg.
- Weisshaar, H.-J. (2014) Legged Saddle Querns of South Asia. *Zeitschrift für Archäologie aussereuropäischer Kulturen* 6: 119-144.

FIGURES (PLATES XVI-XXII)

- Fig. 1. BKG 11 1-2 E. Corridor 35. Macrophase 5 (Photo by L.M. Olivieri. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).
- Fig. 2. BKG 11 5-6 W. Macrophase 5 (Photo by L.M. Olivieri. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).
- Fig. 3. BKG 3429 (Photo by C. Moscatelli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).
- Fig. 4. BKG 3430 (Photo by C. Moscatelli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).
- Fig. 5. BKG LQ. 141 (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).
- Fig. 6. BKG Q types (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).
- Fig. 7. BKG Q.04 (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).
- Fig. 8. BKG Q.16 (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).
- Fig. 9. BKG RQ types (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).
- Fig. 10. BKG RQ.03 (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).
- Fig. 11. BKG RQ.01 (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).
- Fig. 12. BKG RQ.06 (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).





Fig. 1. BKG 11 1-2 E. Corridor 35. Macrophase 5 (Photo by L.M. Olivieri. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).





Fig. 2. BKG 11 5-6 W. Macrophase 5 (Photo by L.M. Olivieri. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).



Fig. 3. BKG 3429 (Photo by C. Moscatelli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).



Fig. 4. BKG 3430 (Photo by C. Moscatelli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).





Fig. 5. BKG LQ. 141 (Photo by R. Micheli, Courtesy Italian Archaeological Mission in Pakistan-ISMEO).



Fig. 6. BKG Q types (Photo by R. Micheli, Courtesy Italian Archaeological Mission in Pakistan-ISMEO).



Fig. 7. BKG Q.04 (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).



Fig. 8. BKG Q.16 (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).

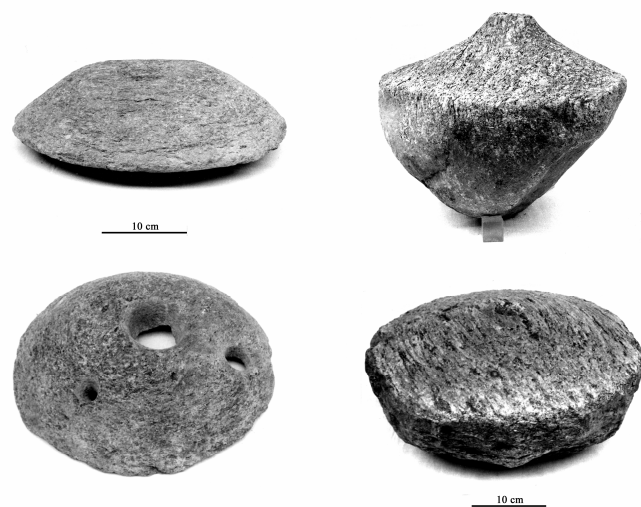


Fig. 9. BKG RQ types (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).



Fig. 10. BKG RQ.03 (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).





Fig. 11. BKG RQ.01 (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).

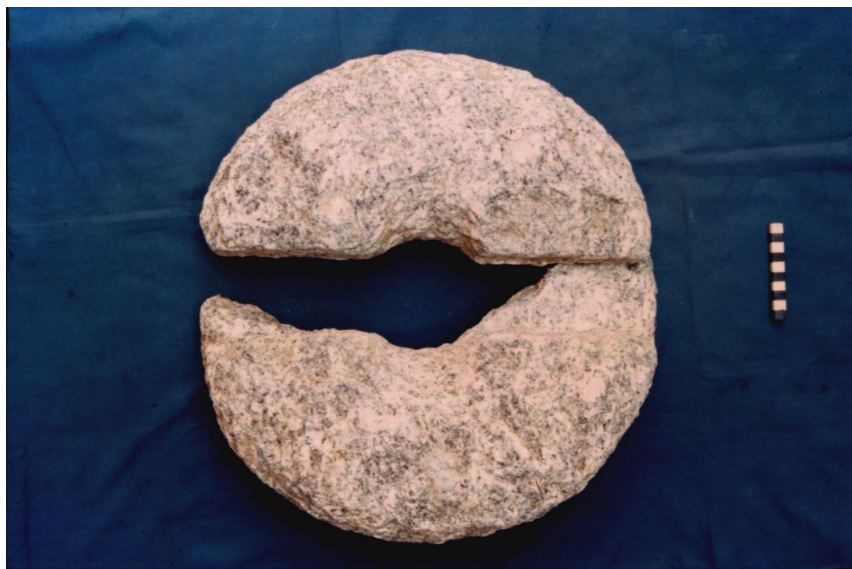


Fig. 12. BKG RQ.06 (Photo by R. Micheli. Courtesy Italian Archaeological Mission in Pakistan-ISMEO).