

HISTORIC-ARCHAEOLOGICAL RESEARCH OF THE CATHOLIC UNIVERSITY OF THE SACRED HEART OF MILANO ON THE INDUS DELTA (2019-2021)

HISTORY AND ARCHAEOLOGY, SCIENCE AND TECHNOLOGY

Nota del m.e. VALERIA PIACENTINI FIORANI (*)

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SUNTO. – Ricerche Storico-Archeologiche dell'Università Cattolica di Milano sul Delta dell'Indo (2019-2021). Storia e Archeologia, Scienza e Tecnologia. Durante gli ultimi tre anni di field-work (2019-2021), abbiamo concentrato le attività archeologiche lungo il grande asse viario nord-sud/est-ovest appartenente a epoche antiche, già individuato, e gli edifici che lo fiancheggiano (Edifici n. 1, 2, 3 e 4). Gli scavi hanno confermato quanto emerso dagli anni precedenti, provandone, in questa ultima fase di popolamento, un re-impiego completamente diverso: una zona-mercato di beni di lusso. Sulle possenti strutture dell'antichità erano stati costruiti dei semplici ambienti – base in pietra sbazzata con elevato in crudo e copertura a tetto – adibiti a modeste abitazioni e officine degli artigiani che vi lavoravano, convenuti là da varie regioni dell'Oceano Indiano occidentale – come comprovabile dalle semplici ceramiche di uso quotidiano trovate negli ambienti (Piacentini & Fusaro 2022). L'asse viario era stato trasformato in comodi pozzi di scarico di scarti e rifiuti sia organici che del lavorato (scarti di avori, frammenti di vetro, ceramiche et alia). La nota che segue intende concentrarsi sulla storia di quest'ultima fase del popolamento del sito (prime decadi del sec. XI- seconda metà del sec. XII AD) e del suo ruolo come crocevia dei traffici internazionali dell'epoca (per fiume, mare e terra), integrando i dati delle fonti testuali con i dati restituiti dalle strutture architettoniche ed evidenze archeologiche venuti alla luce durante queste ultime campagne di scavo. Sempre in questa nota si intende soffermarsi sulle ultime metodo-

(*) Scientific Director of the Italian Historical-Archaeological Research of the Università Cattolica di Milano at Sindh, Pakistan. Member of the Scientific Board of the Research Centre CRiSSMA – Catholic University of the Sacred Heart, Milan, Italy. E-mail: valeria.piacentini@unicatt.it

logie di ricerca storico-archeologica, laddove scienza e tecnologie avanzate consentono realtà che vanno ben aldilà di teoretiche ipotesi proposte dall'archeologia e dalle fonti scritte. Qui, si è dato voce all'archeometria che, con le sue analisi, ha affiancato la ricerca storica con dati praticamente definitivi anche per quanto riguarda determinate cronologie – si veda qui la nota del Prof. Mario Piacentini. Non meno affascinanti sono i risultati dalle tecnologie in materia di grafica, topografia e ortofotogrammetria, i quali hanno raggiunto una precisione matematica e geometrica finora senza precedenti, costituendo una delle basi fondamentali non solo dello scavo in sé ma anche della ricostruzione geografica e geomorfologica del periodo e della regione in studio – si veda nota a cura di A. Tilia & S. Tilia). In questi ambiti, lo storico può solo prendere atto di sistemi e tecnologie ormai molto avanzate, e della loro complementarità, multidisciplinarietà e interdisciplinarietà – ogni disciplina con le proprie metodologie e sistemi – il tutto parte di una immagine più ampia e complessa elaborata in collaborazione.

ABSTRACT. – Historic-Archaeological Research of the Catholic University of the Sacred Heart of Milano on the Indus Delta (2019-2021). History and Archaeology, Science and Technology. During the last three years of field-work (2019-2021), in the central-western portion of the mound we came across a vast area stretching along the east-west main road-axis of past epochs, replanned and rebuilt as a market-zone, where luxury goods were produced by skilled craftsmen converged there from different parts of the Indian Ocean (see *ibid* preceding note 2018/2019 and Piacentini & Fusaro PSAS 2022). We were facing a new phase of the site's life and model of peopling. This article aims at focusing on the historical stage of this last period (written data complemented and integrated with archaeological evidence), the role played by our site as crossroads within the international trades of its time on land, on river and on sea. How science and technology have complemented a theoretical panorama through archaeometric analyses and drone's plans of the bastioned mound, its environment and excavated trenches (see here below the notes by Prof. Mario Piacentini, and A. Tilia & S. Tilia). Stratigraphic levels associated with pottery and other little objects found *in situ* provide a first image of the new urban plan, its political and institutional reorganization and economic system. Textual sources confirm and integrate. Archaeometric analyses have allowed chronologies (complementing historical texts), pottery's provenience (produced *in situ*, imitation or imported), interesting notes on glass and metallurgy, plus some hypotheses on the significance of the rich variety of moulds found *in situ* (spare parts used and thrown away?) or around small smelting kilns. All in all, a vivid plastic image of the last phase of the site's peopling and its abandonment.

INTRODUCTION

The Note of 3rd May 2018 finished with two statements¹. The first

¹ Piacentini Fiorani 2019, *Ricerche Storico Archeologiche dell'Università Cattolica*

affirmed that – at the light of the archaeological and historical research so far carried out – it was possible to assert that Banbhore's site could be identified with the Sasanid Dib/Deb and the Islamic harbour-town of Daybul/Debol. The second advanced the hypothesis that, during some stages of its life, Banbhore's mound might have been the core and capital-city (Pers. *shahr* / Ar. *madīna*) of a *shabristān*, the traditional Indo-Iranian system, which means a region (*ostān*) politically, institutionally, economically and culturally gravitating on a city (*shahr/madīna*), a region characterized by a geographical compactness, which often had the same place-name of its capital-city. In our case, the place-name Dib/Daybul might have identified at the same time both situations, the region *and* its capital-city. About this, only further excavations and surveys could provide solid evidence.

The present note focuses on the excavations carried out at Banbhore during the 2019-2021 field-seasons, that is the last stage of life of the site before its abandonment and end. The approach has been strictly multidisciplinary and interdisciplinary (archaeology, history and related sciences and technologies). Each discipline using its own methodological approach. The final result has been a new picture of the final stage of Banbhore/Daybul after the disruption of the Arab Emirate of Maṣṣūra and the end of its Habbārī dynasty (first two decades of the 11th Century AD). A plastic image, unexpected and so far unknown, the image of a blossoming, prosperous renaissance, which rebuilt itself on the glories of the Past (see *Fig.1* and *Fig. 2*). Archaeology has provided solid data. History and its textual sources have confirmed and integrated archaeological evidence. Science – that is new technologies with their methodological approach – has provided the systematic, logical confirmation of archaeology and theoretical hypotheses (see *Fig. 3*)².

del Sacro Cuore di Milano sul Delta dell'Indo (2010-2018), 111-190, in *Rendiconti dell'Istituto Lombardo di Scienze e Lettere – Classe di Scienze Morali e Storiche*, Pavia, PAGEPress.

Here, I wish to add a preliminary note on *Sind* and *Sindh*, two different graphic transliterations of the same place-name. Graphic, but not phonetic. The former is the classical transliteration from Arabic and Persian, which entered into English. The second is the transliteration of the same place-name from Sindhi and identifies the same region. After the 1948 Independence Act, it has been adopted by the bureaucratic language in English.

² See *Research-Reports*, specie AA.VV. 2017-2018, 2018-2019, 2020, 2021.



Fig. 1. The Western Waters of the Indian Ocean. The Emirate of Mansūrah.



Fig. 2. Drone Ortophotogrammetric Map of the Bastioned Site. Excavated Trenches. (A. Tilia 2021).

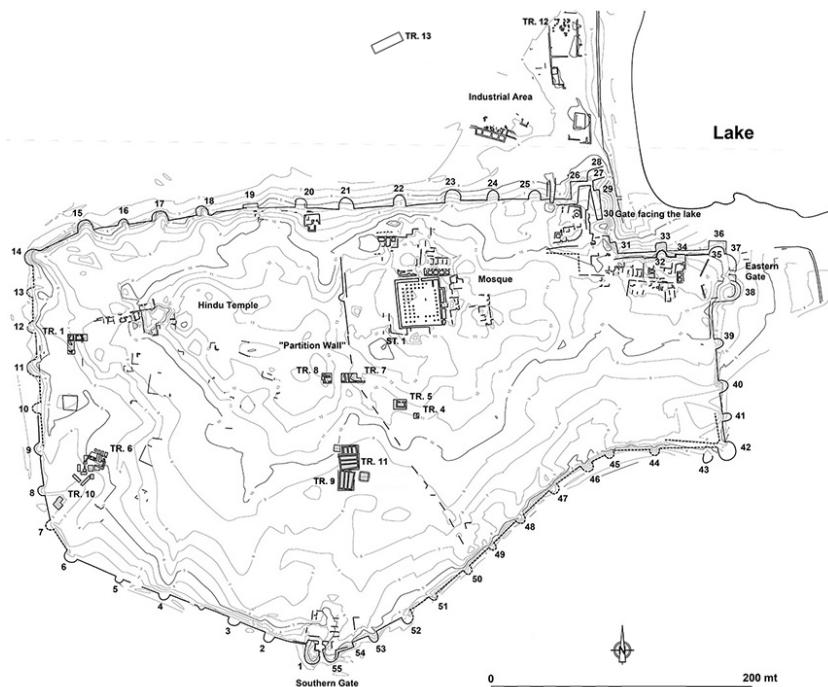


Fig. 3. Plan of the Bastioned Site and Excavated Trenches.
(A. Tilia 2021 from the Drone's Orto-photogrammetric Map).

The previous campaigns had dug out bewildering data that hinted to some drastic reorganization of the site's plan, peopling and life (Trenches 8 and 9). The 2018-2019 campaigns and related archaeological and structural evidences had confirmed such perception, to the point that we decided to further investigate it (Buildings 1, 2, 3, 4. See Fig. 4)³. Undoubtedly, we were facing a new phase of the site's life and a new model of peopling, which preceded the end and abandonment of the mound.

³ For a general view of the new archaeological data and the emerging historical panorama see Bearzot 2019a *Once more on Alexander...*, 46-53; Piacentini Fiorani 2019a, *The Site of Banbhore...*, 17-45; Lashari K. 2019a, *Identification of Debal and Banbhore...*, 54-64; Mantellini, Fusaro, Tilia 2019a, *Technical Reports*, 65-103; AA.VV. 2019a, *Archaeometric Notes*, 104-120. About history and society in the Indian Ocean and local pottery in stratigraphy see Piacentini Fiorani & Fusaro 2022, 247-270.

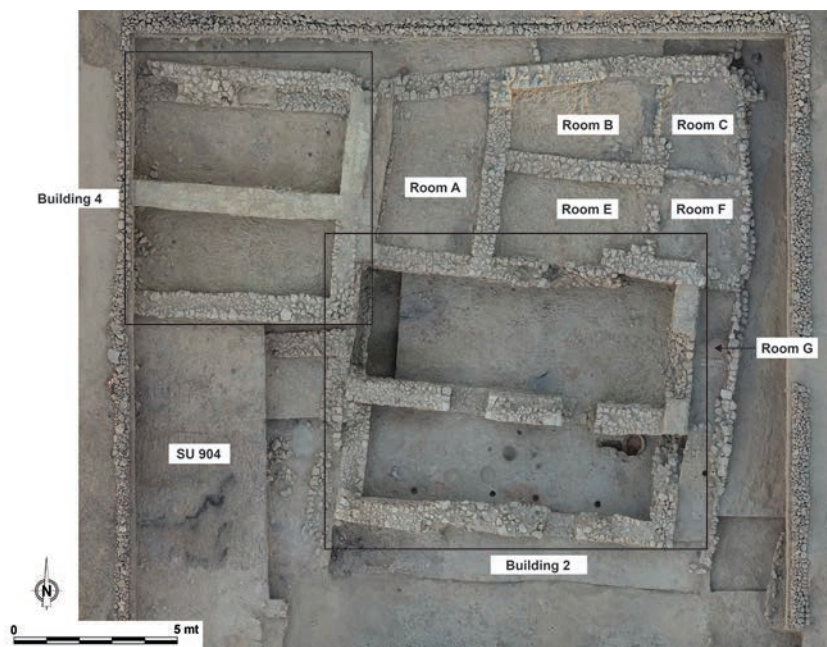


Fig. 4. 11th Century AD, a New Urban Plan. Workshops and Modest Artisans' Houses Rebuilt on Imposing Buildings of the Past (A. Tilia 2021).

Archaeological and structural data provided a definite image which pointed to the re-planning and re-organisation of Banbhore's space, separated into two parts by the so-called «Partition Wall», a new urban plan carried out by a strong, authoritarian, centralised power, which, at the same time, suggested a new political and institutional organization. Eastwards, stood a Palatial area excavated by F.A. Khan, with its Great Mosque rebuilt on a Buddhist Temple, lavish palaces rebuilt on past palaces, facing a lovely artificial lake at the foot of the north-eastern bastions (See Fig. 5)⁴. Westwards, on the relics of past imposing buildings skirting an important North-South/East-West road-axis, excavations in the central area of the

⁴ Khan, F.A 1976, *Banbhore. A Preliminary Report on the Recent Archaeological Excavations at Banbhore*, Karachi, The Department of Archaeology and Museums, 3rd ed., map n.1.

mound opened a quarter of workshops of luxury-goods and related artisans' modest houses, these latter hurriedly built on the top of formidable abandoned buildings. Fragments of glass, ivory offcuts, beads, little metal objects and others were scattered around; the large ancient roads converted into handy pits for offcuts and refusals (organic and other). Pottery and objects, associated with the archaeological levels in stratigraphic sequence, pointed to the final stage of Banbhore/Daybul (Reports by Simone Mantellini & Daniele Redamante). Not only this, pottery's studying of sherds and complete shapes still *in situ*, comparisons with pottery from other sites gave a precious *material evidence* of the renewed prosperity of Daybul's large spectrum of resumed international relationships, trades and economic business⁵.

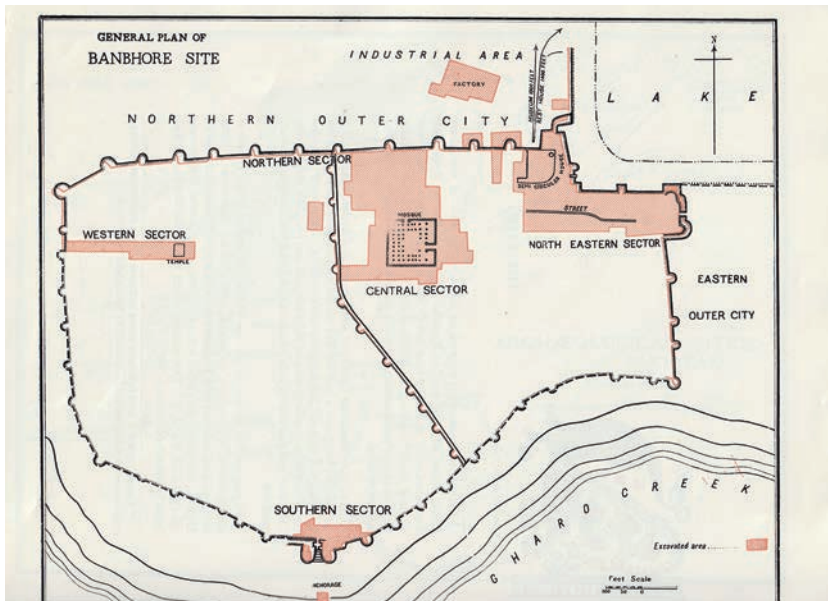


Fig. 5. The «Partition Wall» and F.A. Khan's Excavated Buildings (1976).

Until our arrival in the 2011, this westward portion of the site was a blank area. Khan had dismissed its relevance, stating that it was a

⁵ A. Fusaro, *Research-Report* 2019-2020, 2022.

mound of rubbles and ruins that marked the «decadence and abandonment» of the citadel after the disintegration of Maṇṣūra's Emirate. However, to be noted that, westwards of the Partition Wall, Khan's excavations had been centred only on the Indus Temple and the Southern Gate (see map 1976: *Fig. 5*).

At this point, we had to start new «excavations» in historical texts, too. Chronicles and Travelogues confirmed and complemented the non-textual sources so far brought to light (Part I, History and Archaeology). The following pages will linger on the history of this phase, on what textual sources have recorded, how their interaction with non-textual data have allowed to give life and voice to archaeological evidence and to a still unknown chapter of Daybul's life before its end and abandonment.

But not only this. Science and its Technologies have also helpfully collaborated to this research. During the last decades, these latter have authoritatively entered archaeological-historical investigation, too, providing solid contributions to research, and technical data to confirm (or refuse) theoretical hypotheses. They still are on the threshold of future historical and archaeological enquiries. A most valuable support, however, and a basic step towards new achievements. This does not mean 'neglecting human genius and its ratio', which still choose and control instruments, organise inputs and data, elaborate them, read them...and leave to the colleagues to focus on the final results⁶. As far as Banbhore is concerned, in this note I have privileged archaeometry and its analyses (Mario Piacentini) and topography with its drone's ortho-photogrammetric reliefs (Alessandro and Sven Stefano Tilia): Part II, Science and Technology.

1. HISTORY AND ARCHAEOLOGY

1.1. *Archaeological Unexpected Evidences*

As said above, archaeological and architectonic data – integrating textual sources – had already positioned the site within a larger

⁶ From *Le Calcul et la Raison*, as properly stated by Jean-Claude Gardin in his memorable book Gardin J.-C. 1991, *Le Calcul et la Raison*, Paris, Éditions de l'École des Hautes Études en Sciences Sociales.

regional and global stage⁷. As also said above, this note focuses on the mound's last stable occupation period, which, according to textual sources, witnessed the constitution of the Autonomous Territory (*nāhiya*) of Daybul under a native ruler (*amīr*) within the Seljuk political-military system (c.1050-end 12th Century). According to architectural and archaeological data, the excavated part pertains to the historical phase depicted above as «reoccupation of the bastioned site», which, however, is revealing a completely different space-organization whether compared with the site's Past (Italian trenches 7, 8, 9; French 1 and 6). The 2018-2021 excavations are providing a detailed glimpse of the life in an important Middle Ages Islamic centre, harbour and town at the same time, named in chronicles and geographies as Daybul. At the time, Daybul was the «city» of vast surrounding and outlying territories which politically included Lower Sindh and Makrān, administratively and economically gravitating on it (see following paragraphs and *Fig. 9*). Daybul, no longer outlet to the sea (*bandar*) of some capital-city of the hinterland, was now a city, crucial hinge of the maritime and land trades between the Orient and the Occident, political and geographical interface of the western waters of the Indian Ocean, Arabia and the Gulf, headline of the Monsoon routes, important stage of coasting transactions, centre of production, distribution and re-distribution of precious commodities and luxury goods. Of this phase, the ceramic evidence represents a significant marker, complementing textual sources. And, with ceramic evidence, also ivory specimens, glass fragments, semi-worked shells, beads and porcelain-fragments, metal little objects manufactured *in situ* (all of them documented and under study), which represent as many precious pointers of a prosperous activity, all of them major sources to the re-reading of this stage within the global reorganization of maritime and land spaces under way with the arrival of the Seljuks on the political and military scene⁸.

⁷ Of particular significance were the Italian deep Trenches 7 and 9: Manassero & Piacentini Fiorani 2015, 155-179; Felici, Fusaro, Ibrahim, Lashari, Manassero, Piacentini M., Piacentini Fiorani, Tilia 2016, 125-173. Monique Kervran's trenches 1 and 6 (*Research-Report* 2013) had reached the Parthian level. See also Piacentini Fiorani 2019, *Rendiconti dell'Istituto Lombardo* 2018, 127 ff.

⁸ About these finds, see *Research-Reports* 2019 and 2020-2021. For the Seljuks, see below § 1.4 and § 1.5.

Surprisingly enough, as also noted above, Khan's brochure dedicates only a few lines to artisanal activities carried out *intra* and *extra-moenia* during the last occupational period⁹. Thus – at the light of the 2018 campaign's unexpected architectonic and archaeological data, and at the light of the considerable historical information and studies on this period, in 2019 it was decided to focus on Trench 9 and Building 1 along the East-West great road-axis, where 2017-2018 excavations had allowed to locate scatters of different artisanal specimens, and to investigate the radical rebuilding and reorganization underwent by the bastioned territory during the last stage of its occupation.

The area along the northern wall of Building 1 was cleared; it exposed, by the northern side of the road, two important buildings (Buildings 2 and 3) aligned along the same East-West axis; eastwards, on the corner of Building 3, could be located a fourth building (not yet cleaned by the end of the 2021 field-season) (Fig. 6).

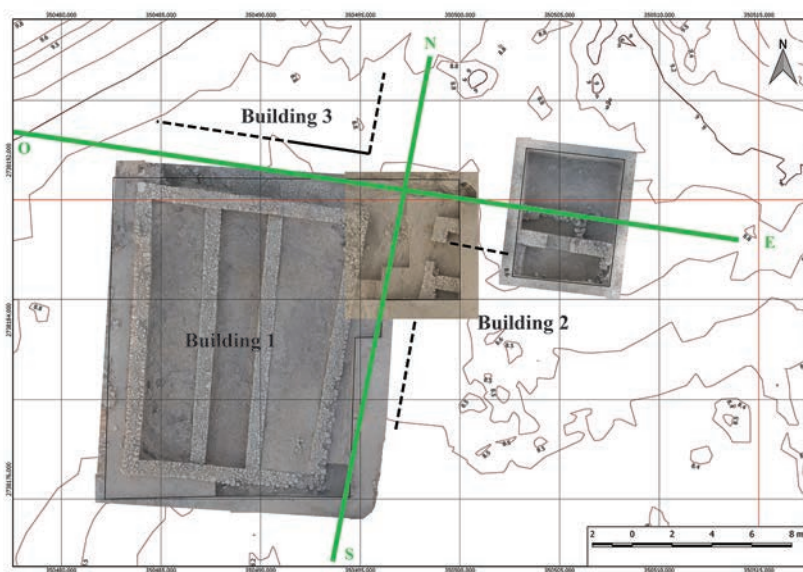


Fig. 6. Buildings 1, 2 and 3.

⁹ Khan F.A. 1976, 17 and 33-4.

The three buildings appeared to have been re-occupied in the final stage of Banbhore's peopling; the excavations exposed on the top of the past imposing structures a quarter (*rub'*) of houses of (usually) two interconnecting rooms, the walls had the basis in unsquared stone, elevation in mudbrick, likely roofed, according to a still alive traditional housing (2019, 2020 and 2021 *Research-Reports*). And outside, accumulated along the great, ancient North-South/East-West road-axis of the past, mounds of ivory offcuts and refusals suggested an intensive ivory craft activity during this last phase, as in other portions of the Western bastioned area excavated or surveyed between 2011–2015. In 2021, excavations had cleared three ivory-workshops, under study by Giorgio Affanni (*Figs. 7 and 8*)¹⁰.



Fig. 7. Building 3: Ivory Workshop.

Refusals and offcuts of other commodities were coming to light westwards, qualifying the site's development within international trades with outlying countries during this precise chronological phase. The

¹⁰ Affanni 2019a *The Ivories of Banbhore ...*, 104-108. See also *Research Reports* 2019-2020 and 2021.

2021 campaign confirmed the importance of the central-western sector of Banbhore-Daybul during the 11th- second half of the 12th Century AD. The presence of other ivory workshops, although smaller than those discovered in 2020, and a complex architectural layout in Trench 9, have provided new important information on this great artisanal workshop and its organization in quarters within the local social-political context. Moreover, Trench 13, accurately excavated *extra-moenia*, has in its turn proved the intense occupation and re-occupation of the lower city outside the fortification: some *extra-moenia* huts along the south-western portion of the bastions (likely shelters for workers), and an important plaster workshop (Trenches 12 and 13, Fig. 3) and others in the «Industrial Quarter», so-called by F.A. Khan¹¹.



Fig. 8. Ivory Workshops: Refusals.

It is worthwhile a historical comment. We have rich textual descriptions of great markets of the time, like Ṣuḥār, Julfar, Musqat, Sharma city's

¹¹ Mantellini *et alia* 2019a, 65-87; *Research-Reports* 2017-2018, 2019-2020, 2021.

along the Arabian coast, Sirāf and Hormuz on *terrafirma* on the Iranian coast, and others. However, the excavated sites were no longer intact as Banbhore's. Here we have a positive plastic image of how an Islamic Middle Ages market might be organised both from the technological point of view (fumes) and the social-political and economic-financial aspects of the time. In other words: quarters, artisans' mobility, financial resources and Merchants' political power – artisans followed capitals and no corporate organization. Commodities were manufactured within the city's walls in order to control and exact the proper duties, landings were outside. Other no less precious information on technologies (in this respect archaeometric analyses are providing interesting data) and artefacts' circulation (manufactured *in situ*, exported and imported) are coming to light.

A plastic image and a precise urban plan.

Of this, a particular feature is represented by the Partition Wall, which cuts North/South-Southeast the site's mound in two parts. It is a wall hurriedly built around the end of the 10th -beginning 11th Century on preceding buildings no less hurriedly flattened down¹². It divides the fortified area into two sectors (*Fig. 3 and 5*): to the North-East, a residential quarter with the Great Mosque and residential and/or administrative buildings, wells and shops (?), excavated in the '50s of the previous century by F.A. Khan. A flight of steps — still *in situ* in the 2015 — connected this area with an artificial lake embellished by four artificial islands; a bridge-barrage (a *gabrband*?) still *in situ* in the 2015 coasted the southern side of the lake and seemed to connect this portion of the site with a line of consolidated sand dunes where, still visible, are occupation evidences. In Tilia's ortophoto of the plan of the citadel (A. Tilia's paper, *Fig. 2b*), the bastioned walls with their 55 square, round and U-shaped towers are well visible; well visible is also the Mosque, the Partition Wall, the palatial structures on the East-Northern corner, and the flight of steps to the artificial lake, and other architectonic structures¹³.

By the end of November-December 2021 field-season, this was the archaeological image of the final occupation phase of a large portion of the bastioned site: a mostly unexpected image, which induced

¹² Manassero & Piacentini Fiorani 2015, 165-179; Felici, Fusaro, Ibrahim, Lashari, Manassero, Piacentini M., Piacentini Fiorani, Tilia 2016, 128-131.

¹³ See above note (7), and Mantellini 2019a *Survey Report Around Banbhore*, 65-69; Fusaro 2019a *Study of the Pottery...*, 88-101.

to new accurate research in the available textual sources, essentially chronicles and geographies in Arabic and Persian.

1.2. *Breaking with the Past. Which Past? The Arab Emirate of Manṣūra (850 c.–first decades of the 11th Century AD)*

Leaving to the archaeologists and their experts the quantification and analyses of the excavated evidences, these same data induced to investigate the *raison d'être* of this new scenario, characterized by intense, well-organized craft-activities within the ancient bastions. It was an image that, on the one hand, suggested a harsh break with the traditional leadership and the political-territorial structure of the Past; on the other, it implied a continuity in the social and administrative system. Which Past, then? This query brought to look at the Arab Emirate of Manṣūra (850 c.–first decades of the eleventh Century) and the violent conclusion of its territorial integrity and dynastic order¹⁴.

By the second half of the ninth century, the Abbasid Province of Sindh was disrupted by internal religious and ethnic strife, which gave life to five de facto independent emirates. One of them was the Arab Emirate of Manṣūra, from the name of its capital-city, the same beautiful capital-city of the Umayyad and, after 750 AD c., the Abbasid Arab Province of Sind. In 850 AD c., 'Umar ibn 'Abdulazīz al-Habbārī acceded to power through the assassination of the last Caliphal Governor. However, once in power he behaved as an illuminated prince. He run his own affairs from Manṣūra, by now capital-city of the Emirate:

a great (*'azīm*) town, situated like an island in the middle of the river Mihrān [the Indus river, ndr]. It is very pleasant and prosperous, and is a resort of merchants. Its inhabitants are Muslim and the king a Qurayshite.

Within this regional political framework, Daybul stands out as:

a town of Sind on the coast of the Great Sea. It is the abode (*jāygāh*) of the merchants. Products (*ālat-bā*) of Hindūstān and the sea are brought there in large quantities¹⁵.

¹⁴ Piacentini Fiorani 2019a, 17-45; Piacentini Fiorani 2021, 71-106. Piacentini Fiorani & Fusaro 2022, 155 ff.

¹⁵ *Hudūd al-'Ālam* by Anonymous Author, ed. V. Minorsky, 122, 123.

Iṣṭākhrī, writing a few decades before the Anonymous Author of the *Hudūd al-‘Ālam* and Muqaddasī, dedicates ten pages of his work to Sind, and depicts Daybul as an important harbour-town on the Indus delta, «outlet par-excellence to the sea» of the immense volume of wealth circulating through the Arab Emirate of Manṣūra (Fig. 9)¹⁶. On the religious and political sphere, ‘Umar ibn ‘Abdulazīz and his successors would keep to Sunnism and pay their duties to the Caliph. Multan, some later, will recognize the Fāṭimid caliphs in Egypt¹⁷.

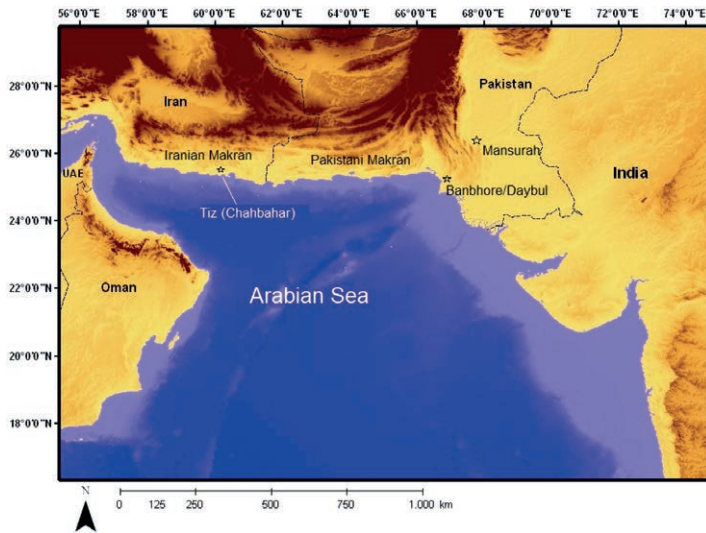


Fig. 9. The Coastal Area of Makrān and the Ancient Harbour-Town of Tīz. Mansūrah and its Outlet to the Sea: Daybul.

¹⁶ Three renowned personalities lived in the 10th Century AD: Iṣṭākhrī, Ibn Ḥawqal and Muqaddasī, who have left interesting travelogues, rich in geographic and historical information...to be however carefully sifted. Iṣṭākhrī's account of Sind is detailed and punctual, especially when he reports place-names, distances, goods to be found or traded through its markets. Ibn Ḥawqal's report largely draws from Iṣṭākhrī. It is also noteworthy that both Iṣṭākhrī and Ibn Ḥawqal name the Great Sea as *Fārs Sea* or *Bahr al-Fārs* (i.e. The Persian Sea), as it was named that liquid space at the time of the Būyid political system (see here below). Muqaddasī, *Aḥsan al-taqāsīm*..., ed. M.J. de Goeje photomech. repr. of the 2nd revised ed. 1906, 485; Iṣṭākhrī, *Kitāb al-masālik*..., ed. M.J. de Goeje 1870, 170-180; Ibn Ḥawqal, *Kitāb ṣūrat al-arḍ*, ed. M.J. de Goeje repr. 1967, 324-5. Cfr. also Piacentini Fiorani 2014, *Beyond Ibn Hawqal's Bahr al-Fārs*..., 83-97 ff.

¹⁷ Iṣṭākhrī *Kitāb al-masālik*... cit., 173. Iṣṭākhrī's note is far from being irrelevant.

All in all, the Habbārīs always preserved a liberal attitude. Culturally, they interacted with adjacent countries and their courts in terms of political challenges and success, and, to a certain extent, also in terms of arts and lifestyle. This governmental line was firmly followed by 'Umar's son 'Abdullāh ibn 'Umar al-Habbārī (883–913c.) and his ten successors¹⁸. Chroniclers of the time (Gardīzī, Bayhaqī, al-'Uṭbī, Ibn al-Athīr in particular) confirm and implement geographies, and depict the Habbārī rulers as firm and liberal personalities, essentially focused on the welfare and order inside the Emirate, more interested to support its world-wide range of business than to personal interventions in the bordering potentates, their struggles and intrigues. We are reported that welfare was widespread, trade links were firmly established and consolidated with neighbouring and outlying regions (Levant, Eurasian steppes, Far East and Hind) and with no less profitable overseas countries through the Indian Ocean's monsoon-routes up to Arabia, East Africa and the lands of the Zenjis or the Infidels' lands¹⁹.

Manšūra's power-system was structured on a firm, centralized power based on a well-articulated bureaucratic apparatus, supported by a solid mercantile class and a wealthy group of landowners. All in all, a pluralistic society, multi-ethnic and multi-religious. Events reported in contemporary chronicles allow to perceive that, at the base of Habbārī international relationships, was a stable though impartial policy between the powers which were fighting for control on Sindh and the riches of this region (Sāmānids, Ṣaffārīds and, some later, the Būyīds and the rising

By the end of the tenth century, the situation will develop in a sharp political-religious antagonism, mirror of the no less sharp Red Sea - Persian Gulf mercantile competition, which, with the deviation of land routes with Inner and Central Asia, would contribute to the decline and end of Manšūra. See below.

¹⁸ 'Abdullāh ibn 'Umar al-Habbārī is noted as the Emir who invested in the restoration of the Mosque of Daybul and other buildings after the 270 AH/ 893 AD earthquake, the same earthquake that struck Sīrāf and its port, signing the brisk decay of the outlet to the sea of Fars. Ibn al-Athīr, *al-Kāmil fī al-tā'rikh*, ed. C.J. Törnberg, 1851-76, vol. 10, p. 3. Cfr. Ghafur, Muhammad Abdul 1966, *Fourteen Kufic Inscriptions of Banbhore, the Site of Daybul*, in *Pakistan Archaeology* 3, Karachi, The Department of Archaeology and Museums, 81-84.

¹⁹ Tabarī, *Kitāb al-rusul wa al-mulūk...*, ed. M.J. de Goeje, repr. of the 1879-1901 Leiden ed., vol. 3, 675 ff., 1326, 1338-9; Ibn al-Athīr, *al-Kāmil...*cit, vol. 7, p. 9; Mas'ūdī, *Murūj al-dhahab...*, ed. and tr. Barbier de Meynard and A.J. Pavet de Courteille, vol. 7, p. 281.

power of the Ghaznavid sultan). Thence, it is possible to infer that such a firm, farsighted political line opened the Emirate to international business and pilgrimage; its road-system, well organized and un-challenging, secured convoys against raids and pillaging, a safe route connected the capital-city and its territory with an important town and harbour on the Indus delta. The Emirs avoided any direct confrontation. Rather than fighting for the acquisition of new territories while the neighbouring emirates were pushed and under the pressure of Ṣaffārid and Sāmānid forces, they privileged diplomatic dealings and business. Like the founder of the Emirate, they negotiated with their neighbours and were essentially concerned to secure the land routes to Khurāsān and Inner Asia (via Sīwistān — present Sehwan Sharif — and Multan), and the land route *via* Makrān-Kirmān up to Yazd and Shiraz. Thus, they sealed that *Baḥr al-Fārs* – the Persian Sea – recorded and defined in all its geo-political features by Iṣṭakhrī and Ibn Ḥawqal. By the second half of the tenth century, the Emirate of Manṣūra was at the apex of its glory. It was *de facto* independent and autonomous of the caliphs in Iraq and it had:

excellent diplomatic relationships with its two neighbour-Emirates of Makrān and Multān, and with sovereigns of the World of Islam and the World of the Infidels²⁰.

A cultural renaissance enlivened the Emirate, and — despite Arabic was still the official language — Sindhi began to be commonly used. Manṣūra and Daybul were the «splendid jewels of the Emirate, magnificent and sumptuously adorned». Daybul was surrounded by well-cultivated fields, villages and other settled areas. A marked *indianization* in the urban plan and local costumes is also recorded: the Emirs and the upper class were in the habit of wearing regal dresses and turbans studded with pearls and precious stones, in a style very similar to the dress worn by contemporary Maharajas in other south-Asian regions. We are also reported about Emirs and high personalities circulating in chariots driven by finely decorated elephants. Elephants were also introduced in the army and used as beasts of burden in agriculture²¹. During this period, in Lower Sind lived and prospered a cosmopolitan, multi-religious, open society, where the Arab component —

²⁰ Iṣṭakhrī, 171; Muqaddasī, 479.

²¹ Iṣṭakhrī, 75; Muqaddasī, 485.

settled there and particularly influent — played a major role²². Archaeological data confirm, for the tenth century, the image of an explosion of activities in all directions²³.

1.3. *And Which Present? The Geopolitical Environment at the Turn of the 10th Century*

We have detailed reports by contemporary chroniclers on the eastern Iranian world at the turn of the 10th Century. These depict a situation marked by endless struggles between various potentates, all of them essentially concerned at getting control (or preserving their control) over the profitable trades along the land routes with Kirmān and Fārs, or, to the North, with Inner-Central Asia. Another much wanted target was the harbour-town of Tīz (presently in the I.R. of Iran, near to the Pakistani border), at the time outlet to the sea of Kīj/Kech – capital-city of the Arab Emirate of Makrān (*Fig. 9*). Protagonists of these fierce struggles were the Sāmānids, the Šaffārids, the Būyids and the Ghaznavids. These latter had the upper hand on Quṣḍār – capital city of the Emirate of Tūrān; thus, they opened their way to Tīz, and forced the Emirs of Makrān and Turān to pay tribute to the Ghaznavid Sultan (*Fig. 10*).

At this point, it is necessary to open a short parenthesis and add a few notes about the protagonists of this intricate period, destined to have a significant impact on Lower Sindh and its destiny. Prime sources are chroniclers (often officials or court writers) contemporary to the reported events. However, if carefully sifted, their accounts and information allow to outline a realistic picture of how affairs took place and evolved according to individual interests and political lines. The Sāmānids (819-c.1005 AD), already on the wane, were still concerned in keeping alive the trade-routes with Central Asia and China; the Šaffārids (867-c.1495 AD) were in their turn still firmly attested in Sīstān; the Būyids (932-c.1062 AD), at the time were already articulating a strong eastwards expansionistic policy, that will take them to

²² Balādhurī, *Kitāb futūḥ al-buldān*, ed. M.J. de Goeje 1866, 437-441; Ibn Khurdādhbih, *Kitāb al-masālik wa al-mamālik*, ed. C. Barbier de Meynard, 283.

²³ The material evidence of such *explosion of activities in all directions* is well depicted in: Mantellini, Fusaro, Tilia 2019a, 65-103; Piacentini, M., Affanni, G. *et alia* 2019a, 104-120, 144-150.

Daybul, official seat of the Crown-Prince; last but not least, the mounting power of the Turkish Ghaznavid dynasty (977- c.1186 AD), which had been fighting for the acquisition of an outlet to the sea. By the end of the century, Ghaznavid aspirations would be diverted from Sindh towards Quṣḍār (Emirate of Tūrān) and the Emirate of Makrān²⁴.



Fig. 10. Iran, Turan and Sindh.

When in 393/1003 Maḥmūd of Ghazna overrun Sīstān and incorporated it into his dominion, we have the peak of these struggles. Yet,

²⁴ al-ʿUṭbī, *al-Tāʾrīkh al-Yamīnī*, Cairo 1286/1869, photomech. repr. 2 vols. 1334/1955, vol. II, 132-133 ff.; Ibn al-Athīr vol. 12, 412 ff.; Bayhaqī, *Tāʾrīkh-i Masʿūdī* (also known as *Tāʾrīkh-i Bayhaqī*), ed. Saʿīd Nafīsī, Tehrān, Ghanī & Fayyād, 69-70, 242-245, 273.

once more the Šaffārids held on, giving life to new fights. By the end of the tenth century, the local ruler of Quṣḍār had bent and paid tribute to the Ghaznavid sultan, forcing the ruler of Makrān to pay in his turn tribute to Ghazna, letting free passage to Tīz. It was not a long-lasting agreement, and further feud would follow. al-‘Uṭbī reports that in 402/1011–1012, after a last revolt, Quṣḍār was definitely subdued by Maḥmūd of Ghazna and the ruler remained a docile vassal²⁵. According to Bayhaqī, it seems that Ghaznavid operations towards Quṣḍār were essentially aimed to exact tributes from the rich traffics in the region. However, some later, the harbour of Tīz would be the starting point of a Ghaznavid expedition to Oman, where the Ghaznavids stood for nearly forty years levying tributes on trades and pilgrimage, until the Būyid prince Abū Kālījār’s expedition. This latter, having sworn loyalty to the Seljuk Sultan and sealed it with a marriage allegiance within Chaghri Beg’s family, chartered a fleet by Hormuz and definitely expelled the Ghaznavids from Oman²⁶.

For Maṣṣūra, the arrangement between the neighbouring Emirates and the Ghaznavids was not at all endurable. It was heavily damaging its economic system (trades and pilgrimage), by making the land route via Makrān unsecure. Moreover, Multan’s religious attitude and its friendly relationships with Fāṭimid Egypt had begun to disturb its dealings, hampering sea trades and business with Arabia. To the North, the declining power of the Sāmānids and the Ghaznavid fights with the various Būyid princes had made vulnerable the frontiers of the Emirate, now open to pressures and incursions by Ghuzz/Oghuz and Qarakhānid groups, who began to attack and pillage villages and towns. It seems that incursions by Turkish bands reached also Daybul, repeatedly attacked²⁷. Be that as it may, the second decade of the eleventh century witnesses the sharp decay of the Emirate of Maṣṣūra and, with it, the end of the Habbārī dynasty. The beautiful city of Maṣṣūra was stormed, laid waste and wildly plundered. Of its magnif-

²⁵ al-‘Uṭbī. vol. II, 132–133; Bayhaqī, 242–245, 273.

²⁶ Bayhaqī, 444, 451–464, 468–469, 548–550, 589–590, 610; Gardīzī, *Zain al-akbbār*, ed. M. Nāzim, 1928, Berlin, Harassowitz Verlag, 99–100. Cfr. Piacentini Fiorani 2014, 107–110 ff.

²⁷ About these raids, see Piacentini Fiorani 2014, 99–119. Cfr. also Bosworth E.C. 1973, *Barbarian incursions: the coming of the Turks into the Islamic world*, in *Islamic civilisation 950–1150*, Oxford, D.S. Richards, 1–16.

icence were left only ruins, rubbles of stones and miserable relics of a splendid Past²⁸. What about Daybul? Attacked and looted, it survived, and, according to archaeological and architectonic evidence, it would rebuild itself to a new grandeur on the relics of its Past. At this point, the *ratio* to the understanding of events in Lower Sindh is represented by Daybul. Textual sources are silent and confusing. Manṣūra was finished; chroniclers are no longer interested to this Emirate. Travellers and geographers are not interested to the ruins of past prosperous markets. On the political stage, a new formidable power was dawning: the Seljuk. Silences and omissions in textual sources acquire a major significance, and non-textual sources and their data become a major supplier of information, which might allow to fill the gap of two-three critical decades, and enable the historian to picture how events may have developed in the Indus deltaic region, hinge of new balances and a new regional and global historic phase.

1.4. *Daybul/Banbhore. Territorial Reorganization...*

As said above, most of the finds dug out during the 2018–2021 campaigns (pottery, worked shells, coins, moulds, glass, metal objects, ivories...) appear to be broadly contemporary with the modest edifices rebuilt on the imposing structures of the past²⁹. The coins have been cleaned and are still under study; however, they are small, light, and low-denomination copper or some other poor alloy; it is unlikely that they circulated for more than a few years; it is probable that they were used for local transactions and/or re-used and melted into small objects (needles, pins *et alia*)³⁰. These finds are mostly scattered on the topsoil

²⁸ Excavations at Manūrah were carried out by Dr Nabi Khan: Nabi Khan, Ahmad, *Al-Manṣūrah. A Forgotten Arab Metropolis in Pakistan*, Karachi, The Department of Archaeology and Museums - Government of Pakistan, 1990. Excavations have been resumed a few years ago by Dr Zahida Quadri and Ali Lashari, General Directorate of Antiquities and Archaeology of Sindh - Ministry Culture, Tourism, Antiquities and Archives of Sindh. Chronicles give only brisk information on the city's end and its possible dating. Likely, it preceded the end of the Emirate, which endured for a few years due to Daybul's resistance and survival. See following paragraph.

²⁹ Mantellini *et alia*, 2019-2020 and 2021 *Research-Reports*; Piacentini & Fusaro 2022, 260 ff.

³⁰ See Nasir, Pervin T. 1969, *Coins of the Early Muslim Period from Banbhore*, in

of the central-western part of the walled mound. In this perspective, the Partition Wall acquires a relevance of its own. F.A. Khan does not spend many words on it³¹. As noted above, Niccolò Manassero and Monique Kervran had decided to start their excavations by investigating the urban asset of the site in their respective areas³². About the Partition Wall, their assumption was: a) it had no religious function of separating the Islamic part from the non-Islamic one; and b) it was a shoddy structure of the final period of the site's life, hurriedly built on preceding buildings, which, in their turn, appeared hurriedly flatted down (Italian Trenches 7 and 8). On the dating, Manassero hesitated between the end of the 10th-beginning 11th Century, or, as an alternative and referring to some pottery evidence studied by Agnese Fusaro, to a later dating around the end of the 12th Century. In any case, only accurate soundings could provide an answer. Simone Mantellini, the new Field-Director, despite energetic encouragements by the Italian and not-Italian scholarship, hesitated, and the archaeological query (a definitely relevant one for the historian, too) still stays unanswered.

Thus, the only way through was to follow a different approach:

Pakistan Archaeology, 6, 117-181 + plates XXI-XXV. With specific regard to the great quantity of moulds' fragments scattered around, see. Piacentini M. 2019a, 113-120 and paper in press in *Journal of Sindh Antiquities* s.d.

³¹ «The last phase is represented by the scanty remains of the top, most settlement in the thirteenth century A.C., confined only to the eastern half of the mound by a weak and shoddy defence wall. The large harbour town appears to have declined and been reduced to a small military outpost by the time» (Khan, F.A. 1976, 17). And this is all. But what about the preceding period? Only brisk notes about the workshops and related activities in the western part of the mound. However, he has provided precious scraps of information when, referring to the period included between the late tenth–twelfth centuries, he states that «in the western part of the mound, the fortification wall was rebuilt on a highly reduced scale...and there were well visible breaches and what might be interpreted as narrow passages» (Khan, F.A. 1976 p. 17 ff.). This information is interesting. First of all, Khan refers to the situation of the rampart when it had not yet undergone the recent interventions of «restauration and beautification». Secondly, Khan refers to two different occupation stages: tenth–twelfth centuries on the one hand, and thirteenth century, that, in his view-point, is the very end of the occupation life of the site, on the other. At the light of the Italian Team's excavations and historical research, this phase has to be reconsidered as can be taken into consideration later sporadic/temporary periods of reoccupation of the mound (Agnese Fusaro's topsoil pottery investigation). The rebuilding of the western walls with well visible breaches is well visible in *Fig. 2b* – Tilia's 2021 ortophoto.

³² See above and Piacentini Fiorani 2019, 142 ff.

that is to investigate the *raison* for building such a Wall, and in such a disorderly hast. This approach took to *Daybul within the geopolitical environment of the time*.

The structural elements brought to light allow to state that the site's architectonic panorama shows considerable discrepancies at the very end of the tenth-early eleventh century. Architectonic and archaeological evidence on stratigraphy prove that we are confronted with a new urban plan and a harsh break with the Past. And, as just hinted above, the different urban plan induces to think that we are confronted with a new historical period marked by a significant political, administrative, socio-economic and financial renovation, though yet in line with Manṣūra's tradition. A period of decay? Not necessarily. The 2014-2015 and 2019-2021 field-seasons have revealed a situation differing from that described by Khan. More than «decline», it would be correct to speak about «reorganization of the space» due to some radical, drastic development on the political stage.

In conclusion, the key to understanding events in Lower Sindh can be Daybul's survival to Manṣūra's catastrophe, a new leadership, and a possible political Manṣūra's heritage in Southern Sindh. Thence, the new organization of spaces.

All in all, chronicles confirm a regional disruption during the second-third decades of the eleventh century, which undoubtedly touched and upset *also* Daybul and its territory: end of Manṣūra (city and emirate), and, with it, end of the Habbārī rule; closing of land and river trade-routes with Khurāsān and Inner/Central Asia (due to the Sāmānid end and Qarakhānid incursions); raids by Turkish groups; endless squabbles between Ghaznavids and Ṣaffārids. Texts also report that, in the forties of the 11th Century, the arrival of the Seljuk Turks on the political stage of the time had brought to a drastic reshuffle of the previous political balances...or unbalances. The battle of Dandānqān (1040 AD), a *ribāṭ* near Marv, signed a decisive defeat over the Ghaznavid army. The surrender of the great cities of Khurāsān opened to the Seljuk brothers, Tughril and Chaghri Beg ibn Dā'ūd, the way to the western regions of the Iranian world and its seaboard, giving life to ambitious Seljuk maritime plans³³. Whilst Chaghri Beg was militarily

³³ Piacentini Fiorani, V. 1999, *Practice in Mediaeval Persian Government: the*

engaged all along the north-eastern frontiers of the empire, where he succeeded in negotiating peace and fruitful alliances with Qarakhānid and Oghuz lords, his son Qāvurd Khān had moved southwards via Tabas – Jīruft – Kirmān – Yazd, fighting with Ṣaffārids and Ghaznavids for the definition of the south-eastern boundaries of the Seljuk domain and an outlet to the sea. We are reported that Maṣṣūra (sic) tried to check the invaders opening negotiations. At the same time, both Quṣḍār and Makrān were firmly established as satellite states of the Ghaznavid empire. Maṣṣūra, left alone, had no other choice than to put on a military resistance, but it was harshly defeated (sic), marking once and for all the end of what had been the resplendent Emirate.

One point deserves special attention. When reporting about Maṣṣūra, chroniclers do not specify if their reference goes to the Emirate or the city. A new evaluation of the reported scanty chronologies and related events seems to point to the Emirate of Maṣṣūra as such, and not to the city of Maṣṣūra or the Habbārī dynasty. This latter, by the fourth decade of the century, was already finished, but not yet the Emirate: military activities went on, and Daybul was in its turn besieged by the Seljuk army, which tried to outflank the bastioned town (sic). But the Seljuks (like the Ghaznavids) were a land-power, and their army was a «land-army» which had no nautical experience. This allowed Daybul to organize a resistance. Taking advantage from its location, it could regularly receive supplies in men and food-stuff from the sea. The Turkish army suffered severe losses due to shortage of drinkable water and dysentery in summertime, and heavy rainfalls and floods during the monsoon-period. It was around the fifties of the eleventh century that Qāvurd Khān ibn Chaghri Beg decided to negotiate with Daybul. Daybul accepted and had the status of autonomous province (*nāḥiya*) under a native ruler within the Seljuk political and military system. Not only: a large portion of the coastal region of Makrān up to Gwadar (or Gwattar?) was incorporated with Sindh. At the same time, Chaghri Beg negotiated a new frontier with the Ghaznavid sultan. The Ghaznavids lost the western territories of their empire to the Seljuks, but retained the «Baluchistan region» at least until the Ghūrid attack on Ghazna in the middle years of the twelfth century (Figs. 9 and 10).

Surrender of the Great Cities of Khurāsān to the Seljuks (AH 428-429/AD 1038-1039), in *Annali dell'Istituto Universitario Orientale di Napoli*, n.s. 59, 38-68.

1.5. ...and Reorganization of the Urban Space. A New Political and Institutional System. *Manṣūra's Heritage?*

At this point, Qāvurd Khān turned his back on the Sindhi seaboards, chartered ships from Hormuz and threw the Seljuk spears into the sands of Oman, which became a Seljuk province (*mulk*)³⁴. The Seljuk arrangement with the Ghaznavid sultan about the latter's «indirect rule» on Quṣḍār (Tūrān) and Kīj (Makrān) may have continued under the reign of Mas'ūd as may have continued (to a certain extent) the Ghaznavid hold on Tīz. About this span of time, information is sparse, often without chronologies; just some hints regarding local rulers, punitive expeditions for the payment of elapsed tributes...but nothing more. We are only informed that land-routes via Kīj-Makrān were reactivated up to Yazd and thence to Shiraz. Be that as it may, after that, we have no news about any planned Ghaznavid maritime policy. Conversely, we have information on a well-planned Seljuk maritime policy towards Oman³⁵.

Textual sources provide a historical framework: the end of Manṣūra («the Emirate of Manṣūra»), the deal between Chaghri Beg and Mas'ūd of Ghazna, and the arrangement between Qāvurd Khān and Daybul/Sindh, which brought to a new territorial and political-institutional system in the Indus deltaic region: a *shabristān* system. Daybul was well alive, its political-administrative status reorganized and strengthened under the shield of the Seljuk army, its traditional

³⁴ About the Seljuk seizure of power and their maritime policy, precise sources are Muḥammad ibn Ibrāhīm, *Tā'rikh-i Saljūqiyyān-i Kirmān*, in M. Th. Houtsma ed., *Recueil de Textes Relatifs à l'Histoire des Seljoucides*, vol. I, 2, 4, 7-8; Wazīrī, Aḥmad 'Alī Khān: *Tā'rikh-i Kirmān*, ed. Ibrāhīm Bastānī Pārīzī, vol. I, 343-353; Bundārī, *Zubdat al-nusra wa nukbbat al-'usra*, in M.Th. Houtsma ed., *Recueil de Textes Relatifs à l'Histoire des Seljoucides*, 2 vols., vol. I, 8-9. See also Piacentini Fiorani 2014, 83-98 and 102-130; Idem, 2013, *The eleventh-twelfth centuries: an 'Umān – Kīj – Kirmān/Harmuz axis?*, in *PSAS* 43, 261-276.

³⁵ About the reactivation of the land routes with Fars and Shiraz, see above n. (33). Some sherds brought to light in Daybul's top-levels are typical of Iṣṭakhr's pottery. Archaeometric analyses have not given a precise definition (see here below § II. Science and Technology: M. Piacentini's note); however, for the historian, beyond the alternative either a local imitation of Iṣṭakhr's shapes or imported material, these sherds epitomize resumed close relationships with Fars and a special taste for Iranian fashionable pottery (see below §2.3).

maritime connections reinforced by matrimonial alliances between local, wealthy and powerful Arab families and their family connections in Iraq and Arabia (Tamīm and Hijazi groups, and the Ibādī network³⁶), its maritime trade network (monsoon routes and coasting) still active and prosperous. Ghaznavid chronicles report about episodic warfare between the Ghaznavid sultans and Sindh, about Makrāni expeditions aimed at reconquering the lost seaboard, followed by Daybul's retaliations to preserve its territory and its political status in order to secure the land-passage to Kirmān via Kij. Brisk notes, which however provide significant historical information about Daybul's vitality. Ceramic evidence, whence related to this historical framework, is a major marker³⁷.

A situation that, likely, lasted until the arrival of other fearful peoples from the north (the devastating Ghūrid incursions around the half of the twelfth century), and, with the disintegration of the Seljuk empire, other tribal groups and finally, in 1225, the Khwārizm Shāh and the Mongol hordes on his pursuit (the early thirteenth century mentioned by F.A. Khan). However, and despite what Khan asserts in his booklet, it does not seem that the Mongol hordes ever reached the deltaic region...they were well settled in Sīstān, and there they stood with their *ulus*.

Daybul's location on the last slopes of the Kuhistan plateau and its favourable position at the mouth of the Indus delta had certainly been one of the reasons of the survival of this major harbour-town for much longer than one millennium. It can also explain the survival of the community that there settled again after the end of Manṣūra. Daybul survived...though «on a reduced scale»...but still enterprising and prosperous as archaeological and architectonic evidence point to. The *intra-moenia* space is still settled...but the territory has been reorganized: a residential quarter and its administrative and religious buildings in the eastern portion of the ancient site, and...artisans' houses and workshops in the western portion where the ancient rampart shows

³⁶ About Ibādī communities well settled in the Manṣūra Emirate, see Piacentini Fiorani 2021, 90-98.

³⁷ See Fusaro in Piacentini Fiorani & Fusaro 2022, and her reports on pottery in *Research Reports* 2019-2020 and 2021. It is interesting how ceramic evidence can also add precious scraps of information on the circulation of goods *and* artisans in the Indian Ocean and no less precious information on the daily life of the artisans settled on Banbhore's mound.

breaches and some repairs... but yet allowed to exercise a strict control on the rich incomes from a wealthy productive activity.

In a flash: the dramatic end of Manṣūra, an obstinate defence *vis-à-vis* the Seljuk army followed by a peace-agreement and a new institutional and political status; thence, a new re-occupation and organization of the space, planned by a wealthy leadership according to changed political, administrative and fiscal-economic requirements.

As hinted above, further investigation is still required, as it is required to further investigate the *raison d'être* of the so-called Partition Wall. Yet, the data emerged from the 2018-2021 campaigns confirm the space re-organization within the ancient bastions and its dating around the first half of the eleventh century. Life at Banbhorē did not finish with the end of Manṣūra and the disruption of its hinterland. It revived and reorganized itself, giving life to a new phase of political, social, financial and economic prosperity on a regional/global dimension, which suggests a cultural continuity and a continuity in governance according to the traditional model of the Indo-Iranian *shahristān*, with its well-planned organization of the territory surrounding the citadel, an accurate water management system, a pretty artificial lake, a lagoon, and, farther on, dwellings, villages, funerary areas, «industrial quarters», well cultivated and irrigated farms.

Manṣūra's Heritage? Likely. Behind Daybul's new ruling family there are the solid cultural heritage of Manṣūra *and* its economic and family connections, based on a well-trained bureaucratic class. Daybul's role is no longer confined to that of outlet to the sea only (*bandar*). It stands out as that of great promoter of regional institutional, economic and financial reforms, which implied the re-opening of the land-routes to Yazd and Shiraz (see below, Iṣṭakhr ceramics § II Science and Technology), and – via Khurāsān – to Inner Asia and its riches. At the same time, Daybul – or, even better, its rulership – invested on the reactivation of the traditional connections with regions bordering the western waters of the Indian Ocean and the Gulf. All in all, a positive continuity in international politics and administrative independent initiatives.

As noted above, here we are confronted with *the plastic image of an «international market» of the Islamic Middle Ages*, and its organization as depicted in textual sources.

About the dating of the final occupation of the mound, these same data point to a double stage: decay and start of its abandonment

(second half of the twelfth century), possibly due to the disruption of the Seljuk dominion, the crumbling of the Qavurdid Kirmān Sultanate, Ghūrid incursions and devastations («peoples – these latter – that never spare anyone»). Definite abandonment and end of the site's stable occupation: around the very end of the twelfth if not early thirteenth century. A violent, abrupt and dramatic end that took the mound by surprise (Khan 1976: 33-34). Be that as it may, be it for natural causes (a catastrophic earthquake, registered by written chronicles), or human no less catastrophic attacks, ceramic and archaeological evidence attest that, up to that very moment, life at Daybul was still active.

2. SCIENCE AND TECHNOLOGY

2.1. *History and Science*

The close collaboration between History and Archaeology, textual sources and non-textual sources, has allowed to shape a new historiographic approach to studying and writing of history and of the history of excavated sites. Integrating material data with written evidence has made it possible to unveil precious pages of our Past. This methodological development is largely due to the strong impact of the *Annales'* school on the cultural milieu of the seventies-eighties of the previous century, and the authoritative mastery of Human and Social Sciences³⁸.

At the dawn of this millennium, Science entered the field, imposing new research-issues, new disciplines and methodological approaches, and, with them, new technologies. The main objective became research about peopling's processes and patterns of settlement. These were studied within the region's geomorphological habi-

³⁸ Max Weber's *Economy and Society* had laid the foundations to this brisk evolution; Pietro Rossi and Fulvio Tessitore (this latter with his erudite school in Naples) developed and gave system to this new research line. Cfr. Piacentini V., *Reminiscences from the past: Giorgio Levi Della Vida and Samuel Miklos Stern: the Islamic city*, in *Journal of Modern Jewish Studies – A Special issue of JMJS in Honour of Samuel Miklos Stern (1929-1969)*, vol. 20 (2021), 4, London, Rutledge, 482-509: § 1 in collaboration with Dr Fitzroy Morissey (All Souls College, Oxford UK).

tat, its physiognomic features and human landscapes, and their development. It signified a scientific approach that gave to the studying of environmental landscapes and their evolution in the course of centuries if not millennia a centrality of their own. Topography turned out as key instrument, and, with it, botanic and paleo-botanic, zoology and paleo-zoology, geology and others. According to J.-C. Gardin and his school (CNR, Paris), geographic/geomorphological research on human habitat was the first and preliminary investigation before any archaeological and historical initiative, the tangible, physical background that might have conditioned human peopling and related models of settlement, or might have been conditioned in its turn by human action. A technological approach entered the stage, imposing its methodologies (practices, methods, systems), providing a solid, technical support to archaeological investigation and historical theories.

Recently, a new technological approach has also entered the scientific stage, Archaeometry and Physics, with their laws, scientific technical approaches and methods, and no less scientific unescapable rules.

Today, we are still on the threshold of a new basic methodological evolution in archaeological and historical research, a positive revolution within the historiographic panorama. At Banbhore, we have not been immune to the seductive collaboration with Mario Piacentini's Mobile Laboratory for Non-Destructive Analyses (LANDA – Rome *La Sapienza* University: Laboratorio di Analisi Non Distruttive ed Archeometria Sebastiano Sciuti – see here below), and the no less seductive technology of drone's investigation and drone's ortho-photogrammetric images (see here below A. & S. Tilia's «methodological» note).

2.2. *Archaeometry*

With the assistance of local scholars (Dr K. Lashari and Dr A. Ibrahim), a mobile Archaeometric Laboratory was set up at Banbhore; it provided concrete assistance during the first steps of Banbhore's investigations (2012-2015) and these last campaigns. For example...and herewith I am honoured to enclose some notes by Mario Piacentini about analyses carried out *on the field*, which have provided precious guide-lines for further investigation. Both Teams, archaeological and historical, have largely benefitted from the given inputs.

2.2.1. Ceramic Sherds and Their Provenance

by *Mario Piacentini*³⁹

The problem. During the 2018-2019 field season, the Italian pottery specialist Agnese Fusaro suggested that a group of three pottery specimens, one found in Trench 9 (Building 1, Room 1 - SU 506) broken in four pieces, and other two in Room 2 (SU 546), might be relics of ceramic jugs «imported» from Ištakhr, a relevant archaeological site in Fars (R.I. of Iran)⁴⁰. She based her assumption on the stylistic aspect of the sherds and on their ceramic bodies (*Fig. 1a*). If imported, these fragments would provide a major evidence to the important role played by Banbhore's site in given epochs as a central place within the global trades of the time.

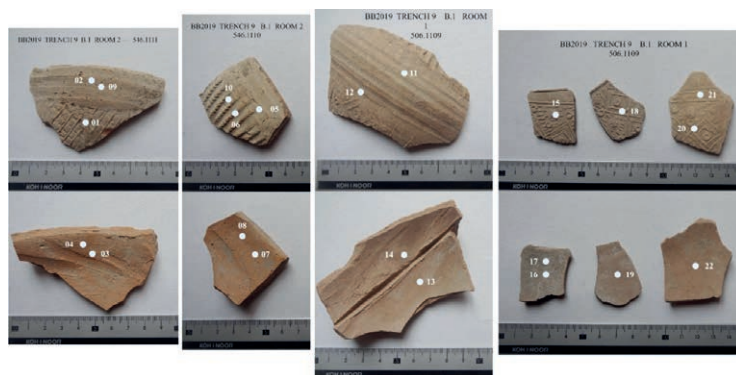


Fig. 1a. The ceramic specimens recalling Ištakhr's pottery.
The white circles indicate the areas where X-ray fluorescence analyses have been performed.

³⁹ Prof Mario Piacentini, chair of Physics in Roma *La Sapienza* University, was Director of the Laboratory for Archaeological Non Destructive Analyses until 2014, when he retired. He is still Consultant for specific analyses. A Collaboration Agreement with the LANDA Laboratory has been signed by the Catholic University of the Sacred Heart. Here, the Italian Research Group wishes to express warm expressions of gratitude to Dr Anna Candida Felici – Assistant to Prof. Mario Piacentini – who has bravely supported us all with her most precious backing in the setting up and organization of the Mobile Archaeometric Laboratory at Banbhore; her competence has been source of intense motivation for all of us.

⁴⁰ See below, note (41).

It is well known that the provenance of ceramic materials can be derived by the analysis of the trace elements. In more than one case, this aim can be achieved with a non-destructive technique, the X-ray fluorescence, measured with simple, portable instruments. Thus, we did a preliminary analysis of these six sherds with a portable X-ray fluorescence spectrometer (*Fig. 2a*)⁴¹.

After this first analysis *in situ*, the six samples have been taken to Italy for further analyses, with the kind permission of the General Directorate of Antiquities & Archaeology - Culture, Tourism and Antiquities Department, Government of Sindh.



Fig. 2a. The portable X-ray fluorescence spectrometer.

⁴¹ The portable X-ray spectrometer was a private one, kindly lent by Prof. Roberto Cesareo. Our thanks to his collaboration.

Instruments and method. The instruments in Rome consisted in the Amptek mini X-ray generator and the Amptek 1-2-3 X-ray detector. The angle between the primary X-ray beam incident on the sample surface and the emitted X-ray fluorescence beam was about 30° . The area hit by the primary X-ray beam was about 2 mm diameter. During the measurements the generator was operated at 35 kV and 50 μ A. This X-ray generator had a tungsten anode and a barium filter for cutting the spectral region between 4 keV and 20 keV of the primary beam. Consequently, the background signal, due to the X-ray photons scattered from the sample, present in the measured X-ray fluorescence spectra, was completely suppressed. In the 4-20 keV energy interval, the X-ray fluorescence emitted by several atomic species of interest for archaeometry fall (*Fig. 3a*).

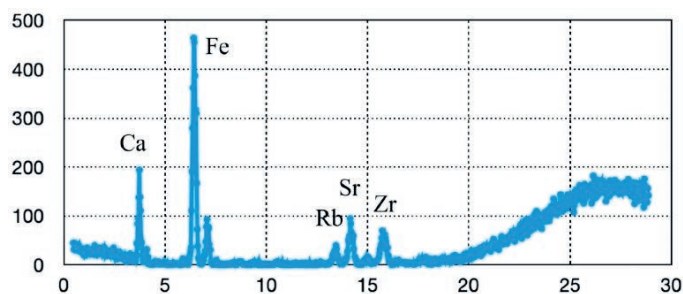


Fig. 3a. The X-ray fluorescence spectrum of a brick from Banbhore measured with the portable spectrometer. Between 4 keV and 20 keV the background signal to the diffusion of primary X-ray beam from the sample is totally suppressed.

In order to ascertain the provenance of ceramics it is necessary to analyse for comparison also samples from the hypothesized provenance. Thus, with the same instrument, we analysed two fragments of bricks coming from Banbhore, of local production, and several fragments of ceramics coming from Iştaḫr, kindly made available by Prof. Maria Vittoria Fontana (Department of Antiquity Sciences, Sapienza University of Rome)⁴². A brief description of the studied ceramics, shown in *Fig. 1a*, is given here below in *Tab. 1a*.

Measurement analysis and conclusions. For each sample, it has been measured the X-ray fluorescence produced by various areas,

⁴² Maria Vittoria Fontana, archaeologist and Islamist - Dipartimento di Scienze

indicated by the white dots in *Fig. 1a*, both external and internal to the ceramic fragments. The counts of the X-ray photons under the fluorescence lines of the identified elements (see for example *Fig. 3a*), measured on several homogeneous areas, were averaged to improve the statistics and the accuracy of the analyses. *Fig. 4a* shows the so-determined counts of the K lines of calcium, strontium and zirconium as bar graphs, having distinguished with different colours the fragments belonging to the same group according to the scheme of *Tab. 1a*. Generally, for provenance studies, minority or trace elements are of major interest [3a, 4a], since they correspond to the impurities characterising the clay deposits. Instead, the main elements derive from the minerals that make up the ceramic mixture, common to all deposits. Calcium is one of the main elements. However, in the graph of the top panel of *Fig. 4a*, showing the calcium counts, it can be seen that the outer part of the analysed jug fragments (labelled CE in *Fig. 4a*) are richer in calcium than their internal counterpart (CR in *Fig. 4a*). This enrichment of calcium on the external surface, which causes it to lighten, is the result of firing.

On the other hand, the study of the intensities of the fluorescence produced by the atoms of strontium and zirconium, minority elements, can help. In fact, strontium follows immediately calcium in the same group of alkaline-earth metals. Therefore, having the same chemical-physical properties, it can replace the calcium atoms in calcium minerals, such as the calcite present in clays forming the ceramic mixtures. However, the percentage of strontium can significantly vary according to the local conditions and processes that led to the formation of the calcite deposits. In the middle panel of *Fig. 4a*, which shows the fluorescence intensity of strontium, it can be observed that:

- for strontium there is no surface enrichment during firing unlike calcium;
- the two fragments CE1 and CE2 have quantities of strontium

dell'Antichità, *La Sapienza* University in Rome - has been Scientific Director of Ištakhr's excavations. With great archaeological and historical competence, she has framed this important site within the geographic strategic panorama of early Islamic times, and its later role as stage on the land route to Shiraz. Agnese Fusaro, her student, collaborated to the studying of Ištakhr's pottery. M.V. Fontana has recently edited a detailed, exhaustive book on Ištakhr: Fontana, M. V. (ed.) 2018, *Ištakhr (2011-2016). Historical and Archaeological Essays*, in *Quadeni Vicino Oriente*, vol. XIII. Colleague and friend, we used to share suggestions and emotions for what was coming out from our sites.

comparable to those present in the Banbhore bricks, unlike the third fragment broken into the four sherds CE3, CE4, CE5 and CE6, - *Fig. 4a* - which have fluorescence values close to those of Iṣṭakhr fragments, in particular to the I4 and I6 fragments;

- examining the bottom panel of *Fig. 4a*, it can be seen that the intensities of the X-ray fluorescence emitted by zirconium atoms are approximately the same for all the samples found in Banbhore (the bricks and the six sherds under analysis) and they are much stronger than those of all the Iṣṭakhr samples.

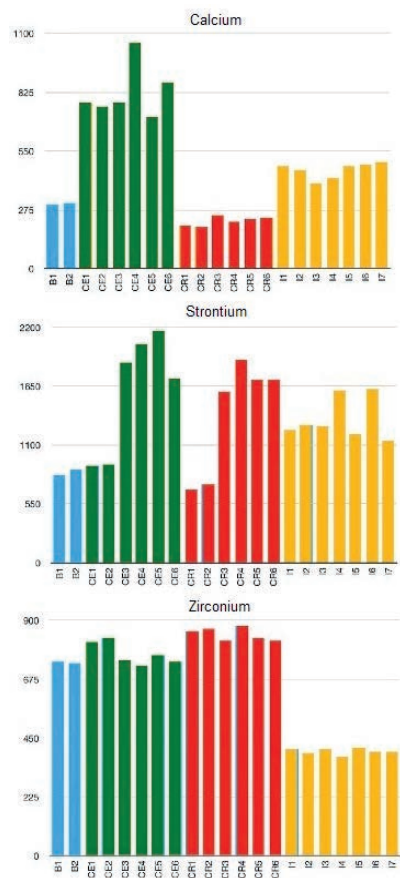


Fig. 4a. Bar graphs of the intensities of the fluorescence K emission lines of calcium (top panel), strontium (middle panel) and zirconium (bottom panel). The different groups of ceramics are differently coloured.

These simple observations on the intensities of the fluorescence lines of the elements present in the ceramic fragments do not allow to reach a conclusion on the provenance of the three fragments found in Banbhore, possibly coming from Iṣṭakhr. For this reason, it has been tried to use a more refined technique to analyse the X-ray fluorescence spectra: the principal component analysis (PCA), using the RStudio software. Since the counts relating to the fluorescence produced by the various elements present in the analysed ceramics differ by two orders of magnitude, we chose to standardise the variables (the counts measured for each element in each spectrum), in order to make them comparable and avoid distorted results. *Fig. 5a* shows the graph of the second main component (Dim2) as a function of the first (Dim1) one. Each point in *Fig. 5a* corresponds to a measurement performed on the ceramic samples and is labelled using the conventional names of the samples given in *Tab. 1a*.

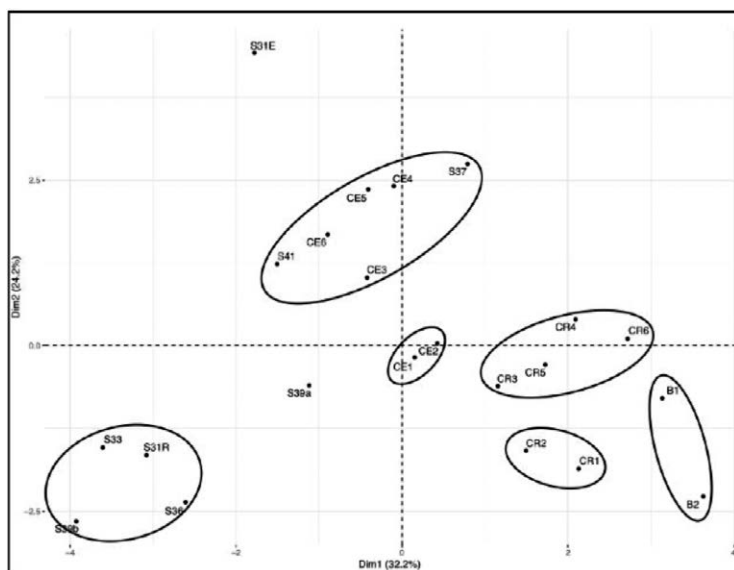


Fig. 5a. Graph of PCA Dim2 component *versus* Dim1 component.

Ellipses enclose groups of points with similar characteristics.

The points are labelled according to the conventional ceramic names in *Tab. 1a*.

From *Fig. 5a* it can be deduced that:

- PCA, too, discriminates the analyses performed on the external face of the samples from Banbhore (richer in calcium) from those performed on the internal face;
- the points associated with the two pottery fragments C1 and C2 (in particular those relative to the inner face) are closer to the points associated with the Banbhore bricks;
- the points associated with the samples from Iṣṭakhr are scattered throughout the graph, probably due to the large inclusions present in the ceramic body. This is particularly evident for the I2 and I1E fragments, the latter being almost white in colour due to calcification of the external face;
- only the fragments of Iṣṭakhr I4 and I6 can be grouped with the fragments under scrutiny found in Banbhore;
- the other fragments of Iṣṭakhr I3, I5, I7 and I1R form a separate group.

This preliminary study does not allow to reach a definite conclusion. The composition of the two fragments C1 and C2 (inventory numbers BB.19.P.546.1110 and BB.19.P.546.1111) seems similar to that of the Banbhore bricks, excluding their provenance from Iṣṭakhr. Conversely, the third sherd, broken into four fragments, is more similar to those from Iṣṭakhr, in particular to fragments I4 and I6, respectively inventoried as *sample37* and *sample41* in *Tab. 1a*. Mineralogical and petrographic analyses could certainly be of considerable help in determining or excluding the provenance of the three fragments selected by Agnese Fusaro.

Tab. 1a. List of the ceramic fragments attributed to Istahkr and taken to Rome for archaeometric analyses (with the kind permission of the Directorate General of Antiquities & Archaeology of Sindh), and of several reference ceramic sherds from Istahkr kindly supplied by Prof. Maria Vittoria Fontana. The samples are indicated with conventional names in column 2, referring to the X-ray fluorescence analyses.

ID	Type	Reference number	Provenance
1 B1	Brick from Banbhore	Sample 45 - 2017-2018	Surface
2 B2	Another brick from Banbhore, scraped area	Sample 04 - 2017 - 2018	Surface
3 CE1	Ceramic fragment, front side	BB.19.P.546.1111	Banbhore, Trench 9 – SU 546
4 CR1	Ceramic fragment, retro		
5 CE2	Ceramic fragment, front side	BB.19.P.546.1110	Banbhore, Trench 9 – SU 546
6 CR2	Ceramic fragment, retro		
7 CE3	Large fragment, front side	BB.19.P.506.1109	Banbhore, Trench 9 – SU 546
8 CR3	Large fragment, retro		
9 CE4	Small square fragment, front side	BB.19.P.506.1109	Banbhore, Trench 9 – SU 546
10 CR4	Small square fragment, retro		
11 CE5	Small rectangular fragment, front side	BB.19.P.506.1109	Banbhore, Trench 9 – SU 546
12 CR5	Small rectangular fragment, retro		
13 CE6	Medium size fragment, front side	BB.19.P.506.1109	Banbhore, Trench 9 – SU 546
14 CR6	Medium size fragment, retro		
15 I1 S31R	Istahkr - large fragment; analysed the internal reddish face	Sample 31	Istahkr, ES 12 - Trench 1 East 2 SU 119 - fabric 7
16 I1E S31E	Same sample; analysed the almost white external face		
17 I2 S33	Istahkr - light gray fragment	Sample 33	Istahkr, ES 12 - Trench 1 East 2 SU 119
18 I3 S36	Istahkr - moulded fragment reddish in color	Sample 36 West SU 124	Istahkr, ES 12 - Trench 1
19 I4 S37	Istahkr - fragment, light gray in color, with numerous inclusions inside the paste	Sample 37	Istahkr, ES 12 - Trench 1 East 2 SU 119
20 I5 S39a	Istahkr - fragment of ceramic mould light gray in color, with numerous “translucent” inclusions inside the paste	Sample 39	Istahkr, Trench 1 East SU 120
21 I6 S39b	Istahkr - another fragment of sample 39 - analysed an area inside the fracture	Sample 39	Istahkr, Trench 1 East SU 120
22 I7 S41	Istahkr - reddish fragment with several dark red inclusions in the paste	Sample 41	Istahkr, ES 12 – Trench 1 SU 141

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2.3. *History and Archaeometry: Texts Through the Eyes of Contemporary Science*

All in all, for the Historian, these technical analyses and their technical terms look like a text in Chinese ideograms. Yet, these archaeometric analyses provide unquestionable data. Archaeological finds and archaeometric conclusions cannot be neither dismissed nor disregarded; conversely, they become a spur to rereading the historical framework.

The dating of the aforesaid ceramics (found in stratigraphy) point to the very end of the tenth - early 11th Century AD. This has induced to go back to the available textual sources, special focus on chronicles and geographies of that period. As noted above, these provide a detailed picture of the events taking place in the eastern lands of the Caliphate under Būyid political and military dominion (320-450 AH/932-1062 AD), and the following Seljuk seizure of power after Dandānqān (1040 AD), the victorious battle that, with the crashing defeat on the Ghaznavid sultan, opened the Iranian world to the Seljuk sultans and their dominion on land and on sea (see above §1.3 and §1.4). Within two decades, Seljuk control on the Gulf and the western waters of the Indian Ocean would be consolidated by the Pact with Daybul, Oman's expedition and conquest (new Province of the Sultanate), the constitution of the Sultanate of Kirmān under Chaghrī Beg's son, Qāvurd Khān and his successors, and strategic matrimonial alliances within the Būyid «family». Amongst these latter, noteworthy is the Kākūyid *liason* - which gave life to the Yazd sultanate - a major stage along the land routes to Fars. Fearful Dailamite warriors, the Būyids always had a special attention for Fars and Shiraz, where they loved to stay, and embellished with beautiful monuments. Shiraz was magnificent and Sīrāf was at its apex as harbour and outlet to the sea of Shiraz. Iṣṭakhr was still playing a relevant role as military base and prime stage of land-routes with Makrān and Sindh. Sharp was the mercantile competition between the Red Sea and the Gulf, to the point that one of the main Būyid targets was to get full control (direct and indirect) on both coasts of the Persian Sea, the *Bahr al-Fārs*. According to Iṣṭakhrī's and Ibn Ḥawqal's geographies (10th Century AD), the *Bahr al-Fārs* ended at Daybul ⁴³. Thus, Daybul entered the stage as its prime actor. Daybul that, at the time, was the powerfully fortified harbour of

⁴³ See above §1.3 and §1.4.

Manšūra; Daybul, a charming city on the Indus Delta, renowned for its fresh waters and agreeable environment; Daybul, residence of the Būyid Crown Prince, where Caliphal Governors and Representatives had their Palaces, too; Daybul, core of river, sea and land global trades, centre of religious temples, terminal of pilgrimage routes from Inner-Central Asia and eastern Iran. Either imitation pottery locally produced, and/or fragments of jugs imported from Iṣṭakhr, Fusaro's ceramics are a material evidence of close land connections between the Indian Ocean and Fars.

Pottery, as studied by Fusaro, provides a material evidence (and archaeometry confirms it) about a role that the Seljuk conquest did not shatter. Beyond sea competition with the Red Sea and Fāṭimid Egypt, security along land routes had been achieved and would be preserved. North-Eastern frontiers had been locked by Chaghri Beg; the following Peace Agreement with the Ghaznavids, the Pacts signed with Daybul and the Omani campaign, matrimonial alliances with Būyid princes and a shrewd policy of allotting local privileges to Būyid lords (like the Kākūyid of Yazd) guaranteed safe passage for goods and caravans all along the land routes from Daybul through Kij-Makrān and the Garmsīrat to Kirmān, Yazd and Shiraz. Archaeological evidence confirms textual sources. Agnese Fusaro's ceramics and archaeometric analyses suggest *reading history through pottery and science*, too.

2.4. *Topography*

As also noted above, topography and graphic documentation became the kernel of any archaeological survey, excavation and scientific record. During these very last decades, its technology underwent impressive developments, an especially interesting element within archaeological panoramas and historical reconstructions. Human and environmental landscapes, and their evolution fixed through graphic and topographic documentation, outline and register basic data relating to life and peopling of a town and its surrounding territory. At the same time, they also document its cycles. At Banbhore's site these phases have been thoroughly registered and regularly documented...until the water-table did not prevent us from going deeper (see preceding note in *Rendiconti dell'Istituto Lombardo* 2018/2019).

Through Alessandro Tilia's words, it is interesting to follow the bewildering evolution of topographical technologies during these last ten-twelve years.

2.4.1. Topography and graphic documentation in the context of Banbhore's Site by *Alessandro* and *Sven Stefano Tilia*

The 2021 topographic and photogrammetric documentation was planned following two distinct objectives: the creation of a new cartography of the citadel of Banbhore and its surrounding area, and, at the same time, the documentation of the findings of the new excavation campaign.

To understand the new achievements, it is necessary to outline how topographic and graphic technologies evolved since F.A. Khan's period and, in particular, during these last years. Let us start here with the Pak-French-Italian Historical-Archaeological Project at Banbhore (2011-2015).

Photogrammetric Survey of Banbhore Citadel. The first draft of the map of Banbhore was carried out in February 2011 with a topographic campaign as part of the Archaeological and Historical Pakistani-French and Italian Joint Project at Banbhore (Sindh) mission in order to create a basic cartography for the future archaeological investigations. For this purpose, a complete photographic coverage of the citadel and the neighbouring areas was carried out using a camera attached to a kite specially adapted for the purpose (Yves Ubelmann). The photos were captured through a Canon Powershot G11 and a Ricoh GR Digital II, both having a 10 Megapixel resolution, set for 5-second interval shots, for a total number of more than 5000 photos. The redundancy made it possible to select a sufficient number of images to be processed for a photogrammetric rendering using one of the first applications capable of working with uncalibrated cameras.

At the same time, a topographic campaign was conducted (Sophie Reynard) to position a traverse consisting of 17 reference stations in UTM coordinates distributed both on the citadel and in the surrounding areas, to be used as reference stations to support future archaeological excavations. This first campaign resulted in a planimetric view of the fortified citadel in the form of a mosaic of orthorectified images, with a ground resolution of about 8 cm.

It was a notable development if compared with F.A. Khan's map, the first and, at the time, the only one.

Ten years later, the photogrammetric techniques have undergone an evolution both in the use of aerial acquiring equipment (UAS) and in digital photogrammetry software. In fact, today we are able to document the territory by means that are able to acquire aerial images distributed in a homogeneous and precise way with fully automated procedures. Hence the need to re-propose the documentation to the highest standards of precision and definition according to the newest state of the art possibilities.

The restitution of the mosaic of images was entrusted to a photogrammetric restitution software which at the time was of the newer generation and which was at the beginning of its development. The result was however up to the standard of these methodologies and allowed the drafting of a first orthophotomosaic but unfortunately lacking the metadata necessary for geo-referencing.

From kite to Drone. When in December 2012 the Italian Team took over responsibility for the topographical and graphic documentation for the mission (by Alessandro Tilia), the first concern was to assign coordinates to the orthophotomosaic of the general site plan, identifying safe control points on the ground referable to the orthophotomosaic created during the previous year. The roto-translation did not give acceptable results, and it was necessary to apply a further deformation (photo-stretching) to the image in order to make the control points coincide better (control points chosen based on their easy recognition on the image, such as the pillars of concrete located around the site as boundary markers). The development of a new map of the citadel through aerial photogrammetry and by means of a drone was conducted together with the collaboration of Sven Stefano Tilia. Initially we used a commercial drone, DJI Mavic Pro, made available by the General Department of Antiquities and Archaeology of Sindh, already used in 2019 during the previous archaeological campaigns. This particular model is equipped with a 12 Mega pixel sensor and the ability to fly via waypoints (vertices of the path travelled by the drone) and therefore to be programmed for flights conducted in a completely autonomous way. The photogrammetric shooting conducted via drone involves the acquisition of a series of zenital photos with an overlap of at least 80% along the paths, with each path overlapping the preceding one by 60%, covering the entire area to be mapped. This acquisition method requires shooting precision that is difficult

to manage through the manual operation of the remote control. This is why software that allows the planning of the flight in a completely automatic way through the guidance system integrated in the drone itself comes to our aid.

Unfortunately, this particular model was immediately unusable due to damage suffered prior to our arrival and we opted for the rental of a replacement drone for the duration of 4 days, to cover the repair time (in Pakistan there are no official assistance/repair centres). The choice fell on a different model of the same brand, a DJI Phantom 4 Pro, with more advanced features as it is equipped with a camera with a mechanical shutter and a resolution of 20 Mega pixels. This particular model is able to take photographs in motion without the distortions generated by an electronic shutter, such as the one mounted on the DJI Mavic Pro camera. This feature has an additional advantage linked to the number of waypoints, reduced to those necessary to make the changes of direction in the shooting path; the DJI Mavic Pro must instead of stopping at the moment of each shot, committing a waypoint for the purpose. To give an example, with the Phantom 4 Pro, one of the photogrammetric acquisition projects was made with only 30 waypoints. The same project, if carried out with the DJI Mavic Pro, would have needed 574 waypoints (one waypoint for each photo); this high number of waypoints generates a further inconvenience due to the limitation to 99 waypoints that can be managed consecutively by DJI drones and therefore determines the need to restart the mission, while in flight, several times.

First, careful planning of the mission was carried out based on:

- size of the area;
- the percentage of overlap between each single shot;
- the camera parameters such as aperture, shutter speed and exposure mode;
- the number of batteries needed to complete the mission compared to the overall flight time;
- the flight altitude with respect to the ground resolution to be obtained;
- the number of targets for the control points to be used;
- the positioning of the targets based on the accessibility of the areas and their visibility with respect to the topographic stations from which to position them.

The total area to be covered, decided in agreement with the archaeological management, was almost 92 hectares divided into 8 sub-areas, two of which covering the fortified citadel and the other 6 relating to the external settlements in the North, North-West and East directions.

Priority was given to the citadel, the initial goal to be achieved, to which the so-called industrial area to the north including the lake and the town east of the walls were added. Due to the aforementioned technical problems, the time initially allocated to this activity (two weeks) was sufficient only to complete the plan of the citadel by taking advantage of the 4 days of availability of the rented drone and taking into account the flight duration offered by the only two batteries available. It was decided to carry out a grid flight path for the zenital photos divided into two acquisition sessions spanning two distinct days at an altitude of 50 m from the ground to have a ground resolution equivalent to 1.4 cm, while the other 2 days were used for the oblique takes of elevated structures such as the citadel walls. At the same time, 18 50x50 cm markers (consisting of pressed cardboard boards and painted in black and white squares) were uniformly distributed, and subsequently topographically positioned by means of a total station. Overall, 1663 photos were taken to cover the entire area bounded by the walls of the citadel from which to select the 1420 photos useful for the photogrammetric rendering of the plan view.

The restitution process using special software takes place, in first instance, with the uploading of the photos, their subdivision into groups based on the day of acquisition, and the attribution of the coordinate system adopted, in our case UTM WGS 84. After this preliminary phase, we proceeded with the alignment of the photos to generate a series of homologous points spanning between the different images, determining a first orientation of the individual photogrammetric shot. The coordinates of the control points are then assigned to the visible markers on the individual photos. The homologous points are then subjected to a series of filterings in order to eliminate those of low quality. This process significantly reduces the positioning error and refines the internal and external orientation parameters of the camera. The next steps were taken in order to generate a point cloud of over 330 million points and a model (*Fig. 1b*) of potentially 86 million triangles (successively, in

order not to use too many PC resources, it was decided to generate a model of just under 10 million triangles, which is easier to manage without compromising the final output).

The completion of the photogrammetric rendering made it possible to generate an orthophoto with a resolution of 1.82 cm (*Fig. 2b*) suitable for a planimetric rendering equal to a scale of 1:200 and a DEM with a resolution of 3.64 cm. The accuracy of the result was verified using control points, corresponding to the internal corners of the paved courtyard of the mosque, measured with a total station in 2012. An improvement in accuracy from 50 cm of the previous orthophoto to less than 3 cm in the current one (*Fig. 3b*), and therefore below the graphical error of the 1:200 restitution scale.



Fig. 1b. Detailed View of the low-resolution model, corresponding to the Southern gate of the Citadel, generated by the photogrammetric restitution process.



Fig. 2b. Orthophoto of the plan of Banbhore Citadel created in 2021.



Fig. 3b. The Great Mosque. Comparison between the photogrammetry carried out in 2011 (left) with that of 2021 (right). In this latter, in addition to the increase in definition, it is possible to see the increase in accuracy with the topographic control points coinciding with the corners of the Mosque's courtyard.

Thus, it has been possible to create a new plan of the bastioned area characterised by increase in definition and accuracy of details.

Having repaired the drone, we then tried to carry out the mapping of the other areas outside the walls. We succeeded, due to a series of technical problems, only to complete the sector including the lake and the industrial area. Since the drone was equipped with a less resolute sensor and an electronic shutter, it was necessary to lower the flight altitude to 45 m and increase the number of shots to obtain the same resolution on the ground and thus consequently increasing the flight times due the high number of waypoints.

The photogrammetric restitution was carried out later once back in Italy on a workstation equipped with adequate power and memory and this involved several days both for the calculation and for identifying the best parameters in the restitution process.

Documentation of excavation activities. The documentation campaign of the excavation activities between November and December 2021, concerned the enlargement of trench 9 to the north and the opening of a new trench *extra-moenia*, no. 13, about 120 meters north of the Citadel Walls.

The documentation of the enlargement of trench 9 was immediately deemed quite complex due to the fivefold surface increase of the plan compared to the previous 2020 campaign. Previously, the acquisition of images useful for photogrammetric restitution was done by manually piloting the drone, trying to calculate by sight the necessary overlap. Unfortunately, the short time offered by the optimal light conditions, on average just over 20 minutes, was no longer sufficient to be able to complete the acquisitions in manual mode. It was decided to adopt a different approach: that of relying on an automatic acquisition as already adopted in the general mapping of the citadel. This mode is at the limits of technical capacities due to the reduced altitude of the drone and the distance between one shot and the next. The problem represented by the lack of precision of the drone mounted GPS, which involved variations of a few meters in the position of the acquisition area day after day, was solved by enlarging the acquisition area in order to absorb these variations (thus discarding the photos in excess). In this way, it was possible to acquire up to 219 perfectly spaced zenital photos in less than 14 and a half minutes covering an area of about 334 square meters. Photos were initially acquired for a general plan of trench 9 in order to document the early stages of the excavation on November 19th and 24th,

carried out both with the DJI Mavic Pro drone and with the Phantom 4 Pro in automatic mode. Next, we moved on to the documentation of other main environments of Building 2 and 4, all performed with the Mavic pro and in manual mode:

- plan of rooms 1 and 2 of building 4;
- survey of two plan views of room 2 of Building 2 to document two phases of excavation;
- survey of four plan views in room G to document the various levels brought to light during the last three days of excavation.

The final excavation plan required three days for the completion of the photogrammetric images, as oblique photos were added to the zenital ones carried out in automatic mode to better define the elevations of the wall structures, for a total of 601 photos. The final result consisted of an orthophoto (*Fig. 4b*) with a pixel resolution of 1.89 mm and a DEM with a pixel resolution of 3.78 mm.



Fig. 4b. Orthophoto of the plan of trench 9 at the end of 2021 excavation's campaign.

The documentation also covered the elevations and walls of the excavation with the restitution of the following documents:

- prospect and section of all three north, east and west walls that delimit the sides of the excavation;
- a prospect/section of a wall of an interior test trench oriented to the West;
- elevation and section of the two faces of the wall that delimits rooms 1 and 2 of building 4 to document the part of the preserved raw wall, set on the stone foundation.

The documentation concerning the new trench 13 was preceded by two series of photogrammetric shots taken without support points, which with a lower accuracy due to the georeferencing based on the internal GPS of the drone, made it possible to identify the area to be investigated. In addition, in this case, the method of acquiring images in automatic mode was used due to the extension of the area (about 187 square meters), after an unsuccessful attempt in manual mode. The documentation consisted in the creation of two general plans of the excavation, one at the beginning and one at the end of the excavation (*Fig. 5b*). Within these, six plan views aimed at documenting the excavation of the floor and of the two jars embedded in room 3. Finally, the elevation section of the east wall of the excavation and the section of the north wall of the trench at the height of room 3 were created.

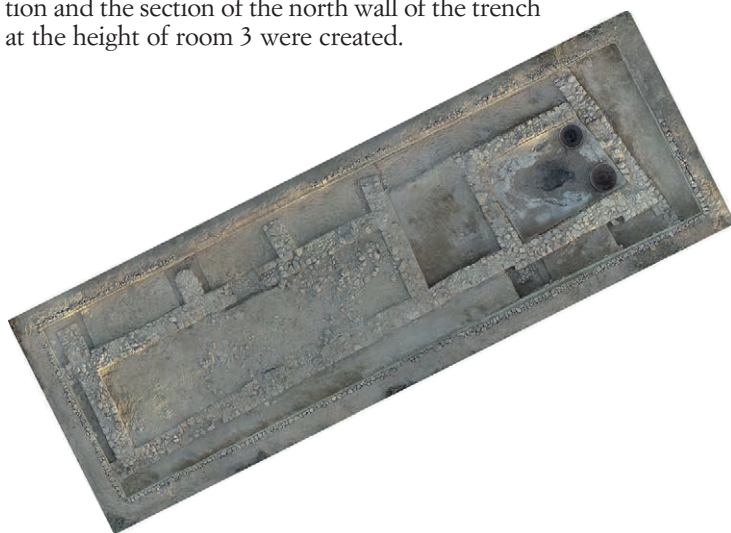


Fig. 5b. Orthophoto of the plan at the end of the 2021 excavations of trench 13.

AND TO CONCLUDE

The preceding note by Alessandro and Sven Stefano Tilia has provided a thorough account of the new technology in graphic/ortographic and ortophotogrammetric documentation of architectonic structures and archaeological evidence in stratigraphic sequence. It has also enhanced the evolution of these techniques during these last few years, and how sophisticated and highly specialised these have become. A science of its own, with its own system and methodological approach. For the archaeologist, nowadays it is becoming a *must*, indispensable to read, understand and document trenches and architectonic structures. And, with them, the various stages of life of the site under study. The accuracy of the data meticulously provided by the topographer – today – does not allow any question. Not only, but a no less accurate studying together of these same data can allow to rationally plan the new archaeological campaigns. As we have done at Banbhore. What about the historian? He is speechless, fascinated by science and technology, and the new perspectives that both can offer to a revisitation of the available textual sources.

Undoubtedly, the methodological approach is changing, a close collaboration between various disciplines, each one with its own instruments and methodological approach...the final result a positive image of the site under study and its history. Topography provides the stages, archaeology bring them to light through well-planned and organised campaigns, archaeometry signs its own unescapable points...the historian has to use his ratio to read them all and put them together in a plastic three-dimensional structure.

As noted more than once, today history is not only the reconstruction of dynasties and events in a chronological sequence. There are other protagonists, like *the people* with their own costumes and traditions, Casts and Families (often formidable *de facto* powers); Tribes and Nomadic groups, precious seasonal manpower, a mobile society with its own rules; the religious casts – often a *de jure* Power – Buddhist, Hindu, Zoroastrian and Islamic – well recorded by Banbhore's history and monuments; and – within Banbhore's landscape – the peoples of the river and the peoples of the sea...a mobile society on liquid spaces that connect Sindh with overseas lands and families. Last but not least, the Bureaucrats, positive families recurring in textual sources, preceding Islam and still solid in power after Islam: a *de facto* power that has ensured a cultural economic force through the centuries. This human

landscape has been coming to light during these last campaigns, with its various cultural connotations, traditions and powers...arts and crafts, punctually mirrored by archaeological data, architectonic evidences, topographic documentation of stages and historical phases, archaeometric scientific statements.

This human landscape has been coming to light during these last archaeological campaigns, each social group playing its traditional role within the traditional Indo-Iranian system, actually Daybul's *shabristān* system after the disruption of Maṣūra's Emirate. It signed the reorganization of the spaces within the bastioned mound, the last phase of Daybul's stable peopling, a stage of political and institutional reforms and economic prosperity based on luxury goods within the global trades and business of the 11th-12th Centuries AD (see above Part I).

Likely, behind the new ruling family there is the solid cultural heritage of Maṣūra with its economic and family connections. Daybul's role stands out as that of great promoter of regional institutional and economic reforms, which implied the re-opening of the land-routes to Yazd and Shiraz (see above, Istakhr ceramics and Piacentini Fiorani 2022), and – via Khurāsān – to Inner Asia and its riches. At the same time, Daybul – or, even better, its rulership – invested on the reactivation of the traditional connections with the regions bordering the western waters of the Indian Ocean and the Gulf. All in all, a positive continuity in international politics and administrative independent initiatives. The artisanal quarter under excavations and related pottery, new archaeometric analyses and the precise stages documented by topographic activity (see above) confirm textual sources.

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ENCLOSURE

TEXTUAL SOURCES

ABBREVIATIONS

- BGA = *Bibliotheca Geographorum Arabicorum*
 JA = *Journal Asiatique*
 PSAS = *Proceedings of the Seminar for Arabian Studies*
 ZDMG = *Zeitschrift der Deutschen Morgenländischen Gesellschaft*

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