



AL-ASHRAFIYYAH MOSQUE AND MADRASAH IN TA'IZZ

Conservation intervention (2008-2015)



ISTITUTO
VENETO
PER I BENI
CULTURALI

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IN TA'IZZ**

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To the people of Yemen

SOCIAL FUND FOR DEVELOPMENT - REPUBLIC OF YEMEN

ISTITUTO VENETO PER I BENI CULTURALI

AL-ASHRAFIYYAH MOSQUE AND MADRASAH IN TA'IZZ

**Conservation intervention
(2008-2015)**

edited by

Renzo Ravagnan and Maurizio Merlo



Venezia 2022

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FOREWORD

The subject of this volume is the work of restoration of the paintings, stuccoworks and woodwork, and the structural consolidation of the al-Ashrafiyyah Mosque and Madrasah in Ta'izz (Yemen, 13th-14th century), carried out by the Istituto Veneto per i Beni Culturali (IVBC, 2008–2015) thanks to the support of the Social Fund for Development (SFD – Culture Heritage Unit). It follows the previous volume *The Great Mosque of Ṣan'ā'. Conservation intervention (2005–2015)*, published in June 2022.

The magnificent religious complex of al-Ashrafiyyah includes the Mosque, with its great domed Prayer Hall, the square inner court, in which the tombs of several sovereigns are located, surmounted by another system of small domes, the Madrasah and, finally, the sector for ritual ablutions consisting of cells, beneath more small domes. These painted domes, the two elegantly decorated minarets with their overhangs that create plays of light and shadow, the arches adorned with festoons, the arched niches carved into the masonry, the staggered ribbon designs, the stuccoworks of the Madrasah, and the sculptured doorway make this Islamic monument one of the most fascinating in Yemen.

The Italian geographer Renzo Manzoni (grandson of the famous writer Alessandro Manzoni, 1785-1873), writes about it in detail in his book *El Yèmen*, in which he names the founder of al-Ashrafiyyah and describes its architecture, decorations, tombs and wood carvings, the library with its “ancient Arabic codices, ruined to a large extent, with few remaining intact”.¹ Drawing on these precious manuscripts as original sources, he tells of the origins of the mosques, the houses or palaces, and from these texts Manzoni himself drew information to write the history of Yemen. With regard to the tombs, Manzoni writes: “On the south side are the marble tombs of the founder, his son Ali and two slaves. Behind a carved wooden screen there are three more tombs, also in marble, containing the bodies of the seven wives of the founder. Facing these tombs, there is another, in brick and plaster, surrounded by wooden screens, in which one of his slaves lies”.²

This two-volume publication, which documents the work of restoration and consolidation carried out on the most symbolic monuments of the two most important cities of Yemen, are part of the project *People's Identity at Risk. Documentation and assessment of Islamic monuments at risk*, which was completed over a period of two years (2020-2022), with the support of the non-profit cultural association *Monumenta Orientalia* (MO) and the Yemeni SFD, and financed by the Aliph Foundation. The publications are a model of reference

¹ Renzo Manzoni, *El Yèmen. Tre anni nell'Arabia felice. Escursioni fatte dal Settembre 1877 al Marzo 1880*, Rome: Tipografia Eredi Botta, 1884, p. 315: “... codici arabi antichissimi, la maggior parte rovinati; pochi i completi”.

² *Ibidem*: “Nel lato Sud stanno le tombe in marmo del fondatore, di suo figlio Àli, e di due schiavi. Dentro uno stecato di legno traforato trovansi tre tombe, pure in marmo, che contengono i corpi delle sette mogli del fondatore. In faccia alla tomba di questi, ve n'ha un'altra, di mattoni e calce, contornata da legni scolpiti, nella quale riposa un suo schiavo”.

both for the assessment of the state of conservation of similar monuments and for the organization of similar restoration projects on the monuments damaged because of the war which has been going on in Yemen for more than seven years.

People's Identity at Risk project arises just from the need to document as much as possible of the country's architectural and cultural heritage damaged by this prolonged conflict. The main objective is to enable Yemeni experts to perform an in-depth study of the state of conservation of the Islamic monuments that have been severely damaged during the war, in order to establish a uniform and coherent system of assessment and lay the foundations for the definition of priorities and planning of future activities of recovery and conservation.

Within the scope of this program, sixty ancient Islamic monuments (mosques, Qur'anic schools, tombs, etc.) were examined and documented across Yemen, from Ṣa'dah to Aden, and from Zabīd to Tarīm. In addition to the SFD, other Yemeni institutions participated in the realization of the project, including the General Organization for the Preservation of the Historical Cities of Yemen (GOPHCY) and the General Organization of Antiquities and Museums (GOAM).

Over a period of two years, sixty-two team members, chosen from experts from SFD, GOAM and GOPHCY, and freelancers, from the cities of Ṣa'dah, Ṣan'ā', Aden and Ta'izz, and from the regions of Ḥaḍramawt and Tihāma participated in the project. There were seventy-eight trainees, and twenty-four volunteers.

The closing ceremony of the project, organized by the SFD in collaboration with the Yemeni Ministry of Culture, was held on July 23, 2022 at the House of Culture in Ṣan'ā', with the participation of the Minister of Culture.

In spite of the security challenges on the ground, the goals set by the *People's Identity at Risk* project were successfully accomplished.

Acknowledgements

I want to thank all the Yemeni collaborators who participated in the realization of the project *People's Identity at Risk*: engineers, architects, restorers, IT experts, photographers and technical personnel of SFD, GOPHCY, GOAM, freelance professionals, students and laborers, in short all those who in countless ways worked toward the common goal with enthusiasm, determination and skill, despite the grievous political and economic obstacles from which Yemen is currently suffering.

Thanks to the Presidents and Directors of the aforementioned Yemeni institutions, and especially to Abdulhakim Al-Sayaghi for his expertise and efficient on-site organization, for the collaboration, punctuality, precision and patience, for the entire duration of the project, with the Italian counterpart, specifically MO.

Many thanks to the Architect Amin Hussain, the Team Leader of the field work of the Project for his efficiency and efforts in training fresh architects and archaeologists.

I thank my friend and colleague Khalid al-Ansi (GOAM, Abyān) for the thirty-year collaboration with the Italian Archaeological Mission to Yemen, and in this specific case for his participation and for his assiduous help within this project. I thank Ahmed Jassar and Ramzi al-Domini (GOAM, Ta‘izz) and Salah al-Husseini (GOAM, Ṣan‘ā’), for providing us with photographic and bibliographic documentation relating to al-Ashrafiyyah.

Thanks to Renzo Ravagnan, Maurizio Merlo and Giovanni Canova who edited the publication of this volume.

I thank Ester Lopardo for her ability and expertise in the administration of the entire project, and for having managed with stubbornness, patience and success all the components that participated in the implementation of the project (banks, institutions, collaborators, etc.).

The *People’s Identity at Risk* project would never have achieved its goal without the constant support of Andrea Balbo, who stood out for his courtesy, professionalism and seriousness.

Last but not least, my profound gratitude goes to the Aliph Foundation for the generous funding of the entire project, serving to document the state of conservation of Islamic monuments in Yemen, and for the publication of these two unique volumes that detail not only the methods and techniques of restoration used, and guidelines for their practical application, but also the extraordinary beauty and value of the cultural heritage of Yemen to all mankind.

Sabina Antonini de Maigret
Scientific Director for the Project
People’s Identity at Risk
Rome, 14 August 2022

PREFACE

Within the Social Fund for Development (SFD)'s momentum and contributions to the preservation of the cultural heritage, particularly the architectural and urban heritage, with a diversity and richness of archaeological, historical monuments, and large number of the tangible and intangible cultural heritage components.

SFD adopted a comprehensive restoration project of the al-Ashrafiyyah Mosque and Madrasah in Ta'izz, which is a unique monument in terms of high and distinctive architectural value in addition to its unique symmetrical external architectural design, containing many stone, wood and stucco decorative elements, colorful mural paintings and antique wood carved. It's construction dates back to the eighth century H. during the Rasulid era (628-856 H./1404-1228 CE), it is considered as one of the most important historical, architectural, and decorative monuments, not at the local level, but at the level of the region and the Islamic world.

The building in general has been exposed to serious threats to its structural and architectural components and infrastructure, as well as decorations, inscriptions, and mural painting in particular due to the obsolescence of time and neglect for long periods and inappropriate interventions for the purpose of maintenance and protection of the building, as these interventions and neglect led to distortion and damage of large parts of the building from the inside and outside. Eliminating and /or treating the effects of those damages required a lengthy, challenging delicate and highly sensitive work within the process of restoration and preservation that spanned a decade 2005-2014, by a national team, led and technically supported by Istituto Veneto per i Beni Culturali, Venice Italy, with funding and administrative and technical supervision from the Cultural Heritage Unit, SFD. SFD followed a comprehensive professional approach that combined the implementation of restoration works with international standards, providing the largest possible number of job opportunities, preserving, and expanding traditional skills and knowledge, in addition to training in restoring antique wood, *qaḍāḍ* (traditional dump proofing plaster), stonework, stucco decorations and mural paintings.

In the beginning, a report was submitted to the SFD in 2000 by the Director of the Antiquities Office, summarizing the status of the Madrasah and the extent of the damages. In 2002, a study was conducted through the Office of Antiquities and Museums in Ta'izz.

In 2003, an architectural study was carried out by the Cultural Division at UNESCO. And in 2005 an agreement was signed between SFD and the sponsoring authorities in Ta'izz Governorate represented by the branch of the General Authority for Antiquities and Museums, Awqaf and the Ta'izz, Governorate Office.

The intervention included:

- Eliminating the dangers on the building by repairing and improving the infrastructure in and around the building,
- Structural and architectural treatments, especially for the two minarets, which were in critical structural condition, in addition to the two main columns in the prayer hall,
- The fine restoration of the mural paintings, decorations and frescoes in the domes and walls of the prayer hall, shrines, and the open courtyard, which were suffering from deterioration and serious damages,
- Restoration of antique wood for shrines kiosks, doors, windows, and gates,
- Restoration of stones at the southern, western, and eastern gates, and at the entrances to the minarets and the Khanqah,
- Implementation of a new electricity network, audio system and lighting appropriate to the value and nature of the building's historical, architectural, and decorative features.

A reuse proposal has also been prepared to the building and its premise appropriate to the nature and value of the building to benefit from its educational and social activities capable of providing job opportunities and income for operational and maintenance cost in the future.

The project contributed to saving one of the most important Islamic archaeological and historical monuments in Yemen, and a local team was trained on the principles and techniques of preserving archaeological and historical buildings with their architectural and decorative details.

The project created more than 136,000 working days and trained and qualified a local technical team of architectural restoration, fine restoration, and site management for more than 66 experienced restorers entrusted with carrying out the restoration work with the help of Italian experts from the Veneto Institute of Cultural Heritage in Venice (IVBC).

We hope that attention will be paid to the maintenance and care of the building and its annexes after delivery and to be very careful about any future interventions, as this monument is a unique cultural and architectural heritage that deserves the utmost attention and care.

Acknowledgment

We like to express our high appreciation to Architect Abdulhakim Al-Sayaghi, the SFD Team Leader of the project for his distinguish effort to ensure success for this project. Thanks extended to Architect Renzo Ravagnan, the Director of the Istituto Veneto per i Beni Culturali and his distinguished technical team for the genuine efforts and the high

professionalism with which they carried out the various restoration activities in the project including training of local team who can continue such activities.

Furthermore, we would like to thank the International Consultant, Dr Alaa Al-Habashi and the National Consultant, the late Archaeologist Al-Ezzi Musleh and the resident Engineer, the late Eng. Mohammed Dabwan (may their souls rests in peace), and Mr. Nabil Al-Ameri, the Accountant of the project. We also express our deep gratitude to all members of the local work team for their hard work.

Also, thanks to all our colleagues at the CHU and SFD Ta'izz Branch, including the field team members, specialists, engineers, consultants, technicians, and administrators. We thank everyone (entities or individuals) who contributed or participated, in any way, in the success and support of the restoration project activities.

While we are in the process of presenting this successful work and this important milestone, we cannot fail to mention, as a matter of commendation, to the founder of the Social Fund for Development, the late Mr. Abdul Karim Ismail Al-Arhabi, who was behind the strong interest and determination to add cultural heritage to the areas of development work of the Social Fund for Development and his support to this project.

Abdullah Ali Al-Dailami
Managing Director
Social Fund for Development



From the left: the director of IVBC Renzo Ravagnan, the restorer Jean Pierre Zocca, the translator Massimo Khairallah and the architect project team leader Abdulhakim Al-Sayaghi during a site inspection.



The community during an exhibition showing the works carried out inside the Mosque.

INTRODUCTION

Conservation of al-Ashrafiyyah Mosque and Madrasah in Ta'izz

This is the second volume that, thanks to the Aliph Foundation, we have been able to publish on the exceptional existential experience of ten years of life in Yemen. The first volume detailing and documenting work on the Great Mosque of Ṣan'ā' has already been published, followed almost immediately by this one on al-Ashrafiyya, in Ta'izz.

Work at the mosque of Ta'izz by the Istituto Veneto per i Beni Culturali (IVBC)¹ began two years after the work at Ṣan'ā', where the Institute had been invited in 2005 by the Social Fund for Development² to restore the Great Mosque built, according to local tradition, at the instruction of the Prophet Muḥammad himself. At the same time, also by agreement with the Social Fund, we were engaged in training young local workers, for whom a course in restoration was held, alternating theoretical lessons in the classroom with practical activities at the worksite, according to the long-standing, highly successful practice of "works on site" instruction. During that period, the relationship with the Social Fund and other Yemeni institutions intensified and the IVBC had ample opportunity to demonstrate its ability to fulfil its obligations and meet its deadlines.

We were not familiar with Ta'izz, the small, precious center where three large mosques are located: al-Mu'tabiyyah, al-Muẓaffar Great Mosque and al-Ashrafiyyah Mosque and Madrasah, now surrounded by the crowded modern districts that have extended the town to make it second largest city in Yemen today.

The mosque that we were asked to restore, al-Ashrafiyyah Mosque and Madrasah, was entirely different from the Great Mosque of Ṣan'ā': in places of the more than five thousand painted wooden coffers on the flat ceiling, here we had domes, frescoed with floral motifs, fruit, Qur'anic inscriptions, of which the splendid colors are still visible, though greatly faded and whitewashed in many cases.

The building, with its nine domes, eight small and one large, is a real jewel of architecture, constructed, according to reliable sources, in 1397 by order of the sultan al-Malik al-Ashraf Ismā'il, the seventh descendent of the Rasulid dynasty, who had made the city the capital of his reign, is a mosque-madrasah, i.e. a school, with classrooms and dormitories to house both students and teachers. There are also several cenotaphs in the large complex, eight of them very ancient, installed in architectural spaces comparable to what we call chapels in the western world, richly built and beautifully decorated, bearing the remains of important members of the royal family. During our first visit, our eyes and hands hastened to discover what materials had been used for the construction: bricks, stone and plaster, plus some wood, as for most of the buildings in that city.

Accepting this new assignment would be a significant commitment for us: it would be necessary to organize a new worksite and plan new training courses, find more instructors

in Italy and locate proper accommodations for them. It was a heavy task to take on, when added to the one we already had ongoing at Ṣan‘ā’ – as the two run simultaneously – but an utterly fascinating one.

We succeeded, in seven years of hard work done with great enthusiasm, and sometimes, when we look at the “before and after” photos, we can still hardly believe we did it, and were able to restore the temple to the use of the faithful. The inauguration ceremony was held in February 2015, just a few days before the bombing began in Yemen. The mural paintings, the stuccoworks, the decorations in plaster and stone, the works in carved wood were finally accessible in all their splendor.

We succeeded thanks to the continuous comparison and exchange between the Italian experts and the local workers, particularly for the reciprocal transmission of knowledge, which enabled the young Yemenis to acquire mastery of the most advanced techniques in the sector of conservation, working alongside Italian restoration experts and living a unique experience in the field, in addition to leaning the traditional construction techniques of their own country.

We succeeded thanks to the agreement between us and the Social Fund as to the shared goals and aims of the project; thanks also to the active and convinced participation of all the people involved and to whom we are deeply grateful for the enthusiasm that the progress of the work inspired, for the generosity with which the project was supported, and for the profound desire of each of us to grow and help others to grow, personally and professionally.

Human relations are always fundamental in this type of project, and we wanted to highlight them in the introduction to this publication, which explores and explains the complex works that were done at al-Ashrafiyyah Mosque and Madrasah, from different historical, cultural and technical points of view, indicating a method that we hope others will find useful in future activities for its conservation.

Renzo Ravagnan

Director

Istituto Veneto per i Beni Culturali

- 1 The Istituto Veneto per i Beni Culturali (IVBC - the Veneto Cultural Heritage Institute) is a non-profit organization accredited by the Veneto Region. Since 1996, it has been holding courses of professional training for young restoration workers. Its educational activity extends over a three-year period that includes the acquisition of theoretical knowledge and practical training, disposing of worksites that have become a reference for several significant locations in the area. Through its worksite schools, in Venice and the rest of Italy, and also abroad, it has carried out many restorations of public buildings or buildings in use by the public; for years it has been cooperating with institutions engaged in the safeguard and valorization of historic and artistic properties, such as the Superintendence and General Direction of Veneto, and with the committees for the safeguard of Venice, particularly *Save Venice* and *Venice in peril*. The commitment to preserve the cultural heritage has led the Institute to operate in other countries as well, particularly in the Holy Land and in Yemen.
- 2 The Social Fund for Development (SFD) is a non-profit organization that operates in Yemen. It was established to contribute to the attainment of the goals established by the national plans of social and economic development for the reduction of poverty. The SFD supports development by improving access to basic services, increasing economic opportunities and reducing the vulnerability of the poor, as well as providing professional training at the national and local level.

ACKNOWLEDGMENTS

Dedication to the People of Yemen

The restoration of the al-Ashrafiyyah Mosque and Madrasah in Ta'izz, as previously for the Great Mosque of Şan'ā', would not have been possible without the involvement and the enthusiastic cooperation of the many people who participated in the project, bringing their experience and their skills to the realization of the enterprise. They all believed in the value of this collective labor and took responsibility for it, successfully completing it and creating a harmonious, well-balanced environment.

I wish to express my gratitude, first of all, to the SOCIAL FUND FOR DEVELOPMENT for the significant commitment made in the interests of safeguarding the artistic and urban heritage of Ta'izz and of all Yemen, even in such tragic times as these; to Abdullah Ali AL-DAILAMI, the current director, to Nabil AL-MAKALEH and Abdulhakim AL-SAYAGHI, who never flagged in their efficient and constant support of our work and with whom I formed a strong bond of admiration and friendship. Abdulhakim AL-SAYAGHI worked unceasingly for the success of this work at Ta'izz, where he accompanied me constantly, participating with his vast expertise in the solution of the many problems that we encountered every day.

Our thoughts go with immense gratitude to the director at the time, the Minister Abdulkarim AL-ARHABI, who unfortunately left us some time ago.

Recently, we also lost Professor Ronald LEWCOCK, to my great sorrow, as well as our dear Isam AWWAD. We spent many unforgettable days together studying and exploring the issues connected with the restoration of the mosques. Ronald opened the doors of Yemen to me, and was my mentor, teaching me about its culture, history, architecture and traditions, and introducing me to its wonderful people.

My heartfelt thanks to Cristina MURADORE and Massimo KHAIRALLAH, able and active participants in the project, who accompanied me as interpreters and took care of me during my many trips and stays, as well as Fawzi AL-DUBHANI, our reference for the solution of all our logistics issues.

I want to express my profound gratitude also to Sabina ANTONINI, archaeologist and scholar of the history of Yemen and the Horn of Africa, who generously conveyed her knowledge to me. I am proud to call her a dear friend for whom I have the greatest respect and consideration.

To Giovanni CANOVA, whose knowledge was essential in the preparation of this publication, to which he also contributed an essay on his interpretation of the Qur'anic inscriptions, based on his extensive study, go my profound thanks.

Thanks also to Maurizio MERLO, for his devotion to the work of restoration at the Yemeni worksites, and for his active participation in preparing this book, and to Moisé RUMONATO of the Centro Internazionale della Grafica in Venice for his commitment to editing this volume. Thanks to Katherine FAY who has patiently followed the translation of this important volume.

Particular thanks go to the restoration experts Jean Pierre ZOCCA, Albarà ALLUBADI, Nenad Gool KEVESIC, and the talented women on the restoration team, Alessandra SANDRINI and Luisa BARBAN, who, in performing a role of significant responsibility in the management of the worksites, achieved results of the highest quality.

My thanks to Mohammed Ali Ahmed DABWAN, who left us too soon. He was the engineer of reference for the Social Fund at the worksite in Ta'izz: knowledgeable and skilled, he practiced his profession with great energy and dedication to ensure that we had everything we needed to do what we felt was necessary.

Thanks to MONUMENTA ORIENTALIA, sponsor of the project *People's Identity at Risk. Documentation and assessment of Islamic monuments at risk (2020-2022)*, which includes the printing of this book.

I wish to express my profound gratitude to the ALIPH foundation that is financing, in addition to this publication and the one already published on the Great Mosque in Şan'ā', an important initiative linked to the protection of the urban heritage of the capital.

Thanks to the instructors and interpreters of their lessons, as well as the entire Italian and Yemeni teams, listed hereafter by name.

Renzo Ravagnan
Director
Istituto Veneto per i Beni Culturali

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Director of Istituto Veneto per i Beni Culturali

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Section 1

AL-ASHRAFIYYAH MOSQUE AND MADRASAH

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Madrakah in Ta'izz

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Ch. 4 - The inscriptions



AL-ASHRAFIYYAH MOSQUE AND MADRASAH IN TA'IZZ

ABDULHAKIM AL-SAYAGHI

Al-Ashrafiyyah Mosque and Madrasah in Ta'izz is one of the masterpieces of architectural art belonging to the Rasulid state and Islamic civilization in Yemen, and an open book in which to read the origins of its art and discover the maturity of the Yemeni civilization. It is located at the foot of Jabal Şabir in the old city of Ta'izz. It is the only remaining Rasulid monument in Ta'izz other than al-Muzaffar Great Mosque and al-Mu'tabiyyah Madrasah.



Fig. 1. Overview of al-Ashrafiyyah Mosque and Madrasah in Ta'izz.

The Rasulid Era 628-856 H

The Rasulid era begins with ‘Alī Rasūl ibn Muḥammad ibn Hārūn, who came to Yemen in the second Ayyubid campaign in 575 H. with Sultan Ṭuḡtakīn ibn Ayyūb and was succeeded by four sons in Yemen: Abū Bakr, Mūsā, Ḥasan and ‘Umar. This last son, who was a commander in the army of King al-Mas‘ūd (612-626 h.), was appointed to manage the affairs of Yemen. The king decided to travel to Egypt, but passed away in Mecca, so ‘Umar declared himself king of Yemen with the name of al-Manṣūr Nūr al-Dīn ‘Umar ibn ‘Alī Rasūl, in the year 628 H. He eventually extended his influence to Mecca and is considered the founder of the Rasulid state. He was brutally assassinated by the Mamluks at Dār al-‘Izz in the city of al-Janad, and was buried in the Madrasah he had built in Dhī Huzaym, west of Dhī ‘Udaynah in 648 H. After him, King al-Muẓaffar Yūsuf ibn ‘Umar took over the role, and made Ta‘izz the capital of the Rasulid state. At that time, Yemen experienced a scientific and literary Renaissance that included Sharī‘ah, religious and educational sciences, culture, literature, arts, industry. Medicine and astronomy flourished, laws were enacted, schools and dormitories for students were built, and the kings took an active interest in the arts, science, literature, genealogy, and astronomy, leaving many books. The most renowned of these literate kings was al-Malik al-Muẓaffar. When news of his death reached the Imām Muḥammad ibn Tāj al-Dīn in 696 H. he mourned him with the words “He whose pen was shattering our swords has died”.

Al-Ashrafiyyah Mosque and Madrasah

Built to honor al-Malik al-Ashraf Ismā‘īl ibn al-‘Abbās ibn al-Mujāhid ‘Alī ibn al-Mu’ayyad Dāwūd ibn al-Muẓaffar Yūsuf ibn al-Manṣūr ‘Umar ibn ‘Alī Rasūl who took power after his father al-‘Abbās in the year 788 H. (1376 CE). The establishment of al-Madrasah al-Ashrafiyyah was ordered by King al-Ashraf in the year 800 H., as mentioned in the memorial inscription erected at the gate of the royal entrance from the south side.

Eastern minaret entrance panel

1. “He ordered the building of this blessed Madrasah, our master and our king, Sultan son of the sultan, the honorable King al-Ashraf.”
2. “The facilitator of life and religion is Ismā‘īl ibn ‘Abbās ibn ‘Alī ibn Dāwūd ibn Yūsuf; may God perpetuate his kingdom and glorify his victory.”

Construction began on this splendid Madrasah in the month of Rabī‘ al-Ākhir in the year 800 H. (1398 CE), by order of King al-Ashraf Ismā‘īl ibn al-‘Abbās (r. 778-803 H.), a scientist in genealogy, medicine and astronomy, the seventh king in the line of Rasulid rulers, numbering 14 kings in all.



Fig. 2. Foundation inscription.

He built an astrolabe (known in ancient marine navigation as *al-ḥuqqah*) and the eastern annex of al-Muẓaffar Mosque and was the first king of the Rasulid dynasty to plant rice in Wādī Zabīd. He also established the Seryaqus orchard, planting strange trees as reported. He died on the eighteenth of Rabīʿ al-Awwal, 803 H./1400 CE.

Al-Khazrajī and Ibn al-Daybaʿ wrote that King al-Ashraf Ismāʿīl established in the city of Taʿizz a good-looking Madrasah and appointed an *imām* to it, a *muʾadhdhin*, a judge, a teacher for orphans learning the Qurʾan, a Shāfiʿī teacher, a teaching assistant, a teacher speaking the *al-ḥadīth* of the Prophet, peace be upon him, a teacher of grammar and literature, a group of students, and an endowment containing a number of valuable books in every art, and a good endowment to the Madrasah to suffice them (quoted from *al-ʿUqūd al-luʿluʾiyyah*, by al-Khazrajī).

The inscription says that this is “The work of the poor slave ʿUmar ibn ʿAlī ibn ʿAbd al-ʿAzīz, may Allah forgive him in the year 803 H”.

Architectural arts at al-Ashrafiyyah Mosque and Madrasah

Al-Ashrafiyyah Mosque and Madrasah in Taʿizz represents a good example of Rasulid architecture in the balance of its horizontal plan and its graceful architectural proportions, benefiting from its location overlooking the city from the northern foot of Jabal Ṣabir.

The planning of al-Ashrafiyyah Mosque and Madrasah is a developed model for the

religious architecture of that era and the richest in the arts of geometric, botany, stucco decoration, wood carving, decoration with *qaḍāḍ* (a traditional insulating material which is a mixture of lime and volcanic ash) and the use of gold in coloring Qur'anic verses and on the tombstones of the two kings, al-Ashraf Ismā'īl and al-Nāṣir Aḥmad ibn al-Ashraf. The cenotaphs of the kings were constructed using basalt silver stone belonging to the rocky base of Jabal Ṣabir, which was used in the construction of façades, internal partitions, minarets' plinths, and bricks, which were used in the construction of the vaults, domes, and minarets. Timber was used as building ties and cushions for columns, shock absorbers, and the bonding materials were clay, gypsum, and *qaḍāḍ*.

The two floors of Al-Ashrafiyyah Mosque and Madrasah

The ground floor is divided into two sections:

- Royal burial place (the burial chambers of the king, his family, and his entourage) on the eastern side.
- Eight dormitories for students located along the northern side.

This floor has a private entrance from the north and is connected to the ground floor from the south by a stone staircase covered with *qaḍāḍ* (it is a traditional waterproof course consisting of a mixture of lime and volcanic ash in particular ratios depending on the region and the site of application: roofs, walls, or water ducts).



Fig. 3. First floor plan of al-Ashrafiyyah Mosque and Madrasah in Ta'izz.

The upper floor consists of:

- A. The prayer hall of 45.5 meters length from east to west and 34.5 meters wide from north to south, covered by nine domes, the largest of which is the central dome, with four smaller domes on each of the eastern and western sides. The prayer hall is enclosed within three corridors from the east, west and south and connected to the study halls via the open burial courtyard from the south side.
- B. The open courtyard contains three domes on separate shrines with two sides of large wooden *mashrabiyyahs*. The eastern side contains the carved and decorated marble shrine of King al-Ashraf Ismā'īl, and on the opposite side is a similar shrine of his son al-Nāṣir Aḥmad ibn al-Ashraf Ismā'īl, while the third is for his wife, Jihat al-Tawāshī Jamāl al-Dīn Mu'tab.
- C. Two vaulted halls occupy the eastern and western sides of the shrines in the open courtyard; the eastern hall used for teaching al-Ḥadīth al-Sharīf, and the western hall was for teaching Fiqh al-Shāfi'ī in addition to the open porticos, with a library at the room south of the western hall. (الوقفية الغسانية)
- D. Al-Khanqah.
- E. The building has three gates from the western, southern, and eastern sides. The southern (royal) gate is distinguished by its large and red sandstone arches and lobed arches, which are very similar to the Mughal architecture found in the Indian subcontinent in Lahore and Delhi.
- F. The internal spaces of the building are surrounded by three corridors from the southern, eastern, and western sides overlooking the city through two porticos that end with a small dome and pointed arches.
- G. At the south-eastern corner of the first floor is the ablution unit consisting of 13 lavatories, with a rectangular ablution pool in the middle, connected to the southern and eastern porticos.
- H. The twin eastern and western minarets are distinctive for their structural, architectural, and decorative design, overlooking the city of Ta'izz, and considered as a landmark of the Old City of Ta'izz.

Damage assessment and state of conservation of the monument

The building structures of al-Ashrafiyyah Mosque and Madrasah and its annexes were affected by the obsolescence of time and neglect together, leading to the emergence of various damages including numerous medium and large cracks.

- Undoubtedly, an earthquake occurred at some point, causing cracks in the domes, the most dangerous of which was in the corner bends and the eastern corner and on both sides of the central dome and the northwest corner.
- Termites had undermined the reinforcing timber elements of the building, especially in the two minarets.

- Moisture from the infiltration of rainwater had obliterated parts of the decoration and loosened masonry on the eastern part of the façade.
- Mineral salts rose to the surface and eroded some building stones.
- The insertion of reinforced concrete beams in the necks of the small domes obliterated large areas of decoration, up to 120 linear meters with a width of 40 cm.
- The use of lime whitewash in the periodic, semi-annual maintenance work led to covering large areas of decoration on the walls and domes.



Fig. 4. First inspection of the mural painting.

- The eastern part of the ground floor was closed without ventilation for a very long time.
- Clumsy repairs damaged the building in general and the decorations and inscriptions in particular.
- Inappropriate electrical and lighting fixtures were installed in many parts of the building and its annexes.
- There was constant pollution from the carbon exhaust of motor vehicles.
- In 2016, due to the war and armed conflict, the eastern minaret underwent damage but was repaired by a member of the technical team staying in Ta'izz who had been trained in the project under the supervision of the project officer in the Headquarters of SFD. They kept in touch via social media for remote coordination with IVBC in Venice. It was a successful operation.

Stages of repair and restoration works

- In 1978, repairs included inserting reinforced concrete beams in the walls under the domes' tambours and lintels of the prayer hall. This intervention caused a loss of more than 105 meters of inscriptions and floral designs. Reinforced concrete beams also been inserted on the top of the shrine's courtyard and a column erected as well, outside the prayer hall.
- In 1980, an UNESCO technical report (Visual inspection of the al-Ashrafiyyah Mosque and Madrasah), by Eugenio Galdieri and Alejandro Alva was issued.

- In 1983-1996, the accumulated layers of plaster applied over the decoration on the gypsum walls of the prayer hall were removed.
- In 2003, an initial study and documentation by Alaa Al-Habashi, was prepared under the sponsorship of UNESCO – Cultural Division and was the basis to begin the restoration project.
- In 2005, structural and architectural restoration works got under way as part of a comprehensive restoration project for the entire building and its annexes, funded by the Social Fund for Development (SFD).
- In 2008, the fine conservation of the mural paintings was undertaken with the support of the Istituto Veneto per i Beni Culturali (Veneto Institute for Cultural Heritage, IVBC), including a Training course for a team of local professionals on conservation of mural painting and archaeological wooden elements, taught by IVBC experts.

Architecture and decorative arts in al-Ashrafiyyah Mosque and Madrasah

Barbara Finster points out “that Rasulid architecture, at least in the area of cult buildings, is quite indigenous and original in spite of a number of borrowed elements; the Rasulid period was the peak of architecture and religious art in Yemen, and had a distinct local character despite borrowing new elements; it was a modernization of traditional elements and at the same time a strengthening of the bond which ties it to the common Islamic koine.” (B. Finster, “The Architecture of the Rasulids”, 254.)

The technique of covering with domes and vaults, which bears the influence of the Anatolian Seljuks and the Ayyubid Madrasah in Aleppo, is the style that made its way into the architecture of mosques and madrasahs in Yemen.

The building displays colorful floral and geometrical mural patterns and inscription bands that express the level of artistic maturity of the time as an artistic product for the tastes of earlier civilizations and reflects the extent of development in decoration, especially the inscription bands and the diversity of their calligraphy. There are three types of letter shapes that were not known before, like ‘Alī’s repeated name ‘Alī (علي) bands on the walls and the band in the tambour of the central dome which is the centerpiece of the building’s decorative background, the star plate.

The domed mosques and vaulted roofing are the main characteristics of the Rasulid architecture and the use of squinches to transform from the square base into the circle of the dome as an alternative to the *muqarnas* which is usually used in Islamic architecture, as well as the lobed arches.

The star plate is considered to be the centerpiece of the decoration and the source of plastic of the geometric patterns and motifs of the building and the fan shaped plates as well beside the emblem of the Rasulid state, the five-pointed rose, covering the spaces of the bands with the cotton flower as well as the stylized pomegranate.

The blazon (*al-rank*), the emblem of the state of Banū Rasūl, forms a decorative element on metal, glass, and minted coins, as well as the Rasulid buildings, as it appeared in the decorations of the domes of the Rasulid mosques and madrasahs, a symbol of national sovereignty.

The five-pointed rose is the emblem of the Rasulid state; it is found in the decoration of palaces and religious buildings, and on glass artifacts and Rasulid household utensils. The other famous pattern in the mural paintings is the pomegranate shape.



Figs. 5, 6 and 7. The five-pointed rose, star plates and other motives on arches and niches of the prayer hall.

The use of the square and the rectangle in the decoration of the colored mural bands, which moved to al-‘Āmiriyyah Mosque and Madrasah in Radā‘ about a hundred years later.

Stucco decoration

Stucco (gypsum, plaster) decorations were used to cover the walls and the interior of the arches and to fill the corner arches and the interior of the domes in the shrines. It was a material that could be colored with gold, like the inscription bands at the front of the prayer hall, the *qiblah*, and the apse of the *mihrāb*, and in different scripts, the most important of which are the geometric Kufic script, the floral Kufic, the braided Kufic, the foliate Kufic and Thuluth, clear Thuluth (Jālī), and Naskh calligraphy decorated with bee hexagons.

Star plate circles and geometric decoration were also used, and the artist used modified plant leaves in symmetry with the plant decorations, considering the optics in the tastes of the artistic painting in the general output.

And he wrote on the arch the verse 77 – Sūrah al-Hajj

﴿ يَا أَيُّهَا الَّذِينَ آمَنُوا ارْكَعُوا وَاسْجُدُوا وَاعْبُدُوا رَبَّكُمْ وَافْعَلُوا الْخَيْرَ لَعَلَّكُمْ تُفْلِحُونَ ﴾

It was also written in the arch the Sūrah al-Ikhlāṣ

﴿ قُلْ هُوَ اللَّهُ أَحَدٌ ۝ اللَّهُ الصَّمَدُ ۝ لَمْ يَلِدْ وَلَمْ يُولَدْ ۝ وَلَمْ يَكُنْ لَهُ كُفُوًا أَحَدٌ ۝ ﴾

And in the band in Kufic script from the Sūrah al-Aḥzāb – verse 56

﴿ إِنَّ اللَّهَ وَمَلَائِكَتَهُ يُصَلُّونَ عَلَى النَّبِيِّ يَا أَيُّهَا الَّذِينَ آمَنُوا صَلُّوا عَلَيْهِ وَسَلِّمُوا تَسْلِيمًا ﴾

and on the aedicule of the *miḥrāb* the Sūrah al-Raḥmān. On the sides of the *miḥrāb* there is a diamond teardrop motif.



Fig. 8. Gypsum decoration of Qur'anic inscription.

Qadād

The *qadād* is an ancient Yemeni traditional technique for covering, protecting, and insulating floors, walls, and surfaces as a waterproof and moisture-resistant material, used only on parts built with stones or *yājūr* (burned bricks).

The *qadād* is composed of a mixture of lime and *hashash* (volcanic ash), sand or fine gravel, free of salt, in specific proportions that vary from one region to another. It is applied well and used as an insulating material for water and moisture (waterproof course), used in construction as a mortar and decorative material.

The lime should be of high quality, which has not been burned for a long time, and soaked in water for two weeks or more, depending on the type and use, during this period the lime is stirred frequently. The accompanying material, *hashash*, sand or gravel is also cleaned of brittle.

Several layers of *qadāḍ* (generally three layers) are applied depending on the work site. The work part of stones or bricks is cleaned well to ensure that it adheres to the first layer of *qadāḍ* and penetrates the spaces in-between.

Each layer requires three to four days of mixing and pounding to ensure that it adheres to the other layers and eventually forms a single compact, cohesive layer.

The bottom layer is made with a coarse mixture using relatively large pebbles to ensure better adherence to what is underneath. A softer mixture is also used for the middle layer by adding finer lime. And the top layer is softened by adding larger percentage of lime.

The final layer is softened and rubbed, adding animal marrow as a water-repellent precipitate. *Qadāḍ* is used extensively in al-Ashrafiyyah building in the ablution units, plastering and decorations in a distinctive way.

Wooden decorations

Wooden decorations are a type of art that has its own decorative units and various elements that were used in the ceilings of religious buildings, doors, windows, *mashrabiyyahs*, tomb coffins, and others. In the shrines open courtyard in the kiosk doors, carving of conical lozenges in arabesque frames decoration of botanical motives inlaid with deep and embossed reliefs in ivory. There are wonderful examples of multiplicity of decorative units, such as star plates, arabesque carving, inscription bands, and interlaced openwork.



Figs. 9 and 10. Arabesque works at the kiosks of the shrines.

Mural paintings

The fine restoration works on mural painting on walls and domes was carried out by a trained local team under the supervision of experts from IVBC during the period 2008-2014. Works of conservation and repair of wooden elements, gypsum and stone work were done as well. This part will be written by colleagues from IVBC.



Fig. 11. The central dome of the prayer hall.

Phases of the comprehensive restoration project for al-Ashrafiyyah Mosque and Madrasah

After reviewing the studies of the project, the supervision team was formed as follows:

- Architect / Abdulhakim Al-Sayaghi, Project Team Leader
- Mr Al-Ezzi Musleh (archaeologist and historian), project consultant
- Engineer / Mohamed Dabwan, Project Site Engineer
- Accountant / Nabil Al-Amri, Project Accountant
- Engineer/ Sami, Assistant Resident Engineer
- Dr Alaa Al-Habashi, the international consultant for the project.

The field work on the project started at the beginning of May 2005 and continued until the end of October 2014 as follows.

The first stage

- Replacing the water and sewerage network in and around the building.
- Restoration and strengthening of the northern and eastern plinths.

- Restoration of the windows of the minaret that are covered with bars, and the supply of wooden windows with copper mesh to prevent birds and bats from entering the minaret



Fig. 12. Repair of the plinth at the north-eastern corner of the main building.

- Removal of reinforced concrete beams in the open hall court yard.
- Replacing the damaged wooden beams with timber of the same type for the ceilings, walls and staircases of the two minarets from inside, starting in the eastern and then western areas, by a professional master with transferring his experience to an assistant.
- Replacing the damaged stones with the same type of original stones in all façades of the southern entrance.



Fig. 13. Restoration work of the façade.

- Replacing the damaged wooden lintels for the doors and windows of the prayer hall, and of the eastern main corridors.
- Restoration of the walls of the ablution units from outside.
- Removing the backfill in the pond and fountain area by means of archaeological probes by specialized archaeologists.

- Removing the backfill in the aqueducts and water drainage channels on the eastern and northern sides of the building.
- Discovery of the entrance to the royal cemetery, which is dedicated to the royal family, in the southern part of the ground floor (semi-vault).

Opening and refining the skylights and ventilation openings for the ground floor.

The second stage

- Opening the southern entrance of the fence and restoration of the entrance arch, the retaining wall and the staircase.
- Making sensors for the eastern corridor, tracking moisture sources, removing cement layers for the entire corridor.
- Lowering the level and removing the backfill from around the building on the western side.
- Removing the damaged layer of pavement, correcting the level, and removing the backfill around the building on the north side, showing the waterways.
- Leveling the floor of the fountain and making the layers of the *qaḍāḍ* around the stairs.
- Reconstruction of the porches in the southern façade between the two minarets.
- Emptying and cleaning the rooms of the northern basement of stored materials and opening the windows shared between the school and the cemetery.

Third stage

- Restoration of the façades of the western minaret from the damaged and accumulated layers of light, replacing the damaged wooden lintels in the main body of the minaret from the outside, and replacing the damaged railing from the outside.



Figs. 14 and 15. Eastern minaret restoration works.

- Completion of sewage works for toilets, paving their floors with the eastern corridor, restoring the sewage for the northern and western corridors around the lavatories, and making a water and sewage network and linking it to the public network.
- Completing the *qaḍāḍ* works for the northern façade and replacing the damaged window's wooden lintels and above the *qiblah*, cleaning the wall of the protruding part of the *qiblah* from the accumulated layers of lime and cement, replacing the damaged wooden beams and completing the paving work in the northern street.
- Ceiling cladding of the eastern and western chambers in the basement (the royal cemetery) as a model with the refining of the cemetery and school window openings, paving the floors and restoring the arches of the southern wall of the cemetery.
- Removing the layers of cement added on the walls of the cellars, replacing the damaged lintels, and showing the eastern and western windows in the eastern and western vaults.
- Removing the asphalt layers and making a layer of stone paving for the north and west streets of the building in proportion to the mosque's surroundings.
- Refinement of the staircase for the southern entrance to the mosque and reopening the blocked door between the southern entrance and the lavatories. The construction of a hidden underground tank below the stairs is an alternative to the concrete tank that was removed.
- Replacing the damaged wooden lintels in the doors and walls of the western basement and re-slitting the walls and edges of the doors and windows.
- Removing the layers of lime accumulated on the eastern minaret, replacing the damaged lintels and wooden beams, and restoring the damaged bar.
- Replacing some of the wall beams and beams in the western corridor and refinement of the railings around them.
- Replacing the electrical network and installing new appropriate lighting and audio system.

In October 2014, the comprehensive restoration works for the building and its annexes have been completed.

On January 22nd 2015, the project was handed over to the local council of the Governorate of Ta'izz, the building opened to the public within an official opening ceremony.

In 2015 al-Ashrafiyyah Mosque and Madrasah was well preserved and only in need of regular maintenance.

The two remaining monuments from the Rasulid era in the old city of Ta'izz are the al-Muẓaffar Great Mosque and al-Madrasah al-Mu'tabiyyah, and SFD had two separated restoration projects for the two monuments. Another historical building is one of the oldest hammams in Yemen adjacent to al-Muẓaffar mosque to the west, it was the hammam of King al-Muẓaffar. A comprehensive restoration project was supposed to begin in March 2015, but due to the war and armed conflict, the project had to be stopped.



Fig. 16. New lighting and audio system.

Al-Muzaffar Great Mosque

Al-Muzaffar Great Mosque is located in the area “Dhī ‘Udaynah” in the city of Ta‘izz. It was established by Sultan al-Muzaffar, the second king of the Rasulid era, probably in the first half of his reign (648 H./1250 CE). It plays the role of the great mosque in the capital City of Ta‘izz and the State. It is also one of the oldest madrasahs and regarded as the first model that many Rasulid madrasahs adopted after that.

In 1962, the only minaret that was located in the southeast corner of the open courtyard fell, and the last expansion of the mosque was in the seventies. In the seventies of the twentieth century, a reinforced concrete structure was added on the southern side of the mosque, and a new minaret was built in the eighties of the twentieth century on the northeastern corner in a San‘ani style.

Al-Muzaffar Mosque consists of two floors, a basement, which is the old madrasah, with four corridors, interspersed with some rooms, and entrance. The ground floor, which is the mosque, consists of a prayer hall, and an open courtyard surrounded by corridors on three sides, in addition to some other annexes such as the women’s prayer hall, the minaret, ablution units and a room for preparing bodies for burial.

SFD had a rescue project al-Muzaffar in 2005, when work was done in the basement area, as well as stabilization of the loadbearing walls and arches. Preliminary tests and soundings for the mural paintings and gypsum decorations were carried out and a project document had been prepared.



Fig. 17. Eye bird view of al-Muzaffar Mosque – Ta'izz.

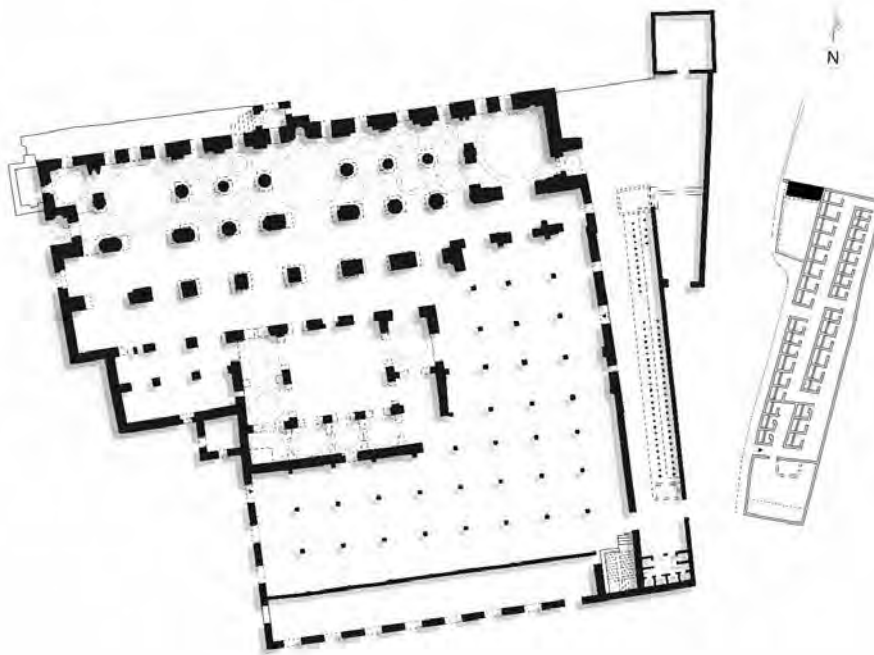


Fig. 18. Ground plan of al-Muzaffar Mosque – Ta'izz.

In 2015, a study of the mosque was prepared and the first phase of the comprehensive restoration project proposed to start in March 2015, but due to the war and armed conflict it had to be postponed.



Figs. 19 and 20. First inspection of the mural paintings in al-Muẓaffar Mosque – Ta'izz.



Figs. 21 and 22. Deteriorated mural paintings in al-Muẓaffar Mosque – Ta'izz.

Al-Mu'tabiyyah Mosque and Madrasah

It was built by Jihat al-Tawāshī Jamāl al-Dīn Mut'ab, the wife of Sultan al-Ashraf Ismā'īl, 800-803 H./1397-1400 CE, and it is located at the bottom of al-Sirājiyyah mount in Ta'izz. With al-Ashrafiyyah Mosque and Madrasah and al-Muẓaffar Great Mosque, it is one of the remaining examples of the great madrasahs established by the sultans and members of the Rasulid royal family.

It was described in the Ghassanid endowment (الوقفية الغسانية).

It consists of an open courtyard surrounded by four porticos, the deepest of which is the *qiblah* (Prayer Hall) portico, which is a rectangle space with two pillars in the middle, dividing the space into six squares, topped by six equal domes mounted on corner niches. The prayer hall domes, walls, arches and corner niches are decorated with the colorful

mural paintings and stucco decorations characterizing of the Rasulid architecture, each of the domes has a different inscription and bears the Rasulid coat of arms, a five-petalled red rose on a white ground.

A restoration project had been implemented in May 2005.

The two monuments of al-Muzaffar Mosque and al-Mu'tabiyyah Madrasah are in need of urgent restoration works and should be given priority in the Old City of Ta'izz.



Fig. 23. Overview of al-Mu'tabiyyah Mosque and Madrasah – Ta'izz.

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Section 1 - Chapter 2

THE UNESCO MISSIONS

RENZO RAVAGNAN – THE ITALIAN-YEMENI TEAM

Introduction

Al-Ashrafiyyah Mosque and Madrasah, considered a jewel of Yemeni architecture, has been the subject, in the past, of many studies from the architectural standpoint and that of its artistic decoration, as well as on aspects of its state of conservation.

One of the first studies was made by R.B. Lewcock and G.R. Smith, published in 1974,¹ where they examined the three mosques of the Rasulid period present in the ancient city of Ta'izz. In addition to al-Ashrafiyyah Mosque and Madrasah, they discussed al-Muẓaffar Mosque and the smaller Madrasah al-Mu'tabiyyah. This first study was then followed by other writings, with more in-depth references to the architecture and relative decorations, more specifically concerning al-Ashrafiyyah Mosque and Madrasah, one of which, also by Lewcock, will be discussed in the next chapter.²

After the studies by R.B. Lewcock and G.Rex Smith, three important technical reports on the state of conservation of the buildings and decorations were filed by experts appointed by UNESCO, relative to the al-Ashrafiyyah Mosque and Madrasah.

FIRST UNESCO REPORT

A first, highly technical report, written by Eugenio Galdieri and Alejandro Alva, architects of ICCROM sent by UNESCO,³ was published in 1981. The goal of the report

¹ Lewcock, R.B., Smith, G.R., *Three Medieval Mosques in the Yemen*. Part II, *Oriental Art* 20 (1974): 192-203.

² Lewcock, R.B., "The Painted Dome of the Ashrafiyyah in Ta'izz, Yemen," *Articles presented to R.B. Serjeant on the occasion of his retirement from the Sir Thomas Adams's Chair of Arabic at the University of Cambridge*, London and New York 1983: 100-117.

³ Galdieri, E., Alva, A., *Visual Inspection of the Al-Ashrafiyyah Mosque*, Restricted Technical Report RP/1979-80/4/7.6/05, Serial No. FMR/CC/CH/81/144E, UNESCO, Paris 1981. The "Report" was made at the request of the government of the Arab Republic of Yemen, planned by the General Director of Unesco in the sphere of the regular organization of the 1979-1980 program, with a mission in the country from April 8 to 14, 1980, by Eugenio Galdieri, architect, consultant at ICCROM, and Alejandro Alva, architect, assistant co-ordinator of the course of Architectural Conservation, ICCROM (*International Centre for the Study of the Preservation and Restauration of Cultural Property*, Rome).



Fig. 1. Photo of al-Ashrafiyyah Mosque and Madrasah, taken in 1975. West side.



Fig. 2. Photo of the inside of the main dome, taken in 1974.

was to provide the government of the Arab Republic of Yemen with technical assistance to study the structural problems of al-Ashrafiyyah Mosque and Madrasah, plan how to strengthen the static condition of the building and also draw up a program of conservative restoration of the architecture and decorations.⁴

The detailed report called attention to two evident breaks that ran vertically through the masonry structure, starting from the load-bearing pillars of the great main central dome. The issue that was debated with great interest concerned the problems caused by humidity, in the structural elements of the construction in general, starting from the foundations and continuing all the way to the roofing. At the same time, reports were made of damage caused by the seepage of rainwater by infiltration through the fissures in the roofing and walls, which can be seen very clearly on the decorated surfaces inside the Mosque. Above the height of the arches of the smaller domes, in the Prayer Hall (northwest and northeast wings), which are richly decorated, the ICCROM experts identified and objected bitterly to the grave mishandling of repairs originating with the insertion of reinforced concrete beams in the walls, done with the intention of improving structural stability.

With regard to the painted decorations on the surfaces of the architecture, in the report, in addition to a brief description of the types found, a number of methods of intervention are summarized, recommending that they be carried out by qualified personnel.

⁴ Galdieri, Alva, *Visual Inspection of the Al-Ashrafiyyah Mosque*, 1.

SECOND UNESCO REPORT

A second technical report, which completes the previous one, also requested by UNESCO, was drawn up by the Chief Restoration Expert of ICCROM, Paul Schwartzbaum, focusing on the mural paintings of al-Ashrafiyyah Mosque and Madrasah in 1981 and published in 1982.⁵

In the introduction of the report, the expert assessed the state of conservation of the mosque in general terms as good, giving as reason the protective coating known as ‘*gos*’. The nature of this protection is described as a whitewash in lime and plaster, applied in the past on the lower portions of the decorated walls that were more readily accessible by the faithful and consequently more easily damaged.

The executive technique of the mural painting is described in its various steps, indicating the preparation of the basic mortars made from damp plaster, outlining the preparatory design by tracing off the cartoon and the decoration in distemper, i.e. pigment amalgamated with a water-based binder.

The expert observes that in the upper hemispherical convexity over the great main central dome, the painting seems to be of higher quality than that of the other decorated areas below, i.e. on the tambour, but also with respect to the walls and the adjacent smaller domes. In consideration of these observations, Paul Schwartzbaum theorized a change of the team of painters in this central section of the main dome only, to complete the decoration of the intrados after completing the construction.

The expert from ICCROM observed deterioration on the surface of the paint, inside the eight lateral dome, caused by infiltrations from the roof as well as rising moisture from below.

The areas most seriously damaged by rainwater, with almost total loss of entire sections of the decoration, were found on the walls of the great dome, from the four windows of the tambour descending into the polylobate niches, and all the way down to the floor.

Mr Schwartzbaum in his report, also referring to the studies made previously by the architects E. Galdieri and A. Alva, bitterly laments the extensive damage to the decorations in the small domes, following insertion of the reinforced concrete bars in the sections of the load-bearing walls, done in the hope of stabilizing the structure.

He defines as “catastrophic” the destruction of about 40 square meters of mural painting, which substantially ruined a complete cycle, upsetting the harmonious unity of

5 Schwartzbaum, P., *The mural paintings of Al-Ashrafiyyah Mosque, Taiz*, Technical Report RP/1979-80/4/7.6/05, Serial No. FMR/CLT/CH/82/103. UNESCO, Paris 1982. The second “Report” follows and integrates the first one by E. Galdieri and A. Alva, made at the request of the government of the Arab Republic of Yemen to the General Director of UNESCO. The terms of reference for both missions were: to make technical assistance by UNESCO available to the Arab Republic of Yemen in order to study the structural weaknesses of al-Ashrafiyyah Mosque and Madrasah, Ta’izz (Yemen) and to design a structure to strengthen the building and plan its restoration. The second inspection took place from October 12 to 18, 1981, and was carried out by Paul Schwartzbaum, Chief Conservation and Restoration Expert at ICCROM. The expert was accompanied by Miss Rosalind Wade, archeologist, advisor to the National Museum, Arab Republic of Yemen.

vision of the whole, both architecturally and decoratively. Finally, P. Schwartzbaum indicates a series of “recommendations” for a plan of conservative actions, both on the mural paintings and on the carved stuccoworks.

THIRD UNESCO REPORT

A third technical report, very complete with regard to the state of fact of the mosque, containing among the other things a proposal for the conservative restoration of al-Ashrafiyyah Mosque and Madrasah, was presented to the “Division of Cultural Heritage” of UNESCO, in 2003, by the architect Alaa Al-Habashi⁶ director of the mission, and the architect Abdulhakim Al-Sayaghi.⁷

The initial part of the report illustrates the historical framework of the Rasulid kings⁸ who governed Yemen from 1229 to 1454. Later, the author points out that, at the time of his mission, the structure was experiencing a difficult situation of management and administration by different local and government authorities. A third part of the report is devoted to a review of the architectural documentation, identifying in the drawings by the architect and scholar Ronald Lewcock⁹ the only references currently available, relative to the floorplan of the building, the western and northern façades.

Alaa Al-Habashi recovers and transcribes, in his report referring to the history of works on the mosque, from its foundation in 1397 until November 2003, when his survey was made, jointly with the architect Abdulhakim Al-Sayaghi, copartner in the mission.

A technical section of the report is devoted to a mapping of the cracks in the architectural monument. In the wall structure of the prayer hall, in all the small domes, longitudinal fissures were identified, as well as significant cracks along the entire eastern and western walls of the main central dome. To repair this damage, we learn in this report, that the director of the Mosque, i.e. the Awqaf, employed a construction company in 1978-1980 to install reinforced concrete beams 40 cm high in the walls of the smaller domes, at the level of the vaults, so as to surround the sectors and halt the movements, as we have already reported.

Cracks in domes, and vaults

It seems that the northern wall of the prayer hall had experienced during previous time series of movement towards the north. The movement followed the topography of the

6 Al-Habashi, A., *The Conservation of the Mosque/Madrassa of al-Ashrafiyya, Ta'iz, Yemen*, Technical Conservation Report and Budget Proposal Submitted to The United Nations Educational, Scientific and Cultural Organization (UNESCO), Division of Cultural Heritage, Contract No. 4500013057, November-December 2003.

7 Abdulhakim Al-Sayaghi, copartner of the UNESCO mission, project manager for the Social Fund for Development – Sana'a, Yemen.

8 Al-Habashi, A., *The Conservation of the Mosque/Madrassa*, 6-7.

9 *Ibidem*, 9.

area that is sloped northwards, and probably was due to the slippage of the materials of the surrounding terrain especially during the rainy seasons. This movement resulted in opening up longitudinal cracks that usually run in an East-West direction, and obviously manifested along the corner squinches of almost all the small domes of the prayer hall. For an illustrated explanation of this phenomenon (...). This movement also resulted in opening up two major cracks along the eastern and the western wall of the main dome (...). It is because the seriousness of this movement that, in 1978-80, the Awqaf decided to install a series of reinforced concrete beams to tie all the domes together and to stop such movement. The crack monitors that were installed afterwards, in 1981-82, prove that such movement was indeed stopped, and they stabilized the condition. This means that the cracks that are existing are no longer active, and the structural defects are no longer effective (...).

The inspection by the UNESCO expert on the status of the “crack monitors” installed in 1981-1982, demonstrated that the slippage had been stopped and the condition had stabilized. More in general, it repeated that the infiltrations of water through the cracks had damaged the masonry, architectural elements and decorations inside the building, in the domes of the prayer hall and other portions of the structure.

Damage of the “*qaḍāḍ*” floors and roofing

(...) At the time of the investigation, almost all the surfaces of the *qaḍāḍ* were found partially damaged from two main causes. The first are the faulty slopes and details, which led rainwater to pool in various roof and floor points causing a disintegration of the surface of the plaster. Since the plaster acts as a sealing layer, and once it has disintegrated, the plaster loses some of its impermeability, and its surface texture becomes rough, allowing more water to pool, infiltrate and, thus, cause further deterioration (...). In addition to the disintegration of the surface of the *qaḍāḍ*, there is another reason that leads the water to pool, and causes damages similar to that described above. This was due to improper drainage of faulty roof slopes that resulted in entrapment of water in many roof and floor corners, joints, and critical points.

The second cause of deterioration of the *qaḍāḍ* was the lack of expansion joints in the large surfaces of the plaster, especially those on the outside of the domes and vaults. Depending on their orientation, the plaster surfaces that cover any curved profile are exposed to different rates of sunlight and weathering conditions during the day. For that reason, that each section of these surfaces of plaster expand and contract differently. The differential movement between areas in one layer of the plaster, and the lack of proper expansion joints between those areas, lead to development of a network of hairline-cracks (checking) on its surfaces. For illustrations of the hairline cracks over the main dome of the prayer hall (...). For similar hairline cracks on vaults (...). For sketches of the networks of hairline cracks developed on each curved surface of the roof (...). These cracks then trap rainwater and consequently cause water damage to the painted and decorated interior of the domes. For examples of

the damages of the interior of the domes caused by water infiltrated through hairline cracks (...).

The report continues with the description of damage found on the floor of the roof, on the architraves of the minarets, on the beams in wood with structural functions, in addition to the upheaval caused by the insertion of modern structures such as metal tanks and cisterns in reinforced concrete in the courtyards. The birds, also, which nest on the various terraces and in the window openings, are another cause of damage, as are the many different kinds of weeds infesting the roof on different levels and on the exposed surfaces of the building. Another paragraph discussed the refined carved and painted wooden structures in the area reserved for the cenotaphs in the small inner court.

Damage to decorative wooden elements

The courtyard of al-Ashrafiyyah Mosque and Madrasah, space No. 2, contains some of the monument's best woodwork. The turned wood and carved wooden screens, which enclose the various courtyard cenotaphs are an example. Another is the carved wood of the door that leads from the courtyard to the prayer hall. A third very important decorated wooden element is this double-sashed door located at the entrance of the western gate.

In addition to the already mentioned wooden decorative elements, there are still several original cupboard doors and window sashes that are quite interesting, but unfortunately badly neglected. They deserve to be preserved before they disintegrate.

All the aforementioned decorative elements are installed either in a semi-enclosed space or in the open, exposing them to different weathering parameters. Where sunlight reaches those elements, the wood was found dry, its painted layers were faded, and its surface brittle. Almost all of the mentioned wooden elements were painted several times, covering the color scheme of the original paint. The edges where the screens



Fig. 3. Al-Ashrafiyyah Mosque and Madrasah. North façade.



Fig. 4. Al-Ashrafiyyah Mosque and Madrasah. External view of the domes.

meet surrounding walls received careless brush-strokes of lime wash. There are also many missing and/or broken pieces from the turned wooden elements, and from the inlaid ivory. Moreover, in many places, the iron nails holding the different wooden pieces together, have been lost.

It seems that human vandalism may have also contributed to worsening the state of the decorative wooden elements of al-Ashrafiyyah. Many of the screen panels were entirely lost, suggesting that they had been removed from their place and taken away. One of the examples is the door sash of the eastern gate.

The report concludes with a number of suggestions about the conservative measures to apply, and calling for a global project: from structural repairs and repairs on the finish of the architecture to recover of the carved and openwork decorations in plaster, to restoration of the decorated walls of the prayer hall. Moreover, there are instructions for conservative recovery of the historical wooden elements such as doors and lintels, as well as the carved and decorated wood elements of the tombs, the stone cenotaphs inside the pavilions, the sculptured marble lintels.

This last report by Alaa Al-Habashi would be decisive for the start of works for the conservative recovery of al-Ashrafiyyah Mosque and Madrasah.



THE PAINTED DOME OF THE ASHRAFIYYAH IN TA‘IZZ

RONALD LEWCOCK*

Foreword

In 1972 Professor Serjeant organized an expedition of Cambridge scholars to begin detailed research in the Yemen. I was asked to join and, through the generosity of the T.E. Lawrence Fund, I began architectural studies. One of the early results of this first journey was the publication, with Dr. G.R. Smith, of two preliminary reports on the mosques of Ta‘izz.¹ Since then, I have often returned to admire these buildings and, in particular, the beauty of the paintings in the domes. From the perspective of almost a decade, and a far wider knowledge of much of the Yemen, it now seems to me that they are among the greatest works of man in South Arabia – a country extraordinarily rich in fine art and architecture – and of unique importance in the wider realm of Islamic art.

History and general description

The Jāmi‘ al-Muẓaffar was built, at least in substantial part, by Sultan al-Muẓaffar Yūsuf (647-694/1249-1295). The Ashrafiyyah was built either by al-Ashraf I (694-697/1295-1297) or by al-Ashraf II (778-803/1376-1400) or by the two in succession. The prayer-

* Ronald Lewcock (d. 2022, Sri Lanka) visited us a number of times during the course of restoration works on the Ashrafiyyah Mosque and Madrasah by the Istituto Veneto per i Beni Culturali, always generous with his observations and advice based on his long experience in Yemen. Unfortunately, circumstances made it impossible for him to participate in this volume with a new contribution, but he left us an article written many years ago in honor of his colleague, Robert Serjeant, when the Ashrafiyyah was in a state of severe deterioration. We think that in spite of the time that has passed, this article continues to present many original insights, particularly in the comparison between the architectural and decorative designs of the Ashrafiyyah and those found in other Islamic buildings and artifacts. We decided, therefore, to publish it again here, to honour the memory of the illustrious scholar and for its intrinsic value. (Reprinted from *Arabian and Islamic Studies. Articles presented to R.B. Serjeant on the occasion of his retirement from Sir Thomas Adams’s Chair of Arabic at the University of Cambridge*, edited by R.L. Bidwell and G.R. Smith, London and New York 1983: 100-117.)

hall of the mosque of Muẓaffar is covered with three large domes, and twelve smaller ones. That of the Ashrafiyyah by one large dome, flanked by eight small domes.

While it seems likely that all the domes were originally decorated internally, partly with bas-relief ornament (in the niches under the squinch arches and in the blind openings simulating window openings in the drums) and partly by painted decorations, only the largest domes and a few of the smaller ones have preserved a substantial amount of the painted decoration. The reason for this seems to have been the enthusiasm of zealots in repainting the interiors of the prayer-halls with whitewash as far as it could be painted or thrown – the larger dome decorations have been preserved mainly because they were out of reach.

There is therefore an intriguing possibility that the original paintings of some of the lower domes, and of the lower sections of the large domes, may be preserved beneath the layers of whitewash. Only careful analysis will establish whether this is so, and then only the most skillful conservation by professional experts will enable them to be revealed again, if, indeed, it can be done at all. Even more tragic is the deterioration of the condition of the external surfaces of the domes during the last ten years, since the photographs taken in 1972. The resulting penetration of water has severely damaged many of the paintings, so that the possibility of preserving and restoring them completely is now a matter of some doubt.

The decoration of the main dome of the Ashrafiyyah

The bowl of the dome is decorated with a central rosette of 24 lobes. A monumental *naskhī* inscription of a verse from the Qur'an surrounds it. A similar monumental *naskhī* inscription of verses from the Qur'an forms the lower border of the dome; it is divided into four sections by large 8-lobed rosettes, each containing two concentric circles within which is a smaller rosette of irregular lobing. A third inscription stands above the lowest one, executed this time in eastern kufic, divided into twelve panels by doubled vertical shafts which rise up through the lettering to support a decorative painted arcade of five-cusped arches, the centre of each of which is linked in turn to a ring encircling the central inscription of the dome by a double shaft.

A number of features of the shafting deserve special attention. Alternate double-shafts rise above the kufic inscription only a short distance before they divide to encircle, again alternately, spiralling rosettes, which might almost be attempts to represent fireworks ("Catherine-wheels") and twelve-pointed stars in three concentric rings, which are also made to appear to be spiralling by the way they are coloured and shaded.

The double shafts then move up together again until they divide to form the cusped arches. But at the top of each of these they divide again and proceed towards the central ring, interrupted only by a tiny knot near the top.

Between these knots, small fleur-de-lis shaped arrow heads grow out from the central



Plate 1. The painted great dome of the Ashrafiyyah.



Plate 2. The springing and drum of the great dome of the Ashrafiyyah.

ring, each with a smaller fleur-de-lis in its centre. The other main double-shafts rise above the kufic lettering to large four-looped knots with adze or axe forms outlined between the shafts above them.

Finally, in the space between every pair of main double shafts, there rises above the kufic lettering a second, minor, double-shaft motif. Linked to the main shafts by horizontals which form a frame above the letters, this motif leaves the inscription after forming a semi-circle around a palmette motif. It then moves upwards to terminate in another fleur-de-lis arrow head. But, before it reaches this, the shaft is studded in the centre with spiralling rosettes not unlike swastikas. They also give the illusion – perhaps this is intentional – of spiralling fireworks. In colour, the eastern kufic, the shafts, bands and cusped arches are all gold; the *naskhī* inscriptions and most of the decorative features are white.

Running uniformly behind all these motifs is a spiralling vine decoration with leaves and flowers, creating a rich floral field on a blue background. The circular drum of the dome is alternately pierced by windows and niches. Both have shell scalloping of ancient Umayyad type which was in widespread use over a long period. The rear walls of the niches are pierced in a variety of overall geometric patterns made up of straight lines radiating from star-shaped openings evenly spaced across the surfaces. A similarly patterned bas-relief covers the wall of the drum between the arches, with the difference that the patterns radiate from large half-rosettes.

Below the circular drum, an octagonal drum has a painted chevron ornament in a band below which the surface of the drum is painted in an extremely beautiful pattern with alternate triangles framing hexagons (containing three open triangles fitted together) and star-rosettes of geometrical construction. This decoration is highlighted in lime-green and dark pink.

The squinch arches contain domes which are decorated in a radiating arabesque ornament. Between them, blind rectangular windows are crowned with circular blind recesses, and these contain star patterns based on triangles. The surface in front of them had a bold, free lily pattern.

The cusped arches over the latter, and the squinch arches themselves, have narrow painted bands of alternately red and white voussoirs.

Finally, one range below the main squinch arches there are small squinch arches containing plaster bas-reliefs, now whitewashed over, with elaborately intertwining arabesques in different styles, with superimposed bands of trilobed arches overlaying them. Intermediate panels have rich intertwining arabesques in a different design and the central feature is a circular, deeply recessed shell boss.

The decorations on one of the Muzaffar mosque domes

These will be only briefly considered for comparison purposes. The dome chosen is the eastern one. Here a floral arabesque surrounded the central boss, itself already obscured by damp penetration in 1972 when the photograph reproduced here was taken (Plate 4). Outside of this a free monumental Qur'anic inscription is divided into four sections by rondels, each again containing a floral arabesque pattern. A further floral arabesque pattern encircles the dome to frame the central pattern.

The main surface of the dome outside of the central area is filled with eight large waterpot-shaped medallions outlined in broad dark ornamented bands. Alternate waterpots have geometrical overall patterns of the type referred to in one of the areas of the Ashrafiyyah. An additional feature is that the central stars are filled with 4-vaaned spirals of the swastika type identified as above. The other medallions have complex overall patterns of arabesques intertwined with straight lines. The surface between the medallions has a further complex arabesque pattern and the dome surface is completed with a continuous band of inscription.

The circular string course below the dome is decorated with a row of curious, almost semicircular arches standing on a horizontal step on top of columns, all against a floral arabesque background. Below, the rows of window and niche arches have chevron patterns and stripes of various types. The niches below have bold floral patterns, such as found on plates, and indeed some of them are set in circles, with a central floral star. The main squinch arches have patterns extremely close to those of the Ashrafiyyah, and the surface in between has an ingenious overall pattern of overlapping and intertwining floral rosettes.

Decorative style

In the articles published in 1974 we identified the decorations of the domes as related to Egyptian work at the end of the 7th/13th century and the beginning of the 8th/14th century.² The possibility that the decorations may be later merits a more detailed examination of the evidence. This is an important issue in ascertaining the dates of work on the building, which are in dispute between the reigns of the two Sultans al-Ashraf.³ Detailed examination is particularly desirable in view of the increased evidence that is available as a result of the growing number of studies on the development of the Mamluk styles that have been made in recent years.⁴

In the paragraphs that follow I have examined the decorative elements one by one in an attempt to date the fashionable period when each motif was in use in the Islamic art of other areas and determine, if possible, the date of its original appearance and its provenance. I hope in this way to build up a general body of evidence which will suggest the main source of the style of the design, and even the approximate date of work of executing the painting and reliefs.

Considering the decorations on the main dome of the Ashrafiyyah first, with the numbers below referring to the decorative elements already identified.

Of the large *rosettes*, that in the centre of the dome is sufficiently general in type to be difficult to date to any particular place or period. But the large 8-lobed rosettes on the lower edges of the dome are more specific in form, and resemble elements of Mamluk art in Egypt and Syria in the 8th/14th century in evidence in metalwork and book decoration (Plates 5 and 6).⁵

The division of the dome surface with *double-shafts carrying cusped arches*, etc., is paralleled in much decoration in the Islamic world in the 7th/13th and 8th/14th century, notably in Hispano-Moorish, Anatolian and Indian examples. An important example cited by Creswell is a panel at the base of the minaret of Sayyidnā al-Ḥusayn which is assumed by him to be contemporary with the inscription on the gate of the minaret, which is dated 634/1237.⁶ That panel is, however, almost exactly similar, in its particular combination of forms, to two important examples of a century later – first, the courtyard panels of the Bū ‘Ināniyyah Madrasah in Fez (753-756/1350-3),⁷ and second, the main central tympanums and other decorations of the Mirador and the Court of the Lions of the Alhambra, Granada (Plate 3, 755-794/1354-91).⁸ This combination of forms was therefore apparently the height of fashion around 750/1350 in western Islamic architecture; it seems unlikely that it could have been executed over a century earlier in Cairo.

It is worth noting at this point that the extremely beautiful monumental *naskhī* inscriptions are in a style very similar to that of the celebrated calligraphy of the Great Mosque in Ashtarjān, Persia (715/1315),⁹ as well as, of course, resembling closely the calligraphy of a series of Mamluk metalwork pieces actually made for the Rasulid court in Ta‘izz, and other celebrated pieces of Mamluk metalwork, which are all datable to the period 689-751/1290-1350.¹⁰ Many of these pieces also have double-shaft ornament of types.¹¹

The large *knots* appearing on the doubled shafts, are already evident in eastern kufic inscriptions in the 7th/13th century.¹² More elaborate forms of the knotting are to be found in Anatolian Seljuk architecture.¹³ *Cusped arches* are also found in the 7th/13th century in many areas of Islam.¹⁴ Finally, *eastern kufic* sometimes carrying knotting in its vertical shafts, was a common feature of 8th/14th century Mamluk art.¹⁵

Spiralling rosettes, both large and small are a feature of Mamluk art in the early 8th/14th century. But while the latter can be paralleled exactly (in cloth), that example is assumed to be from the 9th/15th century,¹⁶ whereas the generic type, similar except that it has six or eight vanes instead of four, is common in examples of metalwork of the period from 689/1290 to 731/1330, some of them made for the Sultan in Yemen.¹⁷ An example of the spiralling rosette on a building is that on the Madrasah–Mausoleum of Zayn al-Dhī Yūsuf in Cairo (697/1298) where it is carved in stone over some of the windows.¹⁸ Exact precedent for the dotting and rainbow colouring of the spirals in the Ashrafiyyah is not yet established.

The equivalent motifs of the *12-pointed stars* looking rather like concentric chevron ro-



Plate 3. Part of the decoration of the Mirador de la Daraxa, Court of the Myrtles, Alhambra, Spain. (c. 755-794/1354-91 ?)



Plate 4. The painted decoration on the large eastern dome of the Muẓaffar mosque, Ta'izz.

settes have similar models in the central stars of some pages of calligraphy (e.g. Plate 7).¹⁹ Their use in isolation is unusual, except in Indian Islamic, where concentric floral rosettes are sometimes found on buildings (e.g. Jamaat Khana Masjid, Delhi, c. 720/1320(?)).²⁰ Ettinghausen has, however, noted the appearance of these rosettes in a Qur'an otherwise Mamluk in style.²¹ But the latter are far removed from the simple geometry of the rosettes in the Ashrafiyyah.

The use of fleur-de-lis shapes as terminals is common throughout Islamic art, and particularly so in the Yemen.²² Not surprisingly, it was a frequent ornament in 8th/14th century Mamluk art (e.g. background floral ornament of the monumental kufic in the Sultan Ḥasan Madrasah, Cairo, 758-764/1356-1362).²³ Similarly, *axehead forms* occur in Mamluk art (cf. ceramic strainer in Museum of Islamic art, Item no. 1288),²⁴ as do *palmette* forms, the latter on metalwork of the period of al-Nāṣir Muḥammad and his successors (c. 689-751/1290-1350).²⁵

The peculiar combination of *arrow on a shaft* pointing up into the center of a cusped arch is evident in the examples referred to above, from Cairo (Minaret of Sayyidnā al-Ḥusayn), Fez (Madrasah of Bū 'Ināniyyah) and the Alhambra (cf. Plate 3).

The overall background of *spiralling vines and leaves* across the dome, has, of course, an ancient tradition; but close parallels in detailed character may be seen in the background to the monumental kufic of the Madrasah of Sultan Ḥasan, Cairo, 758-764/1356-1362. Other fine examples may be seen in the Quranic illuminations of the period around 735/1334.²⁶

Bands of *chevron* ornament were used in Anatolian Seljuk architecture before being adopted in Mamluk architecture for the northeast portal of the Mosque of Baybars (665-8/1266-9).²⁷

Star-rosettes of the type used in the pattern of the circular drum are another common feature of 8th/14th century Mamluk decoration, both in carpentry, in inlaid doors and shutters, and in the illumination of Qur'ans.²⁸ A similar precedent exists for overall star patterns of straight lines and,²⁹ although these can be taken back further in time to Anatolian Seljuk architectural decorations.

The beautiful *radiating arabesque patterns* of the squinch domes and likewise have close parallels with both Mamluk book illuminations of the 8th/14th century (Plate 7, centre), and, in their lower part, with decorations on metalwork (e.g. Plate 6).³⁰

Star patterns based on triangles are again widespread, but close parallels to the types found here are observable in Mamluk art (Plate 55, centre and Plate 8) not only in crafts but in architecture (Cairo, Taybarsiyyah Madrasah, *mīhrāb*, 709/1309-10).³¹

Bold free *arabesque* patterns are characteristic of all the best work of Mamluk craftsmen in many different materials. Superimposed and intertwining arabesques are a feature of Andalusian and Moorish Islamic in particular, but were in widespread use in other parts of the Islamic world by the end of the 7th/13th century (Lājīn's pulpit, once in the Mosque of Ibn Ṭūlūn, 696/1296,³² Madrasah-Mausoleum of Qarāsūnqur, 700/1300-1, Cairo).³³



Plate 5. Leather book cover, Egypt/Syria, 8th/14th century.
Chester Beatty Library Moritz Collection 20. (cf. note 5)



Plate 6. Lamp made in brass inlaid with silver and gold. Mamluk,
second half of 8th/14th century.

The *striped stone work arch* patterns first became popular in Cairo after al-Nāṣir Muḥammad built the Qaṣr al-Ablaq in the Citadel (713/1313), probably copied from the palace of the same name in Damascus (665/266-7).³⁴ In red and white, this technique was used in the arches flanking the interior door of the portico of the Mosque of Sultan Ḥasan, Cairo (758-64/1356-62), apparently modelled on Hispano-Moorish examples.³⁵

The large eastern dome of the Muḥaffar mosque is clearly designed by a different hand, and while many features suggest that it is, at least in part, almost contemporary, there is not sufficient space here to do more than draw attention to the provenance and style of some of the elements not already dealt with above. (It is hoped to publish a more detailed and systematic study of the decoration of the Muḥaffar mosque at a later date.)

The most striking features of this dome are the large *waterpot-shaped medallions* and. Similar motifs were in widespread use over a long period in Quranic illumination.³⁶ In architectural decoration they appeared in Cairo on the Madrasah and Mausoleum of the Emir Sunqur Saʿdī (715/1315)³⁷ and the Mosque of the Emir Ḥusayn (719/1319),³⁸ and continued in occasional use thereafter. On wall decorations, both internally and externally, their appearance was quite similar to those on the Muḥaffar dome, except that they were usually free of a supporting moulding, and had fleur-de-lis ornaments both top and bottom. Arabesque ornaments of a type extremely close to those between the medallions likewise appeared in Cairo in the dome decoration of the Madrasah-Mausoleum of Zayn al-Dīn Yūsuf (697/1298) and the Madrasah-Mausoleum of Sultan al-Nāṣir Muḥammad (695-703/1295-6–1303-4).³⁹

The use of bold *chevron* and striped patterning framing arches and niches was a fashion in Cairo from the period of at least the Mausoleum of Qalāʾūn (684/1285) onwards.⁴⁰ The precedent for plain striped patterning of arches is discussed above.

As has already been mentioned, the decoration of the semi-dome niches within large squinch arches is almost identical with that of the Ashrafiyyah, an indication that the work above may be almost contemporary in date.

The walls of the corner niches in the octagonal drum seem to be decorated in imitation of precious plates of Mesopotamian and Fatimid, and possibly Persian, provenance. No precedent for such a practice in decorative painting is known, but it seems to reflect a fashion for setting precious ceramic plates into walls as ornamentation, a practice that has survived down to the present day in many parts of the Islamic world.⁴¹

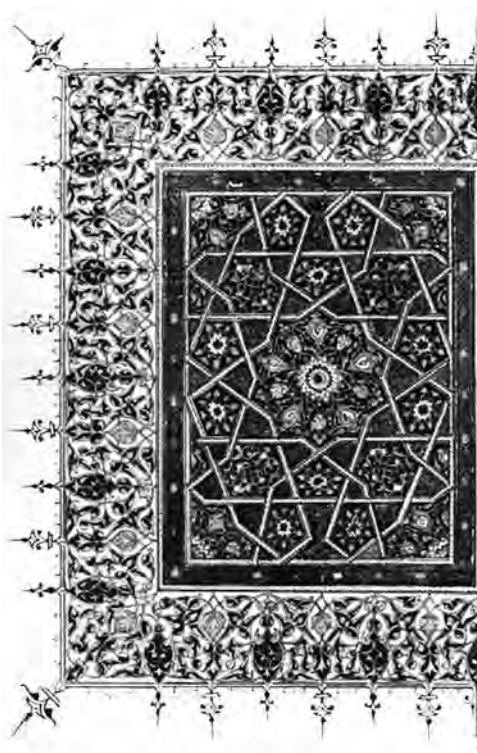


Plate 7. End page of a Qur'an in a style typical of 8th/14th century Mamluk illumination. (cf. note 19)

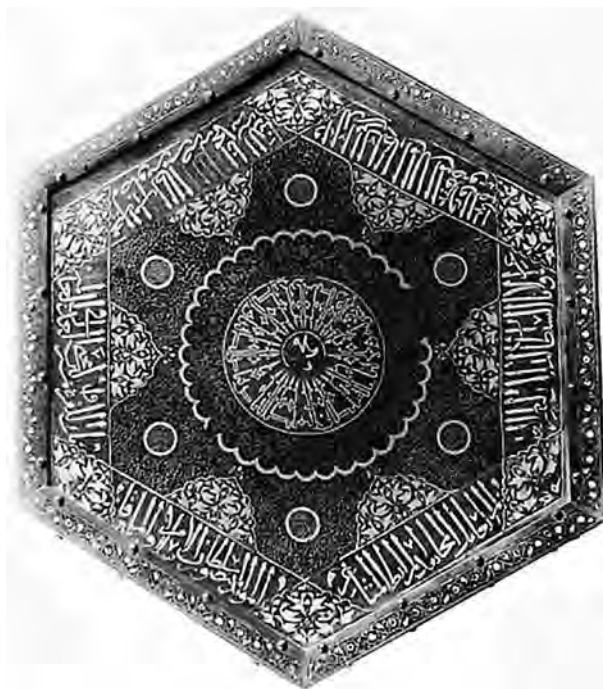


Plate 8. Brass plated *kursī* in the name of Sultan al-Nāṣir Muḥammad (c. 720/1320). Cairo, Museum of Islamic Art, Cat. No. 61.

Conclusion

The consistently fine quality of design and execution of these ceilings, particularly that of the Ashrafiyyah, argue that each was conceived and executed on a coherent scheme over a short period under the direction of a leading master. Who that master may have been we have as yet no way of knowing, although it is possible that cleaning may yet reveal his signature. In the meantime, among the mass of evidence discussed above, there is a clear indication that the painted domes were executed in the style current in the period between 715/1315 and 762/1360, and probably still fashionable in the 770s/1370s and 780s/1380s.

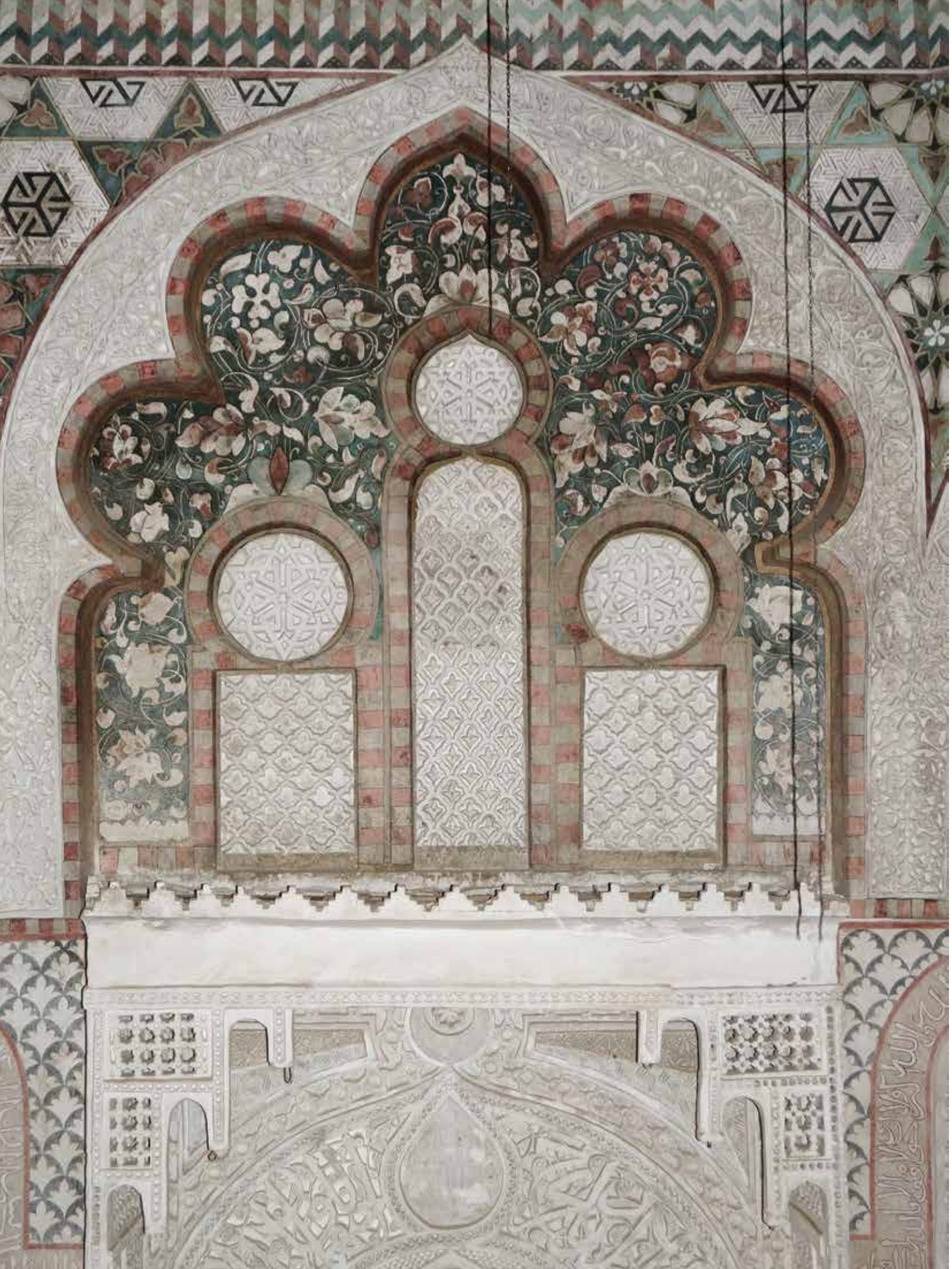
The dome decoration of the Ashrafiyyah was, in its general design and many of its features, unlike any other such decoration of which we have knowledge. It was, interestingly enough, apparently derived in part from sources other than purely architectural decoration. While much of the 8th/14th century was marked by internationalism, by a tendency for artists and craftsmen to travel and for ideas to be interchanged between many different parts of the Islamic world, we have no reason to suppose that the designer of these decorations came from further afield than the Mamluk realms of Egypt and Syria – whose art we already know the Rasulids to have admired.⁴²

In overall pattern the Ashrafiyyah dome follows the arrangement typical in much metalwork (cf. Plate 6) but it involves a richness of imagination and a diversity of motifs far in excess of anything normally demanded of craftsman working in a small compass. That it has been achieved so masterfully, and with such subtleties of colour and form, is an indication of the outstanding calibre of the artists and craftsmen who accomplished it. They achieve a level of artistic design, colouring and execution equal to work of the highest quality in the Islamic world at that period – which also saw the construction of the Mosque-Madrasah-Mausoleum of Sultan Ḥasan in Cairo, the Madrasah of Bū ‘Ināniyyah in Fez, and the two great courts of the Alhambra at Granada.

It is to be hoped that the Yemeni government will ensure that these dome paintings, which were recently severely damaged by water, will be safely protected against further deterioration. Their interest is not limited by national boundaries. They are singular in their type and quality; until a decade ago they were in an extraordinarily perfect state of preservation; and they are surely unique in their beauty and magnificence among dome paintings in the Mamluk style.

Notes

- ¹ R.B. Lewcock and G.R. Smith, "Three Medieval Mosques in the Yemen", Parts i and ii, *Oriental Art*, 20 (1974) i:1-12 and ii: 192-203.
- ² Op. cit., ii: 200-2.
- ³ Op. cit., 2: 192 and 200. For an extensive recent bibliography the reader is referred to the catalogue of the exhibition *Art of the Mamluks* prepared by Esin Atil, published by the Smithsonian Institution Press, Washington, D.C., 1981, and the forthcoming proceedings of the symposium *Art of the Mamluks*, May, 1985, to be published in a special volume of *Muqarnas*.
- ⁵ Discussed in G. Bosch, J. Carswell and G. Petherbridge, *Islamic Bindings and Bookmaking*, Catalogue of an Exhibition at The Oriental Institute, University of Chicago, May-August 1981: 161.
- ⁶ K.A.C. Creswell, *Muslim Architecture of Egypt*, London, 1962, ii, 83-4, Plate 29b.
- ⁷ Cf. D. Hill and L. Golvin, *Islamic Architecture in North Africa*, London, 1976.
- ⁸ Cf. T. Burckhardt, *Art of Islam*, London, 1976, Plate 57 and O. Grabar, *The Alhambra*, London, 1978, Plates 55, 61, 115.
- ⁹ M. Rogers, *The Spread of Islam*, London, 1976: 78.
- ¹⁰ E. Atil, op. cit.: 64-5, 81-4, 86-99, etc.
- ¹¹ E.g. Item Catalogue No. 80, Museum of Islamic Art, Cairo, Pen box in the name of Sultan al-Nāṣir Muḥammad, c. 731/1330.
- ¹² E.g. Delhi, Tomb of Iltutmish (633/1235), v. P. Brown, *Indian Architecture, Islamic Period*, Bombay, 1956: Plate viii.
- ¹³ E.g. Sivas, Turbe of Izzuddin Kaikaus (617/1220), v. R. A. Jairazbhoy, *Outline of Islamic Architecture*, London, 1972: Plate 99.
- ¹⁴ See note 12 above.
- ¹⁵ E.g. Nazi Zain-al-Din, *Atlas of Arabic Calligraphy*, Plates 312, 323, etc. and M. Lings, *The Qur'anic Art of Calligraphy and Illumination*, London, 1976, Plates 42, 43 and 44.
- ¹⁶ E. Atil, op. cit.: 238.
- ¹⁷ Ibid.: 62-3, 67, 86-7, etc.
- ¹⁸ K.A.C. Creswell, op. cit.: Plate 82, d.
- ¹⁹ M. Lings, op. cit.: 78, Plate 37.
- ²⁰ P. Brown, op. cit.: Plate Ci.
- ²¹ R. Ettinghausen, *Arab Painting*, Lausanne, 1962: 173 and M. Lings, op. cit.: Plate 65.
- ²² Cf. R.B. Serjeant and Ronald Lewcock, *Ṣan'ā', an Arabian Islamic City*, London, 1983.
- ²³ T. Burckhardt, op. cit.: Fig. 26.
- ²⁴ *Guide to the Museum of Islamic Art*, Cairo, 1373/1953: Fig. 10.
- ²⁵ Wafiyya "Objects bearing the name of an-Nasir Muhammad and his successors", in *Colloque International sur l'histoire du Caire*, Cairo, 1969-72: 235-241; and E. Atil, op. cit.: 87.
- ²⁶ M. Lings, op. cit.: Plate 63.
- ²⁷ R.A. Jairazbhoy, op. cit.: Plate 82. K.A.C. Creswell, op. cit.: Plate 50 b and c.
- ²⁸ M. Lings, op. cit.: Plates 59 and 65, dating respectively from 713/1313 and 766-778/1363-1376.
- ²⁹ M. Lings, op. cit.: Plate 105, dating from 703/1303, probably Andalusian.
- ³⁰ E. Atil, op. cit.: 99.
- ³¹ K.A.C. Creswell, op. cit.: ii, 253-4, Plate 99 b.
- ³² Victoria and Albert Museum, v. S. Lane-Poole, *Art of the Saracens in Egypt*, London, 1886: Figs. 35-8.
- ³³ K.A.C. Creswell, op. cit.: ii, Plate 89 c.
- ³⁴ Ibid.: 171-2, 260-4, Fig. 144.
- ³⁵ Burckhardt, op. cit.: Plate 129.
- ³⁶ M. Lings, op. cit.: Plates 11, 12, 14, 15, 16, 23, 42, 43, 44, 67, 98, etc.
- ³⁷ K.A.C. Creswell, op. cit.: ii, Plates 101c, 102d, etc.
- ³⁸ Ibid.: Plate 104a.
- ³⁹ Ibid.: Plates 84c and 86b.
- ⁴⁰ Ibid.: Plates 108 b, 112 a, 114 c.
- ⁴¹ Notably in Oman, East Africa and Nigeria.
- ⁴² E. Atil, op. cit.: 62.



AL-MADRASAH AL-ASHRAFIYYAH IN TA‘IZZ THE INSCRIPTIONS

GIOVANNI CANOVA*

1. The Rasulid dynasty

Events in the lives of the Rasulid sultans (626-845/1228-1441) and the development of the city of Ta‘izz, which became the capital of the kingdom, are narrated by annalists Abū ‘Abd Allāh al-Janadī (d. 732/1324), Shihāb al-Dīn al-‘Umarī (d. 749/1349), ‘Alī ibn al-Ḥasan al-Khazrajī (d. 812/1410) and Abū Makhramah (d. 947/1540). Al-Khazrajī was a contemporary of al-Malik al-Ashraf Ismā‘īl, another author of a history of the dynasty.¹ For the later events, we have access to the annals of an anonymous author who lived in the 9th century² and to the works of Ibn al-Dayba‘ al-Zabīdī (d. 944/1537) and Yaḥyā ibn al-Ḥusayn (d. 1100/1689).

The most important work by al-Khazrajī, *al-‘Uqūd al-lu’lu’iyyah fī tārikh al-dawlah al-rasūliyyah*, is known in the translation by J.W. Redhouse, E.G. Browne, R.A. Nicholson and A. Rogers, *The Pearl Strings. A History of the Resūliyy Dynasty of Yemen*. The Arabic edition was edited by Muḥammad ‘Asal. The history of the Rasulid sultans is narrated year by year. After a brief history of ancient Yemen, Ḥimyar and the Marib dam, the author briefly mentions the Ghassanid kings in Syria, from whom the Rasulids claim to be descended.³

The historian R. Rex Smith has devoted many studies to the Rasulid dynasty; he emphasizes its continuity with respect to the Ayyubid heritage:

“The period after 632/1235, during which the Rasūlids held control of Tihāma and southern Yemen, was without doubt the most brilliant in the mediaeval history of the country. All the hard, pioneering work had been done by their predecessors, the

* University of Naples “L’Orientale”. There are different transcriptions for the Arabic names, depending on the system used by the different authors. E.g., *madrasah* and *madrasa*.

1 *Fākihāt al-zaman*. Manchester, John Rylands Library, Ar. 19.

2 *Tārikh al-dawlah al-rasūliyyah fī al-Yaman*, Paris, B.n.F., Ar. 4609.

3 Al-Khazrajī, *al-‘Uqūd al-lu’lu’iyyah / The Pearl-Strings*, London and Leyden 1906-1918. On the historian al-Khazrajī see Sadek 1997.

Ayyūbids, with their vast armies, including numerous cavalry. Their conquests had been thorough. In addition, their skilled administrators trained in Syria and Egypt had established an effective administration in the Yemen. The Rasūlids were able to build on to these achievements. They, too, had efficient local civil servants and, what is more, the royal house was blessed with a plethora of gifted intellectuals who brought great scholarly effort to an already highly educated country.” (Smith 1988a: 136).

Like the Mamluk kings of Egypt and Syria, the Rasulid sovereigns also bore honorific titles, after *al-sultān* (‘he who wields the power, the authority’ *sultāh*) and *al-malik* (‘the king...’) followed by a noun indicating a quality, that preceded the actual proper name. For example, al-Sultān “al-Malik al-Ashraf” Ismā‘īl ibn ‘Abbās. Al-Madrasah al-Ashrafiyyah, the subject of this study, took its name from the honorific title, al-Ashraf. This is followed by the data relative to his descent (*ibn... ibn...* ‘son of’) in a genealogical line that is an element of prestige and can take us to the founder of the dynasty, Rasūl, or to the Ghassanids, of whom the Rasulids claim to be descendants.⁴

[Muḥammad ibn Hārūn (Rasūl)]

[‘Alī ibn Rasūl ibn Hārūn... ibn Kahlān]

- (I) al-Malik al-Manṣūr ‘Umar ibn ‘Alī (r. 626-47/1228-49)
- (II) al-Malik al-Muẓaffar Yūsuf ibn ‘Umar (r. 647-94/1249-95)
- (III) al-Malik al-Ashraf ‘Umar ibn Yūsuf (r. 694-96/1295-96)
- (IV) al-Malik al-Mu’ayyad Dāwūd ibn Yūsuf (r. 696-721/1296-1322)
- (V) al-Malik al-Mujāhid ‘Alī ibn Dāwūd (r. 721-64/1322-63)
- (VI) al-Malik al-Afḍal al-‘Abbās ibn ‘Alī (r. 764-78/1363-1377)
- (VII) al-Malik al-Ashraf Ismā‘īl ibn al-‘Abbās (r. 778-803/1377-1400)
- (VIII) al-Malik al-Nāṣir Aḥmad ibn Ismā‘īl (r. 803-27/1400-24)
- (IX) al-Malik al-Manṣūr ‘Abd Allāh ibn Aḥmad (r. 827-30/1424-27)
- (X) al-Malik al-Ashraf Ismā‘īl ibn Aḥmad (r. 830-31/1427-28)
- (XI) al-Malik al-Zāhir Yaḥyā ibn Ismā‘īl (r. 831-42/1428-38)
- (XII) al-Malik al-Ashraf Ismā‘īl ibn Yaḥyā (r. 842-45/1438-41)
- (XIII) al-Malik al-Muẓaffar Yūsuf ibn ‘Umar (r. 845/1441).

⁴ Al-Malik al-Ashraf, *Turfat al-aṣḥāb*: 100. The sultan resumes the genealogical line of ‘Alī ibn Rasūl, linking it back to the Ghassanids, descendants of the Azd, from Kahlān and Qaḥṭān; and adds: “If anyone asks you what tribe you belong to?” You answer: ‘Qaḥṭān’.” According to the historic sources, however, they belong to the Turkoman branch. “The Zaydī imamate, which lasted for almost a millennium in the north, was founded by non-Yemeni descendants of the Prophet Muḥammad. The Ayyubids and Rasulids were Kurds and Turkomans, although the Rasulids manufactured an ancient Yemeni genealogy to validate their claim to rule the land” (Varisco 1993: 15).

The title al-Ashraf ('the noblest'), was attributed to four Rasulid sultans.⁵ Other honorific epithets are al-Mansūr ('the victorious, the aided [by God]'), al-Muẓaffar ('the victorious, the triumphant'), al-Mu'ayyad ('the supported [by God]'), al-Mujāhid ('the fighter for the faith'), al-Afdal ('the best'), al-Nāṣir ('the protector, the granting victory'), al-Zāhir ('the conqueror'). At times, the historical works only mention this title, for example al-Ashraf (*nisbah*: al-ashrafi').⁶

In the inscriptions and in the official documents there may be additional simple honorific titles such as *al-sayyid* ('lord, chief'), *al-ajall* ('greater, more splendid'), *al-mu'azzam* ('august, glorified'), *al-'ālim* ('learned'), *al-'ādil* ('just, righteous'); or compound honorific titles such as: *mumahhid al-dunyā wa-l-dīn* (lit. 'He who facilitate worldly life and religion'), *asad/hizbar al-dunyā wa-l-dīn* ('lion of worldly life and religion'), *sayyid al-mulūk wa-l-salātīn* ('lord of kings and sultans'), *sayyid mulūk al-'arab wa-l-'ajam* ('lord of the kings of the Arabs and non-Arabs'), *shāhinshāh* ('king of kings'), *nāshir janāḥ al-'adl* ('protector of justice'), *mālik riqāb al-umam* ('he who watches over the communities'), *sultān al-Islām* ('sultan of Islam').⁷

The sultan's wife is not usually called by her proper name, but with the honorary title of Jihah (literally, 'side, direction'), followed by the name of the eunuch (*al-tawāshī*) that the sultan has assigned to her service.⁸

2. The scientific and literary activity of the Rasulid sovereigns

The period in which the Rasulid dynasty reigned in Yemen, between the 13th and the 15th century CE, was one of the most fertile for the history and culture of Yemen.⁹ The arts flourished, especially religious architecture, as did the sciences. During the reign of al-Malik al-Muẓaffar Yūsuf, the second Rasulid sultan (d. 694/1294), Ta'izz became the capital of the kingdom.¹⁰ The city is located in a strategic position at the foot of Mount Ṣabir. Its fortress (*ḥiṣn*) was already mentioned in the Sulayḥid chronicles during the reign of Queen Arwā.¹¹ Yemeni scientific works from the Rasulid period range from astronomy to mathematics, from agriculture to medicine and veterinary practice, to the art of book-

5 For a brief history of this Sunni dynasty of the Yemen, see Smith's entry "Rasūlids" in the *Encyclopaedia of Islam*, vol. 8, 1995: 455-457; and also the entry "Ta'izz", vol. 10, 2000: 118. Al-Qalqashandī devotes a chapter to the Rasulid sovereigns in the *Ṣubḥ al-a'shā*, vol. 5: 30-33. Among the modern historians, see al-Jirāfi, *al-Muqataf*, 133-137, 362. See also the introduction by J. Chelhod to Ibn al-Dayba', *Bughyat al-mustafid*, "Neuf siècles d'histoire...": 21-24; and al-Aṣḥabī 2004: 310. A detailed list of the Rasulid sovereigns is provided by Ansaldi, 1933: 143-146, based on al-Kibsi.

6 Al-Bāshā 1978:1. The author points out that the titles are *alqāb fakhrīyyah rasmiyyah*, 'honorific titles', different from those which indicate an office or a function.

7 Qalqashandī, *Ṣubḥ al-a'shā*, vol. 6: 5-76; van Berchem 1900: 441-456 (on the Mamluk titles). Al-Bāshā 1978, analyzes many of these titles and lists them in alphabetical order. In most studies they are only rendered in transcription, as the literal meaning is redundant.

8 On this title, see al-Bāshā 1978: 248-250.

9 For a more detailed study of the activity of the Rasulids in the administrative, social, religious, educational, historic, scientific and literary sectors see al-Ḥibshī, *Ḥayāt al-adab al-yamanī fī 'aṣr Banī Rasūl*, 1980².

10 On al-Malik al-Muẓaffar and his policy of unification of the Rasulid state, see Varisco 1993.

11 See also Ibn al-Dayba', *Qurrat al-'uyūn*, 192, 201. The fortress was later called al-Qāhirah. On Queen Arwā I refer to my contribution in *The Great Mosque of Ṣan'ā'*, edited by R. Ravagnan and M. Merlo, 2022: 150, 154-158.

binding. The sovereigns themselves were scientists and men of letters. Al-Malik al-Muẓaffar wrote a treatise on the movement of the celestial bodies, a work of pharmacology,¹² a collection of *ḥadīth*, a manual on the arts and crafts entitled *al-Mukhtaraʿ fī funūn min al-ṣunaʿ*,¹³ as well as literary compositions.

Al-Malik al-Ashraf ʿUmar ibn Yūsuf, third Rasulid sultan (d. 696/1296), was a scholar of astronomy. He wrote the treatise *al-Tabṣīrah fī ʿilm al-nujūm* and constructed an astrolabe.¹⁴ He also wrote a work of veterinary medicine (*al-Mughnī fī al-bayṭarah*) and one of genealogy (*Tuṣfat al-aṣḥāb fī maʿrifat al-ansāb*).

Al-Malik al-Muʾayyad Dāwūd ibn Yūsuf, fourth Rasulid sultan (d. 721/1322), owned a vast library. The historian al-Khazraǧī describes him as an expert in every art and science. He was familiar with Arabic works of grammar and lexicography, had the *ijāzah* of the shaykh of Mecca for teaching the *Sunnah* of the Prophet Muḥammad based on the collections of al-Bukhārī, Muslim, al-Tirmidhī. He wrote about hunting, falconry, and ancient Arabic poetry. Al-Malik al-Mujāhid ʿAlī ibn Dāwūd, fifth Rasulid sultan (d. 764/1377) inherited his passion for horses from his father Dāwūd, and wrote a treatise on horsemanship, *al-Aqwāl al-kāfiyah wa-l-fuṣūl al-shāfiyah*, that was widely read throughout the Arab world.¹⁵

Al-Malik al-Afḍal al-ʿAbbās, sixth Rasulid sultan (d. 778/1401), left us a manuscript containing dozens of treatises on a wide range of subjects, particularly scientific subjects like astronomy, medicine, agriculture..., for a total of 542 pages.¹⁶ The physician Tommaso Sarnelli, commenting in his treatise *K. al-Lumʿah al-kāfiyah fī al-adwiyah al-shāfiyah*, observes how

“the Rasūlid-Ghassānid dynasty, renowned for its patronage of the sciences and letters – despite the many episodes of battle, unrest and bloodshed that involved its members –, had built up a tradition, a cultural atmosphere that made medicine almost a family science...”¹⁷

12 *Al-Muʿtamad fī al-adwiyah al-mufradah*. The sultan wrote to al-Malik al-Zāhir Baybars because a doctor was needed for the unhealthy regions of Zafār, but emphasized that he was not asking for himself: “Thanking God, I know in medicine things that others do not know, having studied it since I was very young. My son ʿUmar is also a scholar of medicine”. Meyerhof reports this episode and writes of the passion for the sciences of the Rasulid sovereigns and of the magnificent gifts received from the various delegations from Africa and Asia, including tropical plants: “All the information provided by the Yemeni historian al-Khazraǧī highlights the great interest of the Rasulid sovereigns for agriculture and horticulture” (Meyerhof 1943-1944: 56 -60).

13 Adam Gacek translated the chapter on bookbinding (1997).

14 The work and the sophisticated technology of astrolabe construction were studied by King 1984: 98-122. See also Daum (ed.) 1988: 281.

15 Al-Khazraǧī, *al-Uqūd al-luʿiyyah*, vol. 1: 560-561. Surprisingly though, al-ʿUmarī writes that, according to a report by Ibn Ghānim, al-Malik al-Muʾayyad spent his time idly in his palaces, surrounded by courtesans and singing-girls (*qiyān*). But Ibn Ghānim was moved by resentment for having been sent away from the government offices upon the death of al-Malik al-Muʾayyad (*Masālik al-abṣār*, 152; Muqaddimah: 19m). The story is reported by Qalqashandī, forgetting that he had just praised al-Malik al-Muʾayyad for his love of science and for having assembled a library of a hundred thousand volumes (*Subḥ al-Ashā*, vol. 5: 31, 35). Doris Behrens-Abouseif seems to have accepted this passage without question, extending it to her judgment of the Rasulids as “kings confined in their palaces, well protected in their impregnable strategic location, spending their time with pleasures and frivolities, not being bound by any rules of government...” (2016: 41).

16 Al-Malik al-Afḍal, *The Manuscript of al-Malik al-Afḍal...*, Varisco and Rex Smith (eds). The text contains the photographic reproduction of the manuscript.

17 Sarnelli 1949: 79. Tommaso Sarnelli practiced medicine at Ṣanʿāʾ in the Thirties, at the time of the Imām Yahyā.

The Rasulid sovereigns loved the arts and works of fine craftsmanship. Al-‘Umarī writes that “the kings of Yemen invited (*tastajlibu*) various types of artisans (*arbāb al-ṣinā‘āt*) from Egypt and Syria because there were so few in the country”. Later, he describes how al-Malik al-Muẓaffar and his son al-Malik al-Mu’ayyad “felt great affection for these foreigners” (*lahumā wala‘ bi-ḥubb al-ghurabā’*).¹⁸ The Egyptian physician Ṣalāḥ al-Dīn Muḥammad ibn al-Burhān reports how, at the court of al-Malik al-Mu’ayyad, not a week went by without ships and merchants reaching the port of Aden with goods and gifts of precious objects (*tuḥaf*) from China, India, Sind, Iraq, Uman, Bahrein, Egypt and the African countries of the Zanj and the Habash. This made the Rasulide reign more prosperous than that of the Zaydi Sharifs of Ṣan‘ā’. The emblem (*shi‘ār*) of al-Malik al-Mu’ayyad was a red rose on a white field (*wardah ḥamrā’ fī arḍ bayḍā’*).¹⁹

Numerous objects in metal and glass bear the Rasulid emblem: a five-petalled rosette. Scholars like Max van Berchem, Esin Atıl, Venetia Porter, Noha Sadek, Doris Behrens-Abouseif, Rachel Ward, Ellen Kenney, Éric Vallet have emphasized the importance of the exchange of gifts received and sent by the Rasulid sultans to the Mamluk sultans of Cairo. Many are objects of great artistic value in a style that has been defined as Mamluk-Rasulid art.²⁰ Numerous objects can be seen in collections in many of the world’s most important museums. Stefano Carboni organized an exhibition of Rasulid objects at the Metropolitan Museum of Art in 1995 entitled “The Five-Petalled Rosette: Mamluk Art for the Sultans of Yemen”. At that event, the astrolabe built by ‘Umar ibn Yūsuf, the future caliph al-Malik al-Ashraf, was exhibited.²¹ Many Rasulid objects were also exhibited in the show “Yemen. 3000 Years of Art and Civilisation in Arabia Felix” (Munich 1987-1988), organized by Werner Daum. Among these objects was a glass bottle from the 13th century, kept at the Museum für Islamische Kunst in Berlin, depicting scenes of knights playing polo and the typical Rasulid rosette.²²

On the other hand, the excellence of the Yemeni artists had been well-known for a long time, if even the poet Firdawsī (d. 1020) recalls in his *Shāhnamah* the fame that they enjoyed at the Persian court:

Munzir, returning to his palace, held
Mahrām Gūr high as Saturn. Many a painter
He sought for in Yemen, and all the best
Assembled at his court.²³

18 Al-‘Umarī, *Masālik al-abṣār*, 156, 161. Al-Qalqashandī quotes the two passages as a single quotation (*Ṣubḥ al-a‘shā*, vol. 5: 36).

19 Al-‘Umarī, *Masālik al-abṣār*, 157-159. The author confirms having personally seen the Yemeni banner (*al-sanjaq al-yamanī*) flying atop Mount ‘Arafāt in the year 738 h.: it was white with many red roses. See also al-Qalqashandī, *Ṣubḥ al-a‘shā*, vol. 5: 34.

20 I mention the essay by V. Porter, in Daum (ed.) 1988, referring for the other studies to the bibliography. See, in this volume, Appendix 2.

21 See note 14.

22 Daum (ed.), 1988: 27, the astrolabe is shown on page 281; other objects on pages 19, 217-219.

23 *The Shāhnama of Firdawsī*, translation by A.G. Warned and E. Warner, London: Kegan Paul, 1912, vol. 6: 385.

3. Al-Malik al-Ashraf Ismā‘īl ibn ‘Abbās

Ismā‘īl ibn ‘Abbās acceded to the leadership of the *dawlah* upon the death of his father, al-Malik al-Afḍal ‘Abbās. He arrived in Ta‘izz in 778/1377 taking the title of al-Malik al-Ashraf (II). He was just 17 years old but was considered, even then, a wise young man, and it was he who built the great Madrasah in the city known as al-Ashrafiyyah that contains his tomb. He died in 803/1400.

Observing the magnificence of the building, it would be interesting to know the most significant events of al-Malik al-Ashraf’s life, according to the historical sources. The sultan loved horses and hunting,²⁴ and took great care of the gardens and palm groves. A great popular festival took place every year in the valley of Zabīd at the time of the date harvest. The sultan lived with his emirs, *qāḍī*, military commanders, eunuchs, always in movement between Ta‘izz, Zabīd²⁵ and the other places where he had palaces. The context is that of the continuous struggle against “tribal feudalisms”, according to the definition provided by Joseph Chelhod, represented by rebellious tribes. In Ta‘izz there was also a Jewish community: two conversions to Islam are cited. All this went on against the background of a land that, from the high mountains over Ta‘izz, slopes down toward the Tihāmah and the Red Sea, all the way to the port of Aden. Reports in the form of annals tell of diplomatic missions and exchanges of precious gifts, but also of floods, famines, swarms of locusts, sandstorms, fires and earthquakes. The overall picture is a lively view of the political, social and economic situation of the Rasulid state in southern Yemen from the 8th to the 14th century.²⁶

In the first year of the reign of al-Malik al-Ashraf (778/1377), the royal mint coined a *dirhām* with his name. The king received a delegation of Zaydi *ashraf* led by al-Qāsim ibn al-Hādī, who came to pay tribute to him. Later, his emirs waged campaigns for the domination of the surrounding strongholds (*ḥisn*, pl. *ḥuṣūn*), where the “glorious banner” (*al-rāyah al-sa‘īdah*) was raised, perhaps already with the Rasulid symbol of the five-petalled rosette. The sultan received precious gifts from India, Dahlak, Dongola, from the lands of the ‘Ajām, which included elephants, giraffes and wild beasts,²⁷ as well as incense and slaves. Subsequently, the Mamluk sovereigns of Egypt also sent precious gifts. Expeditions were organized to visit the “northern cantons” (*al-sha‘m* or *al-bilād al-sha‘miyyah*) to arrange

24 On the back of a silver *dirham* dated Ta‘izz 785 h. is the name of al-Malik al-Ashraf and the outline of a falconer on horseback – probably to indicate his passion for hunting. According to Darley-Duran “the coinage of the Rasūlids is virtually unique in medieval Islam for the regular use of pictorial devices”. Daum (ed.), 1988: 202, no. 19.

25 Al-‘Umarī reports that the Rasulid sovereigns spent the summers in Ta‘izz, for its mild climate, and the winters in Zabīd (1985: 152). On Ta‘izz, see also al-Ḥajarī 1984, vol. 1: 110-111.

26 The source of this information is the anonymous work entitled *Tārīkh al-dawlah al-rasūliyyah*, written in annal form, selecting the significant passages (79-131). For a more detailed narrative see al-Khazraǧī, *al-Uqūd al-lu‘lu‘biyyah*, vol. 2: 142-237. See also Ibn al-Dayba‘, *Qurrat al-‘uyūn*, 375-387, with interesting footnotes by Muḥammad al-Akwa‘.

27 Al-Malik al-Ashraf, like earlier Rasulid sultans, regularly received gifts of exotic animals as well as the slaves who cared for them. We can surmise that part of the royal stables was reserved for them, on the outskirts of Ta‘izz or possibly in Zabīd. We are reminded in this connection of the extraordinary miniatures of giraffes and elephants adorned with gorgeous fittings, pictured in the codex of *Kutāb al-Ḥayawān* by al-Jāhiz at the Ambrosiana Library (A.F., D 140 inf.).

for the purchase of Arabian horses; other horses were taken from the nomads (*al-‘arab*). The sultan conquered Ibb and Zafār in 780. In that same year, he sent the *maḥmal* with the royal insignias to Mecca. In the meantime, he had to fight Bedouin tribes and villages that had rebelled, going so far as to have their palm groves cut down. In 783, peace was re-established with the Zaydi *imām*, after several skirmishes in the mountains. In 784, the sultan’s mother, Jihah Jamāl al-Dīn Taghā, “the wisest woman of her time”, died.

In 787, swarms of locusts destroyed crops and palm groves. In the month of Ramaḍān, a comet appeared in the eastern sky (*kawkab dhū dhu’ābah*). In 788, torrential rains in Zabīd caused the destruction of many homes, with great loss of life. The emir, ‘Izz al-Dīn Hibah ibn al-Fakhr called for carpenters, metal workers and masons to come and help with reconstruction. In the same year, al-Malik al-Manṣūr, brother of the sultan al-Malik al-Ashraf, was killed at al-Khazīmī, in the region of al-Mazā’ibah. He was buried at Ta‘izz in al-Madrasah al-Afḍaliyyah. In 788 and 790 other disasters occurred: a fire which caused great damage, a terrible heat wave in Zabīd and on the plain, following by a flood, and an earthquake at Aden.

In 790 a royal vessel (*markab ashrafī*) from Aden, loaded with gifts, docked at al-Ahwāb. The sovereign embarked with the emirs for an excursion at sea. In the same year, gifts arrived from Egypt and from the land of the Zanj, “like nothing ever seen before in Yemen”. In later years, the sultan conquered the citadels of Khadad and Sāqah. Shaykh Manṣūr and a group of *ashraf* dignitaries came down on the Tihāmah and battled the emir al-Bahā’ al-Shamsī, suffering heavy losses. In 793, precious gifts arrived from Bengala, including colorful birds and elephants carrying precious silks (*sundus*). The *qāḍī* ‘Abd al-Raḥmān al-‘Alawī received the order to expand the mosque of ‘Udaynah, on the slopes of Mount Ṣabir. In 794, the sultan went to Zabīd and stayed in the new palace built near the *madrasah* of Jihah Ṣalāḥ. The following year, his sons were circumcised at Zabīd amid great festivities, music and a grand banquet, attended by *qāḍīs* and emirs.²⁸ Also in 795, a sandstorm caused severe damage to Zabīd and its palm grove, destroying 2000 trees. A few months later a terrible fire broke out in the city and surrounding villages.

In 796, the sultan moved to Dār al-Naṣr. In that year, his wife, Jihah al-Ṭawāshī Mu‘tab, mother of al-Nāṣir, al-Fā’iz, al-Afḍal and al-Mujāhid, died and was buried in Zabīd. The queen had promoted the construction of al-Madrasah al-Mu‘tabiyyah in al-Wāsiṭah district of Ta‘izz. Al-Malik al-Ashraf tried to assuage his grief going hunting for wild asses. After a certain time, he married Jihah al-Ṭawāshī Marjān at Dār al-Naṣr.

The sultan took his rebel chiefs’ sons hostage in Zabīd, and took possession of their property, horses and weapons. In 797, the Ma‘āzibah also revolted, but were defeated. The sultan attacked Ibb with the cavalry, conquering various fortresses. Shaykh

28 Al-Khazraji lists the foods, sweets, decorations, flowers (tuberoses, roses, narcissus, jasmine), praises the verses recited for the occasion and says, with pride: “I was one of those who were present on the occasion and who saw the whole of it, one thing after another”. There was a great parade, with a kettledrum band (*ṭablakhānah*), singers and dancing-women (*raqqāṣāt*) “When [the chief of the butchers] had slaughtered what was brought to that spot, the slave-lads, there present, grooms, porters, trumpeters, gardeners, stable keepers, elephant-keepers (*fayyālīn*), and other besides these included in the order, took them away” (*al-‘Uqūd al-lu’lu’iyyah*, vol. 2: 232-235; *The Pearl Strings* vol. 2, 207-210).

al-Ḥubayshī was killed with his children, and his wives were taken prisoner. The sultan returned to Dār al-Salām at Jiblah (798).

Water was channeled from the source of al-Maghris to the palm grove of Dār al-Sawkhayn. The sultan ordered banana trees planted, as well as many varieties of fruit trees and flowers. Thousands of plants were brought to Ta‘izz and Zabīd: “No king before him has ever had anything like this”. In 799 the sultan sent ships with soldiers and goods to the government in the port city of Ḥafār, on the Indian Ocean. In 800, the sultan and his cavalry freed the land north of Zabīd from rebels and Arabs al-Ma‘āzibah and al-Rimāh.

Al-Malik al-Ashraf fell ill while he was in Zabīd. His illness grew worse and he returned to Ta‘izz. There he died on 18th Rabī‘ I 803 h. (6th November, 1400). Qāḍī ‘Alī ibn Abī Bakr al-Nāshirī organized the funeral rites according to the religious tradition (*al-fard wa-l-sunnah*). The body was wrapped in a white shroud, perfumed with musk and camphor, and lowered into the grave. The qāḍī lifted the shroud so that the sultan’s cheek touched the soil. Then he turned the face toward the *qiblah*, in the direction of Mecca, asking God’s mercy (*rahmat Allāh*) over him. He was buried in his own Madrasah, al-Ashrafiyyah, which he had built in the direction (*fi nāḥiyah*) of ‘Udaynah.²⁹

The Egyptian historian, al-Maqrīzī, remembers al-Malik al-Ashraf Ismā‘īl with words of praise:

“Al-Malik al-Ashraf Ismā‘īl... ibn ‘Alī ibn Rasūl [died] on the night of Saturday 18 Rabī‘ I in the city of Ta‘izz in Yemen at the age of thirty-seven. He had governed the sultanate of Yemen after his father’s death in 778 h., until his own death. He was a gentle person, kind, generous and open to science (*‘ilm*), beloved by foreigners. He wrote a history of Yemen.”³⁰

The great lexicographer, Majd al-Dīn al-Fīrūzābādī (d. 817/1415), spent many years as a guest of al-Malik al-Ashraf at Zabīd, where he died and was buried.³¹ In the introduction to his *al-Qāmūs al-muḥīṭ* he remembers the sultan as one who encouraged all the sciences, who “raised their banners”. Al-Fīrūzābādī added verses of praise in which he mentioned the virtues of the sovereign and the nobility of the Banū Rasūl.³² In the sultan’s honor, he composed *Tuḥfat al-ḥamā‘il* “on those among men and angels who bear the name Ismā‘īl” (Al-Akwa‘ 1986: 275).

29 Al-Khazrajī, *al-Uqūd al-lu‘lu‘iyyah*, vol. 2: 317; *The Pearl-Strings*, vol. 2: 286. The traditional burial ceremonies are described in the notes 1637-1642 (vol. 3: 227-229).

30 Al-Maqrīzī, *al-Sulūk*, 1074.

31 See Ibn al-Dayba‘, *Bughyat al-mustafīd*: 132; Tomb of *al-‘allamah* Fīrūzābādī in Zabīd (photograph by J. Chelhod).

32 Al-Fīrūzābādī, *al-Qāmūs al-muḥīṭ*, 32w. See also al-Jirāfī, *al-Muqtataf*, 136; al-Akwa‘ 1986: 275.

4. Al-Madrash al-Ashrafiyyah

Al-Khazrajī describes the works ordered by al-Malik al-Ashraf Ismāʿīl, especially al-Madrasah al-Ashrafiyyah.³³ He praises its magnificence and splendor, detailing the names of the teachers employed there and the salaries paid to them, the subjects taught and the precious books stored at the *madrasah*, as well as the facilitations for students. He makes no mention, however, of the extraordinary refinement of the decorations and inscriptions, nor does he name any of the artisans (Yemeni? from other countries?) who worked for three years on the construction of the building.

“And among the religious monuments which he constructed in the city of Taʿizz (and outside thereof), there is a college of beautiful appearance (*madrasah ḥasanat al-shakl*), that has two gates, east and west, besides the southern gate, with a spacious fore-cloister, an extensive rotunda, and a marvelous superstructure (*takwīn ʿajīb*). He built therein a superb lavatory, and instituted for it a preceptor (*imām*), a *muʿedhdhin*, a sexton, a teacher with orphans to study the Qurʾan; also a professor (*mudarris*) of the holy canon law according to the school of the protojurist Shāfiʿiyy, with a tutor and a number of students; also a professor of the apostolic tradition (*ḥadīth Rasūl Allāh*), and a professor of syntax and literature, with a class of students; and he gave unto it in mortmain trust (*waqf*) a number of books used in teaching every branch of sciences (*al-kutub al-naḥāʾis fī kull fann*). And he gave a mortmain trust unto the college aforesaid and unto those instituted to it a goodly estate sufficient for their maintenance.”³⁴

An important text for the description of al-Madrasah al-Ashrafiyyah – and the other religious buildings of Taʿizz – is contained in the document entitled *al-Waqfiyyah al-Ghassāniyyah*. Qāḍī Ismāʿīl al-Akwaʿ publishes extracts without, however, providing information on its origin and on the period of compilation. *Al-Waqfiyyah al-Ghassāniyyah* consists of several parts.

In the first part, the architectural structure of the building is described in great detail, its large central dome (*qubbah*), supported by four arcades (*ʿuqūd*), which covers the prayer hall and *miḥrāb*, and the two wings (*jīnāḥān*), on the east and west sides. Each wing has four smaller domes, each with two windows facing toward the *qiblah*, to the east and west of the *miḥrāb*. There are three doors: two on the east side and a central vaulted

33 The name in the historical Arabic sources is “al-Madrasah al-Ashrafiyyah”, and that is how it is referred to in this chapter. However, as reported by the Qāḍī Ismāʿīl al-Akwaʿ in his fundamental study *al-Madāris al-Islāmiyyah fī al-Yaman*, in Yemen “these are not independent *madāris* (pl. of *madrasah*), as they are in Syria, Egypt, Iraq, Persia, Khorasan, Transoxiana, because they are *madāris maṣjidiyyah*: *madrasah* and mosque are combined in the same building, with annexed living quarters (*khalwah*) for the teachers and students (al-Akwaʿ 1986: 5, footnote 2). Sometimes the complex is simply called al-Ashrafiyyah. The translation proposed in this volume is al-Ashrafiyyah Mosque and Madrasah. On the importance of the *madrasah* as institution and as architecture in the Islamic world, see Hillenbrand 1986.

34 Al-Khazrajī, *al-Uqūd al-luʿluʿiyyah*, vol. 2: 317; *The Pearl-Strings*, vol. 2: 287.

door (*jammūn* or *jamlūn*) in the southern direction. (...) On the great southern door there is an inscription showing the date of construction.

The second part is a description of the main dome, which is the heart of the *madrasah* and the prayer hall (*maṣjid*), place of devotion (*i'tikāf*) and of instruction of the Qur'an, with the seven canonical readings (*qirā'āt*), the law based on the teaching of *al-imām* al-Shāfi'i, disposing of a well-furnished library (*khizānah*).

There is also a hospice (*khānqah*) for the poor and homeless, and for a Sufi confraternity (*tā'ifah ṣūfiyyah*) that performs good works and is dedicated to God. (...) A section of land is kept for burying the dead and celebrating funeral rites, with the recitation of the Qur'an near the tombs. A large tank (*birkah*) holds the water for ablutions (*wuḍū'*) and ritual purifications (*tahārah*). Other pieces of information concern celebrations for the night of *med-Sha'bān*; the prayers for the eclipse (*ṣalawāt al-khusūf wa-l-kusūf*); the clearing of the mosque and the various parts of the complex, the furnishing of carpets; the lighting of the lamps (*maṣābih*) for the prayer of the *maghrib*, of the evening and at dawn; the lighting of the candles inside and outside the *madrasah* on the last night of Ramaḍān. (...) There follows a detailed list of the people in charge of teaching and of the teachings imparted, the religious and giuridical content, or relative to the Arabic language.

Four Qur'anic reciters alternate in recitations at the tomb of al-Malik al-Zāfir, the son of al-Malik al-Ashraf who died in infancy. The documents conclude with a list of the duties to be performed for maintenance of the decorum of the *madrasah*, and the recommendation of proper remuneration of the people in charge (*al-qayyimīn*) of the complex, the teachers and the students, the provision of meals for the poor and needy and of an increase in the works of religion.³⁵

Al-Madrasah al-Ashrafiyyah takes its name from the honorary title of the sultan, al-Ashraf.³⁶ This is also true of al-Madrasah al-Muẓaffariyyah, built at the order of al-Malik al-Muẓaffar Yūsuf, or of al-Madrasah al-Mu'tabiyyah, founded by Jihah Mu'tab, wife of al-Malik al-Ashraf ibn Ismā'il, and mother of his children: al-Fā'iz 'Abd al-Raḥmān, al-Nāṣir Aḥmad, al-Afḍal al-'Abbās e al-Mujāhid 'Alī.³⁷ Many *madrasahs* received the patronage of women.³⁸

35 Al-Akwa' 1986: 268-274. The author begins the chapter devoted to "al-Madrasah al-Ashrafiyyah *al-kubrā*" (no. 116) by recalling how the buildings was found in a state of severe deterioration due to neglect, to the extent that at the time of the *imām* Aḥmad ibn Yahyā a tannery had been annexed. The damage was later repaired by the Organization for Antiquities and Libraries (286-287, Note 1).

36 *Sharīf* is the one who possesses *sharaf* "honor, high rank, nobility of origin".

37 We do not know her proper name: *al-Waqfiyyah al-Ghassāniyyah* indicates Jihah Mu'tab. The Qāḍī Ismā'il al-Akwa', who reports this document in full, describes her with her complete honorary title: Jihah al-Ṭawāshī al-Ajall Jamāl al-Dīn Mu'tab ibn 'Abd Allāh al-Ashrafī (*al-Madāris al-islāmiyyah*: 284-285). The eunuch at her service, Mu'tab, gave the name to al-Madrasah al-Mu'tabiyyah.

38 Noha Sadek (1989) has devoted a detailed study to the "Rasūlid women, power and patronage."



(G. Canova, 1984)

5. Studies on al-Madrasah al-Ashrafiyyah

A first study on al-Madrasah al-Ashrafiyyah was published by Ronald Lewcock and G. Rex Smith in the '70s of the past century. The two authors did field work in Yemen in the summer of 1972, focusing on the study of five medieval mosques in Shibām, Dhū Jiblah and Ta'izz. In this last city, they devoted particular study to the town's congregational mosque Jāmi' al-Muẓaffar (originally erected as a *madrasah*-mosque); the *madrasah* al-Mu'tabiyyah; the *madrasah*-mosque al-Ashrafiyyah. A Preliminary Report was published in *Oriental Art* in 1974, complete with plans, photographs and a detailed description. With regard to al-Ashrafiyyah, the authors cited the historical sources and the two sultans with the title of al-Malik al-Ashraf:

“(...) from these we read that both al-Ashraf and al-Ashraf II had *madrasah*-mosques built in Ta'izz. Al-Ashraf I was buried in the mosque which bore his name, through our sources do not describe the construction. The Mosque of al-Ashraf in Ta'izz was described in some detail by the Rasūlid historian, al-Khazrajī”.³⁹

The architect Ronald Lewcock published another essay in 1983, dedicated to Professor Robert Serjeant. The author concentrated here on the architectural and artistic aspects of al-Madrasah al-Ashrafiyyah, emphasizing the high quality of the decorations. He highlighted the analogies not only with Mamluk structures in Egypt and Syria, but also with Andalusian and Iranian models. (His essay is included here, see Section 1 – Chapter 3).⁴⁰

The historian of Islamic art, Umberto Scerrato, directed research in the years between 1984 and 1986, performing a typological survey of the Islamic religious architecture of North Yemen. He published detailed reports including extensive graphic and photographic documentation. The study was limited mainly to the observation and survey of architectural structures.⁴¹

The documentation collected in 1989 enabled Giovanna Ventrone Vassallo to publish a detailed study of al-Ashrafiyyah and al-Muẓaffariyyah. She devoted particular attention to the foundation inscriptions of the two buildings, including original photographs. With regard to al-Madrasah al-Ashrafiyyah, the inscriptions cast light on the patronage of the Rasulid Sultan al-Ashraf Ismā'īl. He is remembered as having ordered the construction of the *madrasah*-mosque. The hypothesis of Lewcock and Rex Smith on the possible attribution of a primitive part of al-Ashrafiyyah to al-Malik al-Ashraf 'Umar I was definitively disproven (r. 694-6/1295-96). Giovanna Ventrone Vassallo publishes the text in Arabic characters and in Italian translation of seven inscriptions of al-Ashrafiyyah.

39 Lewcock and Rex Smith 1974: Part ii: 192.

40 The article is also published in Lewcock 2018: “Three Medieval Mosques in the Yemen: Architecture, Art, and Sources”, *CmY* numéro spécial 2 (2018): 60-76.

41 Scerrato 1984, 1985, 1986. The researches were undertaken within the activities of the Italian archaeological mission in Yemen directed by Professor Alessandro de Maigret. Professor Scerrato's team included scholars with a wide range of skills: Giovanna Ventrone Vassallo, Paolo Cuneo, Michael Jung, Mario Mascellani.

They are found on the portals of the *madrasah* and part of the foundation text dated 803 (1400) is carved on a band of stucco in the northeast dome. The restoration in progress by the Department of Antiquities made it possible to read the text for the first time. Nine inscriptions concern al-Maẓaffariyyah. Their reading was a valid aid for a first approach to these texts (Ventrone Vassallo 1992:133-135).

Roberta Giunta has devoted a chapter on “al-Malik al-Ashraf’s Building Activity” in her study on *The Rasūlid Architectural Patronage*, published in 1997. The author quotes the text in Arabic and the English translation of the inscriptions published by Ventrone Vassallo. The chapter is complete with extensive biographical information with citations from historical works and from *al-Awqāf al-Ghassāniyyah*. The table with the genealogical table of The Rasūlid House is also very useful.⁴²

Barbara Finster contributed to the volume edited by Werner Daum, *Yemen 3000 years...* with a detailed chapter on “The Architecture of the Rasūlids”. The author highlights its importance in Islamic art and its characteristic elements. A long list recalls the buildings of the Rasūlids, in chronological order, indicating which ones still exist with the dates and basic information (Finster 1988: 254-263). In a later essay, the author studies Islamic architecture in Yemen, distinguishing between cubical mosques, hypostyle mosques and courtyard mosques. Domed mosques experienced particular development under the influence of the Rasulids, e.g. al-Muẓaffariyyah in Ta‘izz. As regards the *madrasahs*, the author observes that:

“(...) some large royal foundations were also built that constituted an architectural genre of their own. They maintained their position as a special Yemeni form alongside the other large madrasa foundations of the Islamic world. Domed buildings reach their apex with these madrasas, as can be seen from the early Asadiyya, the later Mu‘tabiyya, Ashrafiyya, and many other madrasas now destroyed.”⁴³

Noha Sadek devoted considerable research to Yemeni religious architecture as far back as 1985-1986, and made it the subject of her doctoral thesis in 1990. Her study on the position and patronage of the Rasulid woman aroused particular interest. The significance of the titles with which the wives of the sultans were called, like *al-ḥurrah* (the free), *al-jihah* and *al-dār* (denoting a place and a house), is examined on the basis of historical evidence. The author wonders how many monuments promoted by women survive to this day. “In Ta‘izz only the *madrasah* al-Mu‘tabiyyah survives. Religious monuments were maintained by the *wakf* (endowment) system, using the revenues of agricultural lands and commercial shops for restoration and cleaning, salaries and stipends for the staff and students, as well as their room and board” (1989: 124). The research on women patrons in Rasulid Yemen

42 Giunta 1997: 241-245 (on al-Madrasah al-Ashrafiyyah). The author provides information on al-Ashraf’s Family Activity and al-Ashraf’s Entourage Activity.

43 Finster 1992: 137. In regard to al-Ashrafiyyah, she includes plans and photographs of the minaret and southern portal (Figs. 15-17).

continues in an essay with the evocative title “In the Queen of Sheba’s Footsteps”, recalling the splendor of the ancient South-Arabian civilization. Particular attention is given to al-Madrasah al-Mu‘tabiyyah. Jihah al-Mu‘tab, the wife of Sultan al-Ashraf Ismā‘il, died and was buried at Zabīd, but the *madrasah* that bears her name is located at Ta‘izz and contains decorations of great beauty.⁴⁴ Significantly, the name Jihah Farḥān is also found on a Qur’an commissioned from a calligrapher of Tabrīz. A presentation at the “Seminar for Arabian Studies” in 2003 is devoted to Ta‘izz, capital of the Rasulid dynasty. Noha Sadek examines its history, the city layout, and the built space. The particular city character is of interest for the fact that “all the Rasulid sultans were buried there, in tombs attached to their *madrasahs* (or those of their fathers). Even when they died in another location, were always brought back to Ta‘izz for burial” (2003: 311).

An essay written with Selma al-Radi on “The Painted Mosques of Yemen” is of particular interest. It examines about thirty buildings divided among coffered mosques, domed mosques, and mausoleums. Al-Madrasah al-Ashrafiyyah is one of the domed structures discussed, with a brief description of the condition in which they found the building when they visited it:

“This madrasa complex was built by Sultan al-Ašraf Isma‘il between 800-803 AH/1398-1400 AD. It features a prayer hall covered with a large central dome and eight smaller ones, and a courtyard with three domed tombs where the sultan and his descendants are buried. All the domes in the prayer hall are painted, the finest and most intricately detailed designs reserved in the central dome. All the small domes are showing signs of cracking, and some of their paint has disappeared as a result of cement beams which were inserted sometime in the 1970’s in a misguided attempt at restoration.”⁴⁵

The importance of color was the subject of a specific study by Noha Sadek with focus on the “Colors of Power and Piety in Rasulid Yemen” (2011). In the same study, the author stresses how the Rasulid sultans adopted the domed structure for their mosques and *madrasahs* to differentiate themselves from their Mamluk rivals. For the same reason, “they opted for paint and stucco instead of marble, carved stone, or tiling, techniques predominant in Mamluk architecture”. The grand inscriptions and decorations on the summit of the dome, in a circular structure, could evoke the symbolism of a solar disk: the sovereign rules over his subjects as the sun rules over the planets.⁴⁶

Trevor H.J. Marchand published in 2017 a volume entitled *Architectural Heritage of Yemen: Buildings that Fill my Eye*, which contains essays by different authors. Noha Sadek took up the theme of Rasulid architecture again, presenting in particular the structures of Ta‘izz. The description is accompanied by photographs taken by the Social Fund and

44 Sadek 1993: 20, 23. Fig. 5: Dome over the prayer hall; Fig. 6: Red six-petalled rosette in the center of the dome; Fig. 7: Geometric and floral decoration.

45 Sadek & Al-Radi 1999-2000: 66 (Figs. 19-20).

46 Sadek 2011: 228, 247; Figs. 148-151 (al-Ashrafiyyah), 157-158 (al-Mu‘tabiyyah).

by the IVBC (after restoration). A later essay is devoted to “The Forts of Yemen: The Example of the Citadel of Ta‘izz”, with a brief historic profile extended to the post-Rasulid period:

“Towards the end of the Rasulid period, fierce battles between contenders for the throne raged in and around the citadel, prompting the last Rasulid sultan, al-Mas‘ūd (r. 1442-1454), to construct fortifications on the Sirajiyya hill that connected to the citadel. In 1536, al-Muṭahhar, the son of the Zaydi Imam Sharaf al-Dīn Yaḥyā (r. 1556-1557) constructed a wall around ‘Udayna (...) Al-Muṭahhar’s wall failed to protect the citadel and town in 1546 from the conquering Ottoman armies, which had the advantage of cannonry” (Sadek 2017: 115).

In November-December 2003, the Egyptian architect Alaa Al-Habashi inspected al-Ashrafiyyah on behalf of UNESCO. In his Technical Conservation Report he describes the various sections of the Mosque/Madrasah. Based on data collected at the site and on the documentation examined, Al-Habashi believes that “the historical understanding could be questioned, and perhaps modified” with regard to the use of different materials for the three gates, in addition to the different decorated designs and architectural elements. Clearly, some rather serious problems damaged and continue to damage the buildings, due to careless management. Al-Habashi proposes urgent action to resolve these issues.⁴⁷

In 2004, the architect, Ālā’ Aḥmad Muḥammad al-Aṣḥabī, published an Architectural Study on al-Madrasah al-Ashrafiyyah.⁴⁸ The volume is a more detailed version of a master thesis she presented at the Yarmuk University, Jordan (2002). To date, it is the most exhaustive and best documented study on the subject. The work is divided into three main parts: I. study of the sources and historical references; II. research on the topographical location of the structures, study of the inscriptions, photographic documentation, creation of a small laboratory (*warshah ‘amal*) for analyses and measurements; III. an attempt to summarize the results of the study, evaluating the restorations carried out in the preceding years. This is followed by a series of proposed actions on the buildings of archaeological interest in the city of Ta‘izz, with particular focus on protecting al-Madrasah al-Ashrafiyyah in respect of its utility. “The revitalization of the heritage – writes the author – is rooted in the most intimate depths of our culture and vision of our nation” (al-Aṣḥabī 2004: 11-14).

The table of contents can give an idea of Ālā’ al-Aṣḥabī’s research: 1. Historical overview on the Rasulid Dawlah; 2. Construction of the Islamic *madrasahs* and their independence; 3. History of the construction of al-Madrasah al-Ashrafiyyah; 4. Position and general plan of the Madrasah; 5. Architectural elements and decorations; 6. Construction materials used; 7. Results of the research. Sources and Reference. Iconographic support (photographs and drawings by the author).

⁴⁷ See Section I, Chapter 2: The UNESCO missions.

⁴⁸ *Al-Madrasah al-Ashrafiyyah bi-Ta‘izz zaman al-Dawlah al-Rasūliyyah fī al-Yaman*, 2004. I want to thank Khaled al-Ansi for providing me with a photocopy of the text, which was fundamental for the purpose of this study.

Ālā' al-Aṣḥbahī believes that an organic plan was drawn up for the entire complex, with a clear plan for the distribution of the spaces and architectural elements. The Madrasah does not appear separate from the mosque in the construction project. According to this scholar, construction was done in the following steps: I. The mosque, the prayer hall (*bayt al-ṣalāh*); II. East and west study halls (*qa'āt al-dars*); III. Central space used as a cemetery (*jabbānah*); IV. Room for the Sufi (*khānqah*); V. Main entrance; VI. Minarets; VII. Corridors; VIII. Sanitary services connected to the Madrasah (al-Aṣḥbahī 2004: 79, 87).

The volume contains the text of the foundation inscriptions, the Qur'anic inscriptions and those on the memorial monuments that were accessible at the time of her research. There are doubts about interpretation or missing portions due to the deteriorated condition of the inscriptions. Ālā' al-Aṣḥbahī was able to make comparisons of the reading with the transcriptions of Shuhd Makki in the thesis discussed at the Sorbonne in 1991, entitled *Les écoles rassoulides à Ta'izz*; and was able to take advantage of the aid provided by al-Sayyid 'Abd al-Quddūs, director of antiquities.

* * *

Ronald Lewcock complained in 1983 about the deterioration that was destroying the decorations of al-Madrasah al-Ashrafiyyah. He stressed that the decorations of its domes “are surely unique in their beauty and magnificence among dome painting in the Mamluk style”. In his Foreword, the author recalls his early research with Rex Smith in 1972, and adds:

“From the perspective of almost a decade, and a far wider knowledge of much of the Yemen, it now seems to me that they are among the greatest works of man in South Arabia – a country extraordinarily rich in fine art and architecture – and of unique importance in the wider realm of Islamic art”.⁴⁹

Ronald Lewcock concluded his essay with a pressing appeal to save al-Madrasah al-Ashrafiyyah from deterioration. Many years would pass before his wish could be fulfilled. The works of conservation organized by the Yemeni Social Fund for Development and by the Istituto Veneto per i Beni Culturali (IVBC) in 2005-2015 were fortunately able to restore the Great Mosque in Ṣan'ā' and al-Madrasah al-Ashrafiyyah to their full glory and splendor, though they remain largely unknown among the general works of Islamic art and architecture.⁵⁰

⁴⁹ See above, Section 1, Chapter 3.

⁵⁰ See, for example, Blair and Bloom 1994: 94-96. Bernard O'Kane considers the Great Mosque of Ṣan'ā', the Mosque of Queen Arwā of Jiblah and al-Ashrafiyyah Madrasah Complex of Ta'izz among the 100 “most iconic Islamic houses of worship” (2008: items 3, 22, and 41). Even the Great Mosque of Ṣan'ā' has long been ignored in scientific literature. The pioneering and documented study by Paolo Costa in 1974 does not seem to have attracted any serious interest. This appears clear also in the authoritative publication, *The Art and Architecture of Islam 650-1250*, by R. Ettinghausen and O. Grabar, 1987: they devote no more than a few words to the Great Mosque of Ṣan'ā' (p. 45), although the authors quoted Costa's article in a note. The work done by the Social Fund for Development and by the Istituto Veneto per i Beni Culturali (IVBC) is documented in the volume *The Great Mosque of Ṣan'ā', Conservation Intervention (2005-2015)*, edited by Ravagnan and Merlo, Venezia, 2022.



Fig. 1. Al-Madrasah al-Ashrafiyyah (photograph by the author, 1984).



Fig. 2. Al-Madrasah al-Ashrafiyyah. On the right the domes of al-Muzaffariyyah; its minaret collapsed in 1962 (photograph by the author, 1984).

THE INSCRIPTIONS OF AL-MADRASAH AL-ASHRAFIYYAH

6. Inscriptions and calligraphic styles

The structure of al-Madrasah al-Ashrafiyyah is very different from that of the Great Mosque in Şan‘ā’. The two buildings are not comparable, as they were built at different times. The Great Mosque of Şan‘ā’, as it is now, is the product of works of expansion and reconstruction from the 9th to the 11th century (under the Yu‘firid and Şulayhid dynasties); al-Madrasah al-Ashrafiyyah dates from the 15th century (under the Rasūlid dynasty). In the former case, the structure is flat-roofed, coffered and decorated, with inscriptions in Kufic characters running along the walls. In the case of al-Ashrafiyyah, the structure has decorated domes, with inscriptions in *thuluth* calligraphy on the summit or extending around the sides.⁵¹

The photographic archive of the Istituto Veneto per i Beni Culturali (IVBC), kindly put at my disposal, provided the basis for my investigation. In 1984 I paid a visit to Ta‘izz and its monuments. Unfortunately, I did not have the opportunity to view the inscriptions inside al-Madrasah al-Ashrafiyyah.

Dalu Jones briefly but effectively describes the position and function of calligraphy in Islamic architecture:

“Calligraphy, like all Islamic decoration, is closely linked to geometry. In Arabic it is referred to as ‘the geometry of line’, implying that the proportions of the letters including the curved strokes are all governed by mathematical proportions. Inscriptions of buildings are generally written in an angular, sober and monumental script, *kūfī*, or in later more cursive styles, *naskhī* and *thuluth*. The range of variations between these basic types is immense, varying from century to century and from region to region. *Naskhī*, *thuluth* and *kūfī* bands can also be found in the same inscription, interwoven one within the other or superimposed, perhaps set out in different materials or colours.”⁵²

The great inscriptions in *thuluth* characters seem to derive closely from a “conscious external aesthetic intention”. Richard Ettinghausen wondered, on the subject of Arabic epigraphy, if this was meant to be “communication or symbolic affirmation”.⁵³ In monumental *thuluth*, *naskhī* or Kufic scripts, the letters are without diacritics that distinguish letters with the same *ductus* but with different values. Vowel signs are also missing. This undoubtedly creates considerable difficulty of reading. However, as far as Muslim believers are concerned, “with Qur’anic inscriptions one also needs to remember that the common practice of memorisation of the text would have made identification of it a much simpler matter than with non-Qur’anic inscriptions”.⁵⁴

⁵¹ See Lewcock and Smith 1974, 1975.

⁵² Jones, in Grube *et al.* 1975: 168.

⁵³ Ettinghausen 1974: 297.

⁵⁴ See O’Kane, 2021: 94. For a review of the various styles of Arabic writing, in particular Kufic script, I refer to my contribution in “The Great Mosque of Şan‘ā’: The Qur’anic Inscriptions”, 2022: 138-141.

The letters and decorative motifs of al-Madrasah al-Ashrafiyyah were found covered by layers of plaster or blackened due to lengthy exposure and lamp smoke. They required a delicate process of cleaning and restoration, and when necessary integration. The photographic documentation of the IVBC show their appearance both before and after restoration. In al-Madrasah al-Ashrafiyyah there are various styles of Arabic script:

- 1) *thuluth* for the large inscriptions painted on the plaster of the domes;
- 2) *thuluth* for the inscriptions carved into the plaster around the *mihrāb* and along the walls;
- 3) interlaced Kufic in a band at the base of the main dome and square Kufic in the word ‘Alī, used graphically;⁵⁵
- 4) *naskhī* in the foundation inscriptions engraved on stone and in those carved in the lintel of the western door and in the wooden *mashrabiyyahs*.

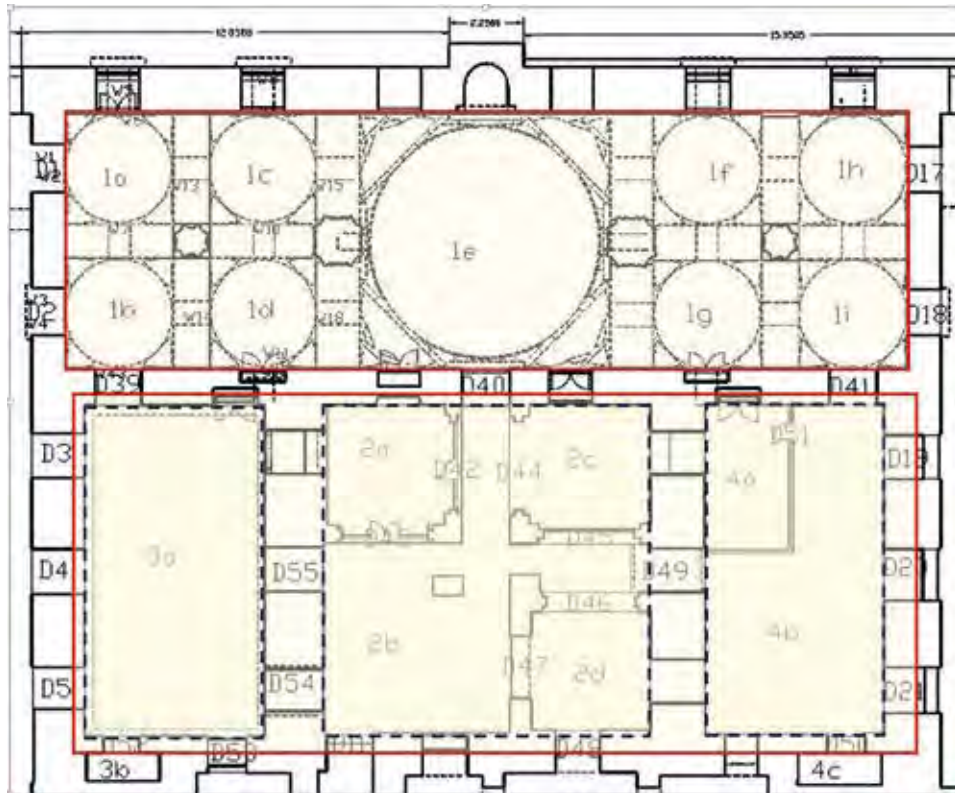


Fig. 3. Al-Madrasah al-Ashrafiyyah: plan.

⁵⁵ See the observations of Sheila Blair (1998: 62): “In addition to formal consideration, the content of the inscription also affected the style, for interlacing interfered with legibility, where it is essential to be able to read the patron’s name. Interlaced Kufic was therefore more popular for pious Kuranic inscriptions than for foundation inscriptions”. Blair distinguishes between *kūfī murabbaʿ* (square Kufic) and *kūfī mudawwar* (round Kufic), used mainly for manuscripts (2006: 144). Giovanni Oman attempted to define the three varieties of square Kufic on the basis of their structure, with a number of graphic reconstructions (1998: 69-88).



Fig. 4. This picture enables us to appraise the size of the letters of the inscriptions on the summit of the dome in the prayer hall (1e), at a height of 15 meters.



Fig. 5. Parts of inscriptions in a vertical section of the dome of the prayer hall (1e).

There are three levels of script: 1. In the upper inscription we can see the *basmalah* in *thuluth* script; 2. In the central part we can make out gilded letters in Kufik; 3. In the lower band there is a fragment of the *sūrah* Āl ‘Imrān, Q 3: 27 (see below the complete text of the inscriptions).



Fig. 6. Text in Kufic script, in a field decorated with floral and geometrical motifs.

The script quotes religious expressions in a highly stylized eastern Kufic. The vertical line of the *lām* is greatly elongated, woven into or surrounding rosettes or spirals: *li-l-* (لل)

[الحمد] لله الشكر لله الوحدة لله الكبرياء لله



Fig. 7. Calligraphic band with the name ‘Alī in square Kufic script.



Fig. 8. ‘Alī: detail of the script.

2

1

The last letter of the name ‘Alī علي is written in the ‘returning’ variant (*al-yā’ al-rā-jī’ah*). It is associated with the same letter, reversed to obtain an effect of graphic balance.⁵⁶



Fig. 9. Example of *thuluth* script carved into the plaster.

Detail of the inscription encircling the *mihrāb*. We see evidence of the expert engraving of the letters in the plaster and decorative elements (*zakhārif jiṣṣiyyah*) in the spaces between them, within a frame (Q 55: 26)

كُلُّ مَنْ عَلَيْهَا فَانٍ

In Figure 9 we can observe two lateral domes (indicated on the plan as **1f** and **1g**) with the arrangement of the inscriptions in monumental *thuluth* on the summit and along the arches. Among the decorative elements, we discern red or white Rasulid rosettes with five (sometimes six) petals; circular designs with appendices along the vertical axis (called by various names: *shams* ‘sun’, *naranj* ‘orange’; and locally *rummān* ‘pomegranate’); arabesques based on a geometrical structure. A second inscription in *thuluth* characters encircles the domes at the bottom. On the walls we see (on the right) a band with the name ‘Alī repeated and (on the left), a decorative motif, while around the great doors there are Qur’anic inscriptions.

⁵⁶ ‘Alī in square Kufic is also found in the Tāhirid al-Madrasah al-‘Āmiriyyah of Radā’ (al-Radi 1997, fig. 75). Giovanni Oman describes the example of the name ‘Alī in a centrifuge script repeated four times (1998: 76).



Fig. 10. Domes **1f** and **1g** (photograph by Majed Alahmadi, 2022).

7. Foundation inscriptions⁵⁷

The three foundation inscriptions in stone, in *naskhī* characters, were used as lintels on the doors of the southern portion of the Madrasah. The first is found over the central door preceding the courtyard; the second is placed on the entrance to the eastern minaret; the third is located on the upper section of the western minaret (it names the supervisor of the construction works).

⁵⁷ Cf. al-Aṣḥabī 2004: 65. The three foundation inscriptions were published with some gaps and variants by Ventrone Vassallo (Arabic text and Italian translation, 1992: 133-134, figs. 1-3), taken up again by Giunta (Arabic text and English translation, honorific titles in transcription 1997: 242). Ālā' al-Aṣḥabī published the Arabic text of the three inscriptions and a fourth foundation inscription, dated 803, on plaster, discovered in later restorations; it mentions the order of construction issued by the sultan al-Malik al-Ashraf (2004: 65-66, figs. 1-3). A later inscription, dated Ramaḍān 801, was discovered outside the southern entrance of the Madrasah by Shuhd Makkī; it begins with the *basmalah* and continues with the invitation to enter confidently: *Udkhulūhā bi-salām āminīn* (quotation from al-Aṣḥabī 2004: 66).



Fig. 11. Foundation inscription of al-Malik al-Ashraf Ismā'īl.

7.1 Foundation inscription I

أمر بعمارة هذه المدرسة المباركة مولانا ومالكنا السلطان بن السلطان السيد الأجل الملك
الأشرف

ممهد الدنيا والدين إسماعيل بن العباس بن علي بن داوود بن يوسف خلد الله ملكه ونصره

1. He ordered the construction of this blessed Madrasah, our master (*mawlānā*) and lord, the sultan, son of the sultan, the illustrious *sayyid*, al-Malik al-Ashraf,
2. the facilitator of life and religion, Ismā'īl ibn al-'Abbās ibn 'Alī ibn Dāwūd ibn Yūsuf. May God make his reign and his victory eternal.



Fig. 12. Foundation inscription dated 800 h.

7.2 Foundation inscription II

وكان ابتداء العمارة في هذه المدرسة
السعيدة في ثاني ربيع آخر سنة ثمان مائة

1. The construction of this blissful Madrasah was undertaken
2. the 2nd day of [the month of] Rabi' II of the year 800 [23 December 1397].

7.3 Foundation inscription III

The inscription, in *naskhī* characters, recalls the name of the *mawlā* of the fortress of Ta‘izz, supervisor of the construction works.



Fig. 13. Undated inscription of Ṣafī al-Dīn Jawhar.

وذكر سيد مولانا سيد الأمراء صفى الدين
جوهر الصبي الدويدار مولى حصن تعز المحروس

1. In memory of the *sayyid* of our lord, the *sayyid* of the emirs, Ṣafī al-Dīn
2. Jawhar al-Ṣabī al-Duwaydār, master (*mawlā*) of the fortress of Ta‘izz the protected one.⁵⁸

7.4 Inscription of completion of construction works, dated 803

The longest inscription, with the name and honorific titles of the sultan al-Malik al-Ashraf Ismā‘īl, is on the inside of the Madrasah in sectors **1i** and **1h** (see Plan, Fig. 3). The inscription in *thuluth* script is engraved in plaster in a band located in the southeast side of the complex. The extension over several walls prevented taking a panoramic photograph of it. I am quoting the complete text and a transcription; the reading and interpretation of some words remains doubtful:⁵⁹

١ أمر بإنشاء هذه المدرسة المباركة السعيدة السلطانية الملكية الأشرفية
٢ أيد الله سعادة ملك مولانا منشيتها مولانا السلطان الأعظم شاهان
٣ شاه المعظم مالك رقاب الأمم سيد ملوك العرب والعجم سلطان الإسلام
٤ والمسلمين سيد الملوك والسلاطين ناشر جناح العدل على العالمين ممهد
٥ الدنيا والدين اسماعيل ابن العباس ابن علي ابن داوود ابن يوسف ابن عمر
٦ بن علي ابن رسول اعزّه الله وبنيه وذلك بتاريخ عشر [ليالي] خلت من شهر
المحرم سنة ثلاث وثمانماية

⁵⁸ The names of cities, fortresses, etc. are generally followed by the word *maḥrūs* ‘protected’ by God.

⁵⁹ See Ventrone Vassallo: incipit in Arabic, Italian translation, dated 803 (1992: 134, figs. 4a-4b); Giunta (English translation: 1997: 243). Al-Aṣḥabī quotes the entire inscription, with gaps, observing that it came to light during works of restoration (2004: 66).

1. *Amara bi-inshā' hādhihi al-madrasah al-mubārakah al-sa'īdah al-sultāniyyah al-ashrafiyyah*
2. *ayyada Allāh sa'ādat mulk mawlānā munshīhā mawlānā al-sultān al-a'zam shāh-in*
3. *shāh al-mu'azzam mālīk riqāb al-umam sayyid mulūk al-'arab wa-l-'ajam sultān al-Islām*
4. *wa-l-muslimīn wa-l-salātīn nāshir jināh al-'adl 'alā al-'ālamīn mumahhid*
5. *al-dunyā wa-l-dīn Ismā'īl ibn al-'Abbās ibn 'Alī ibn Dāwūd ibn Yūsuf ibn 'Umar*
6. *ibn 'Alī ibn Rasūl a'azzahu Allāh wa-banīhi wa-dhālika bi-ta'rīkh 'ashar khalat min shahr al-Muḥarram sanah thalāth wa-thamāni-mi'ah.*

1. He ordered the construction of this Madrasah, blessed, happy, sultanial, *ashrafiyyah* (ref. to al-Malik al-Ashraf)
2. may God sustain the happiness of the reign of our master (*mawlānā*), his builder, the great sultan, king (*shāh*)
3. of kings, the greatest lord (*sayyid*) of the Arabs and non-Arabs, sultan of Islam,
4. of the Muslims and of the sultans, protector of men, facilitator
5. of life on earth and of the faith, Ismā'īl ibn al-'Abbās ibn 'Alī ibn Dāwūd ibn Yūsuf ibn 'Umar
6. ibn 'Alī ibn Rasūl. May God make him and his descendents powerful. This on the 10 [nights] past in the month of al-Muḥarram of the year 803 [August 1400].

Three significant sections of the inscription are shown: 1. order of construction of the Madrasah; 2. name of the sultan al-Malik al-Ashraf Ismā'īl; 3. the date 803 h.



Fig. 14. Order of construction issued by the sultan.

١ أمر بإنشاء هذه المدرسة المباركة السعيدة السلطانية الملكية ...



Fig. 15. Last section of the inscription.

٥ [ممهد] الدنيا والدين اسماعيل ابن العباس ابن علي ابن داوود ابن يوسف ابن عمر ا
٦ بن علي ابن رسول اعزه الله وبنيه وذلك بتاريخ عشر [ليالي] خلت من شهر المحرم
سنة ثلاث وثمانماية



Fig. 16. Detail of the date: year 803 h.

٦ وذلك بتاريخ عشر [ليالي] خلت من شهر المحرم سنة ثلاث وثمانماية

For the translations, see the complete text above.

8. The prayer hall and domes

The inscriptions in the domes are described on the basis of the order chosen in the map prepared by the IVBC, that goes from west (**1a**) to east (**1i**), while the central dome over the prayer hall is indicated with **1e**. It is shown in Arabic characters with the translation of the text starting from the summit of the dome and in the band underneath (as shown in the photographs). I decided not to limit myself to indicating the Surah and verse (for example Q 2: 255), but to quote the text in Arabic with the translation, to give an idea of the content and of the choices made by the calligraphers.

The list that follows is the result of the recognition of the Qur'anic citations found at al-Madrasah al-Ashrafiyyah. The dome is indicated (e.g. **1a**), followed by the number of the inscription starting from the summit (e.g. III). On the lateral walls of the Madrasah and along the arches there are many Qur'anic inscriptions. These have been omitted from the list due to the fragmentary character of the photographic documentation. The photography of dome **1i** shows the state of the wall before the restoration, as an example of the original state.

Basmalah and eulogy of the Prophet: **1e**, I.

Eulogies for the Prophet: **1e**, II.

Sūrah al-Baqarah (*The Cow*) 2: **1i**, I, verses 1-3; **1h**, II, verse 255; **1d**, III, verses 267-271; **1d**, II, verses 278-281; **1f**, II, verses 285-286.

Āl 'Imrān (*The Family of 'Imrān*) 3: **1f**, III, verses 1-7; **1g**, III, verses 17-20; **1g**, I, verse 26; **1e**, III, verses 26-27; **1i**, III, verses 34-37; **1c**, III, verses 133-136; **1h**, III, verses 190-194.

Sūrah al-A'rāf (*The Heights*) 7: **1b**, II, verses 54-56.

Sūrah al-Tawbah (*Repentance*) 9: **1a**, II, verse 111.

Sūrah Yūnus (*Jonah*) 10: **1d**, II, verse 9.

Sūrah Kahf (*The Cave*) 18: **1g**, II, verses 107-110.

Sūrah al-Baqarah (*The Cow*) 24: **1c**, II, verses 35-36.

Sūrah al-Aḥzāb (*The Joint Forces*) 33: **1f**, I, verse 56; **1a**, I, verses 70-72.

Sūrah Yā Sīn (*Yā Sīn*) 36: **1e**, I 1 1; **1i** II, verses 80-83.

Sūrah al-Raḥmān (*The Lord of Mercy*) 55: verses 14-27 (*miḥrāb*).

Sūrah al-Burūj (*The Towering Constellations*) 85: **1b**, III, verses 1-22.

Sūrah al-A'rāf (*The Heights*) 87: **1g**, III, verses 1-19.

Sūrah al-Naṣr (*Help*) 110: **1b**, II, 1-3.

Sūrah al-Ikhlāṣ (*Purity [of Faith]*) 112: **1c**, II, verses 1-4.

The Prayer Hall (1e)

The prayer hall is the central part of the building. The niche of the *miḥrāb* is located on the north wall and is surrounded by a long Qur'anic inscription in *thuluth* characters carved

in the plaster, with the entire Sūrah al-Raḥmān (55: The Lord of Mercy).⁶⁰ The central portion of the inscription is presented, on the basis of the available photography.



Fig. 17. The Qur'anic inscription around the *mihrāb*.

Sūrah al-Raḥmān (The Lord of Mercy) 55: 14-27.

﴿ خَلَقَ الْإِنْسَانَ مِنْ صَلْصَالٍ كَالْفَخَّارِ ﴿١٤﴾ وَخَلَقَ ﴿١٥﴾ الْجَانَّ مِنْ مَّارِجٍ مِنْ نَارٍ ﴿١٦﴾ فَبَايَ آلَاءِ رَبِّكُمَا تُكَذِّبَانِ ﴿١٧﴾ رَبُّ الْمَشْرِقَيْنِ وَرَبُّ الْمَغْرِبَيْنِ ﴿١٨﴾ فَبَايَ آلَاءِ رَبِّكُمَا تُكَذِّبَانِ ﴿١٩﴾ بَيْنَهُمَا بَرْزَخٌ لَا يَبْغِيَانِ ﴿٢٠﴾ فَبَايَ آلَاءِ رَبِّكُمَا تُكَذِّبَانِ ﴿٢١﴾ يَخْرُجُ مِنْهُمَا اللُّؤْلُؤُ وَالْمَرْجَانُ ﴿٢٢﴾ فَبَايَ آلَاءِ رَبِّكُمَا تُكَذِّبَانِ ﴿٢٣﴾ وَلَهُ الْجَوَارِ الْمُنشَآتُ فِي الْبَحْرِ كَالْأَعْلَامِ ﴿٢٤﴾ فَبَايَ آلَاءِ رَبِّكُمَا تُكَذِّبَانِ ﴿٢٥﴾ كُلُّ مَنْ عَلَيْهَا فَانٍ ﴿٢٦﴾ وَيَبْقَى وَجْهُ رَبِّكَ ذُو الْجَلَالِ ﴿٢٧﴾ وَالْإِكْرَامِ ﴾

سورة الرحمن

[¹⁴ He created mankind out of dried clay, like pottery] ¹⁵ He created the jinn out of smokeless fire. ¹⁶ Which, then, of your Lord's blessings do you both deny? ¹⁷ He is Lord of the two risings and the two settings.⁽⁶¹⁾ ¹⁸ Which, then, of your Lord's blessings do you both deny? ¹⁹ He released the two bodies of [fresh and salt] water. ²⁰ They meet, yet there is a barrier between them they do not cross. ²¹ Which, then, of your Lord's blessings do you both deny? ²² Pearls come forth from them: large ones, and small, brilliant ones. ²³ Which, then, of your

⁶⁰ A Medinan sura that highlights God's wonders in this world, describes the end of the world, and paints an evocative picture of the delights of Paradise. The sura is characterized by the refrain "Which, then, of your Lord's blessings do you both deny?" (*The Qur'an*: 354).

⁶¹ This refers to the rising and setting of the sun and the moon.

Lord's blessings do you both deny? ²⁴ His are the moving ships that float, high as mountains, on the sea. ²⁵ Which, then, of your Lord's blessings do you both deny? ²⁶ Everyone on earth perishes. ²⁷ All that remains is the Face of your Lord, full of majesty [bestowing honour].

Dome 1e (Prayer hall)



Fig. 18. The dome of the prayer hall.



Fig. 19. Detail of the center of the dome.

Dome **1e**: I. Inscription in the central part, *thuluth* Mamluki script in large characters.

بسم الله الرحمن الرحيم لا إله إلا الله محمد رسول الله صلى الله عليه وسلم

In the name of God, the Merciful, the Compassionate There is no god except God
Muḥammad is the messenger of God Prayers of God upon him.

Dome **1e**: II. Inscription in the upper band, Kufic script.

بسم الله الرحمن الرحيم العزة لله الملك لله البقاء لله العظمة لله البهاء لله
القدرة لله الكمال لله الحمد لله الشكر لله الوحدة لله الكبرياء لله سبحانه

In the name of God, the Merciful, the Compassionate.

To God belong the might, the reign, the immortality, the greatness, the splendor, the omnipotence, the perfection, the praise, the gratitude, the oneness, the greatness. [God] be praised!⁶²

Dome **1e**: III. Inscription in the middle band, *Kufic* script.

Āl ‘Imrān (*The Family of ‘Imrān*) 3: 26 -27.

﴿ قُلِ اللَّهُمَّ مَالِكُ الْمُلْكِ تُؤْتِي الْمُلْكَ مَنْ تَشَاءُ وَتَنْزِعُ الْمُلْكَ مِمَّنْ تَشَاءُ وَتُعِزُّ مَنْ تَشَاءُ وَتُذِلُّ
مَنْ تَشَاءُ بِيَدِكَ الْخَيْرُ إِنَّكَ عَلَى كُلِّ شَيْءٍ قَدِيرٌ ﴾ ﴿ ٢٦ ﴾ تُؤَلِّجُ اللَّيْلَ فِي النَّهَارِ وَتُؤَلِّجُ النَّهَارَ فِي اللَّيْلِ
وَتُخْرِجُ الْحَيَّ مِنَ الْمَيِّتِ وَتُخْرِجُ الْمَيِّتَ مِنَ الْحَيِّ وَتَرْزُقُ مَنْ تَشَاءُ بِغَيْرِ حِسَابٍ ﴾ ﴿ ٢٧ ﴾
سورة آل عمران

²⁶ Say, ‘God, holder of all control, You give control to whoever You will and remove it from whoever You will; You elevate whoever You will and humble whoever You will. All that is good lies in Your hand: You have power over everything.

²⁷ You merge night into day and day into night; You bring the living out of the dead and the dead out of the living; You provide limitlessly for whoever You will.’

Inscription **1e**: IV. On the walls, *thuluth* script.

Sūrah Yā Sīn (*Yā Sīn*) 36: 1-29.

بسم الله الرحمن الرحيم
﴿ يَس ١ ﴾ وَالْقُرْآنِ الْحَكِيمِ ﴿ ٢ ﴾ إِنَّكَ لَمِنَ الْمُرْسَلِينَ ﴿ ٣ ﴾ عَلَى صِرَاطٍ مُسْتَقِيمٍ ﴿ ٤ ﴾ تَنْزِيلَ الْعَزِيزِ
الرَّحِيمِ ﴿ ٥ ﴾ لِيُنذِرَ قَوْمًا مَّا أُنذِرَ آبَاؤُهُمْ فَهُمْ غَافِلُونَ ﴿ ٦ ﴾ (...) لِيَأْكُلُوا مِن ثَمَرِهِ وَمَا عَمِلَتْهُ

62 Some of these expressions evoke the 99 epithets of God (*al-asmā’ al-ḥusnā*); e.g. al-‘Azīz (the Mighty), al-Malik (the King); al-Bāqī (the Eternal).

أَيَّدِيهِمْ أَفَلَا يَشْكُرُونَ ﴿٣٥﴾ سُبْحَانَ الَّذِي خَلَقَ الْأَزْوَاجَ كُلَّهَا مِمَّا تُنْبِتُ الْأَرْضُ وَمِنْ أَنْفُسِهِمْ
وَمِمَّا لَا يَعْلَمُونَ ﴿٣٦﴾ وَآيَةٌ لَهُمُ اللَّيْلُ نَسْلَخُ مِنْهُ النَّهَارَ فَإِذَا هُمْ مُظْلِمُونَ ﴿٣٧﴾ وَالشَّمْسُ تَجْرِي
لِمُسْتَقَرٍّ لَهَا ذَلِكَ تَقْدِيرُ الْعَزِيزِ الْعَلِيمِ ﴿٣٨﴾ وَالْقَمَرَ قَدَرْنَا مَنَازِلَ حَتَّىٰ عَادَ كَالْعُرْجُونِ الْقَدِيمِ ﴿٣٩﴾
سورة يس

In the name of God, the Merciful, the Compassionate.

¹ Yā Sīn. ² By the wise Qur'an, ³ you [Muḥammad] are truly one of the messengers sent ⁴ on a straight path, ⁵ with a revelation from the Almighty, the Lord of Mercy, ⁶ to warn a people whose forefathers were not warned, and so they are unaware. (verses 7-33)

³⁴ We have put gardens of date palms and grapes in the earth, and We have made springs of water gush out of it ³⁵ so that they could eat its fruit. It was not their own hands that made all this. How can they not give thanks? ³⁶ Glory be to Him who created all the pairs of things that the earth produces, as well as themselves and other things they do not know about. ³⁷ The night is also a sign for them: We strip the daylight from it, and – lo and behold! – they are in darkness. ³⁸ The sun, too, runs its determined course laid down for it by the Almighty, the All Knowing. ³⁹ We have determined phases for the moon until finally it becomes like the old date-stalk.

Dome 1a



Fig. 20. Central part of dome 1a, *thuluth* script.

للهم صلى وسلم على سيدنا محمد يا ذا الجلال والإكرام ورضى الله عن الصحابة أجمعين

Oh God, bless our *sayyid* Muḥammad and grant him salvation! You who possess glory and nobility! May God be pleased with all the Companions [of the Prophet Muḥammad].

Dome **1a: II.** Inscription in the middle section of the dome, *thuluth* script.
Sūrah al-Aḥzāb (*The Joint Forces*) 33: 70-72.

يَا أَيُّهَا الَّذِينَ آمَنُوا اتَّقُوا اللَّهَ وَقُولُوا قَوْلًا سَدِيدًا ﴿٧٠﴾ يُصْلِحْ لَكُمْ أَعْمَالَكُمْ وَيَغْفِرْ لَكُمْ ذُنُوبَكُمْ
وَمَنْ يُطِيعِ اللَّهَ وَرَسُولَهُ فَقَدْ فَازَ فَوْزًا عَظِيمًا ﴿٧١﴾ إِنَّا عَرَضْنَا الْأَمَانَةَ عَلَى السَّمَاوَاتِ وَالْأَرْضِ
وَالْجِبَالِ فَأَبَيْنَ أَنْ يَحْمِلْنَهَا وَأَشْفَقْنَ مِنْهَا وَحَمَلَهَا الْإِنْسَانُ إِنَّهُ كَانَ ظَلُومًا جَهُولًا ﴿٧٢﴾
سورة الأحزاب

⁷⁰ Believers, be mindful of God, speak in a direct fashion and to good purpose, ⁷¹ and He will put your deeds right for you and forgive you your sins. Whoever obeys God and His Messenger will truly achieve a great triumph. ⁷² We offered the Trust to the heavens, the earth, and the mountains, yet they refused to undertake it and were afraid of it; mankind undertook it – they have always been inept and foolish.

Dome **1a: III.** Inscription on the wall.
Sūrah al-Tawbah (*Repentance*) 9: 111.

Dome **1a: IV.** Inscription on the lower portion of the wall.
Sūrah al-A‘lā (*The Most High*) 87: 1-19.

Dome 1b

Dome **1b: I.** Inscription in the circular band at the center of the dome.
Sūrah al-Naṣr (*Help*) 110: 1-3.

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
﴿١﴾ إِذَا جَاءَ نَصْرُ اللَّهِ وَالْفَتْحُ ﴿٢﴾ وَرَأَيْتَ النَّاسَ يَدْخُلُونَ فِي دِينِ اللَّهِ أَفْوَاجًا ﴿٣﴾ فَسَبِّحْ بِحَمْدِ
رَبِّكَ وَاسْتَغْفِرْهُ إِنَّهُ كَانَ تَوَّابًا ﴿٤﴾
سورة النصر

In the name of God, the Merciful, the Compassionate.

¹ When God's help comes and He opens up your way [Prophet], ² when you see people embracing God's faith in crowds, ³ celebrate the praise of your Lord and ask His forgiveness; He is always ready to accept repentance.



Fig. 21. Dome **1b**.

Dome **1b**: II. Inscription in the band below.

Sūrah al-A‘rāf (*The Heights*) 7: 54-56. (Interpolation at the end of verse 54 with the expression *aḥsan al-khāliqīn* [‘the best of Creators’] referring to God).

﴿ إِنَّ رَبَّكُمُ اللَّهُ الَّذِي خَلَقَ السَّمَاوَاتِ وَالْأَرْضَ فِي سِتَّةِ أَيَّامٍ ثُمَّ اسْتَوَىٰ عَلَى الْعَرْشِ يُغْشِي
اللَّيْلَ النَّهَارَ يَطْلُبُهُ حَثِيثًا وَالشَّمْسَ وَالْقَمَرَ وَالنُّجُومَ مُسَخَّرَاتٍ بِأَمْرِهِ ۗ أَلَا لَهُ الْخَلْقُ وَالْأَمْرُ تَبَارَكَ
اللَّهُ [رَبُّ الْعَالَمِينَ] ﴿٥٤﴾ أَحْسَنَ الْخَالِقِينَ ﴿٥٥﴾ ادْعُوا رَبَّكُمْ تَضَرُّعًا وَخُفْيَةً ۚ إِنَّهُ لَا يُحِبُّ
الْمُعْتَدِينَ ﴿٥٦﴾ وَلَا تَفْسِدُوا فِي الْأَرْضِ بَعْدَ إِصْلَاحِهَا وَادْعُوهُ خَوْفًا وَطَمَعًا ۚ إِنَّ رَحْمَةَ اللَّهِ قَرِيبٌ
مِّنَ الْمُحْسِنِينَ ﴿٥٧﴾ ﴾
سورة الأعراف

⁵⁴ Your Lord is God, who created the heavens and earth in six Days, then established Himself on the throne; He makes the night cover the day in swift pursuit; He created the sun, moon and stars to be subservient to His command; all creation and command belong to Him. Exalted be God, Lord of all the worlds! ⁵⁵ Call on your Lord humbly and privately – He does not like those who transgress His bounds: ⁵⁶ do not corrupt the earth after it has been set right – call on Him fearing and hoping. The mercy of God is close to those who do good.

Dome **1b**: III. Inscription on the wall.

Sūrah al-Burūj (*The Towering Constellations*) 85: 1-22.

Dome 1c**Fig. 22.** The center of the dome.

Dome **1c**: I. Inscription at the center of the dome.

Sūrah al-Ikhlāṣ (*Purity [of Faith]*) 112: 1-4.

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
 قُلْ هُوَ اللَّهُ أَحَدٌ ۝ اللَّهُ الصَّمَدُ ۝ لَمْ يَلِدْ وَلَمْ يُولَدْ ۝ وَلَمْ يَكُنْ لَهُ كُفُوًا أَحَدٌ ۝
 سورة الإخلاص

In the name of God the Merciful, the Compassionate.

¹ Say, 'He is God the One, ² God the eternal. ³ He begot no one nor was He begotten.

⁴ No one is comparable to Him'.

Dome **1c**: II. Inscription in the middle band.

Sūrah al-Nūr (*Light*) 24: 35-36

اللَّهُ نُورُ السَّمَاوَاتِ وَالْأَرْضِ مِثْلُ نُورِهِ كَمِشْكَاةٍ فِيهَا مِصْبَاحٌ الْمِصْبَاحُ فِي زُجَاجَةٍ الزُّجَاجَةُ
 كَأَنَّهَا كَوْكَبٌ دُرِّيٌّ يُوقَدُ مِنْ شَجَرَةٍ مُبَارَكَةٍ زَيْتُونَةٍ لَا شَرْقِيَّةٍ وَلَا غَرْبِيَّةٍ يَكَادُ زَيْتُهَا يُضِيءُ وَلَوْ
 لَمْ تَمْسَسْهُ نَارٌ نَوْراً عَلَى نُورٍ يَهْدِي اللَّهُ لِنُورِهِ مَنْ يَشَاءُ وَيَضْرِبُ اللَّهُ الْأَمْثَالَ لِلنَّاسِ وَاللَّهُ بِكُلِّ
 شَيْءٍ عَلِيمٌ ۝ فِي يُبُوتِ أَذُنُ اللَّهِ أَنْ تَرْفَعَ وَيُذَكَّرَ فِيهَا اسْمُهُ [يُسَبِّحُ لَهُ فِيهَا بِالْغُدُوِّ
 وَالْآصَالِ] ۝
 سورة النور

(The conclusion of the verse, quoted in brackets, is not shown for lack of space)

³⁵ God is the Light of the heavens and earth. His Light is like this: there is a niche, and in it a lamp, the lamp inside a glass, a glass like a glittering star, fuelled from a blessed olive tree from neither east nor west, whose oil almost gives light even when no fire touches it – light upon light – God guides whoever He will to his Light; God draws such comparisons for people; God has full knowledge of everything – ³⁶ shining out in houses of worship. God has ordained that they be raised high and that His name be remembered in them, [with men in them celebrating His glory morning and evening].

Dome **1c**: III. Inscription on the wall below.

Sūrah Āl ‘Imrān (The Family of ‘Imrān) 3: 133-136.

Dome 1d



Fig. 23. The summit of the dome.

Dome **1d**: I. Inscription in the upper band, *thuluth* script.

Sūrah Yūnus (*Jonah*) 10: 9

﴿ إِنَّ الَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ يَهْدِيهِمْ رَبُّهُمْ بِإِيمَانِهِمْ تَجْرِي مِنْ تَحْتِهِمُ الْأَنْهَارُ فِي جَنَّاتِ النَّعِيمِ ﴾

⁹ But as for those who believe and do good deeds, their Lord will guide them because of their faith. Streams will flow at their feet in the Gardens of Bliss.

Dome **1f**: I. Inscription on the summit of the dome, *thuluth* script.

Sūrah al-Aḥzāb (*The Joint Forces*) 33: 56

﴿ إِنَّ اللَّهَ وَمَلَائِكَتَهُ يُصَلُّونَ عَلَى النَّبِيِّ يَا أَيُّهَا الَّذِينَ آمَنُوا صَلُّوا عَلَيْهِ وَسَلِّمُوا تَسْلِيمًا ﴾
سورة الأحزاب

⁵⁶ Those who turn for protection to God, His Messenger, and the believers [are God's party] : God's party is sure to triumph.

Dome **1f**: II. Inscription at the base of the dome, *thuluth* script.

Sūrah al-Baqarah (*The Cow*) 2: 285-286

﴿ آمَنَ الرَّسُولُ بِمَا أُنزِلَ إِلَيْهِ مِنْ رَبِّهِ وَالْمُؤْمِنُونَ كُلٌّ آمَنَ بِاللَّهِ وَمَلَائِكَتِهِ وَكُتُبِهِ وَرُسُلِهِ لَا نُفَرِّقُ
بَيْنَ أَحَدٍ مِنْ رُسُلِهِ وَقَالُوا سَمِعْنَا وَأَطَعْنَا غُفْرَانَكَ رَبَّنَا وَإِلَيْكَ الْمَصِيرُ ﴾ لَا يُكَلِّفُ اللَّهُ نَفْسًا إِلَّا
وُسْعَهَا لَهَا مَا كَسَبَتْ وَعَلَيْهَا مَا اكْتَسَبَتْ رَبَّنَا لَا تُؤَاخِذْنَا إِنْ نَسِينَا أَوْ أَخْطَأْنَا رَبَّنَا وَلَا تَحْمِلْ
عَلَيْنَا إِصْرًا كَمَا حَمَلْتَهُ عَلَى الَّذِينَ مِنْ قَبْلِنَا رَبَّنَا وَلَا تُحَمِّلْنَا مَا لَا طَاقَةَ لَنَا بِهِ وَاعْفُ عَنَّا وَاعْفِرْ
لَنَا وَارْحَمْنَا أَنْتَ مَوْلَانَا فَانصُرْنَا عَلَى الْقَوْمِ الْكَافِرِينَ ﴾
سورة البقرة

²⁸⁵ The Messenger believes in what has been sent down to him from his Lord, as do the faithful. They all believe in God, His Angels, His scriptures, and His messengers. 'We make no distinction between any of His messengers,' they say, 'We hear and obey. Grant us Your forgiveness, our Lord. To you we all return!' – ²⁸⁶ God does not burden any soul with more than it can bear: each gains whatever good it has done, and suffers its bad – 'Lord do not take us to task if we forget or make mistakes. Lord, do not burden us as You burdened those before us. Lord, do not burden us with more than we have strength to bear. Pardon us, forgive us, and have mercy on us. You are the Protector, so help us against the disbelievers.'

Dome **1f**: III. Inscription on the wall, *thuluth* script.

Sūrah Āl 'Imrān (*The Family of 'Imrān*) 3: 1–7.

Dome 1g



Fig. 25. Summit of dome 1g.

Dome **1g**: I. Inscription at the center of the dome, *thuluth* script.

Sūrah Āl ‘Imrān (*The Family of ‘Imrān*) 3: 26

﴿ قُلِ اللَّهُمَّ مَالِكَ الْمُلْكِ تُؤْتِي الْمُلْكَ مَنْ تَشَاءُ وَتَنْزِعُ الْمُلْكَ مِمَّنْ تَشَاءُ وَتُعِزُّ مَنْ تَشَاءُ وَتُذِلُّ مَنْ تَشَاءُ يَبْدِكَ الْخَيْرُ إِنَّكَ عَلَىٰ كُلِّ شَيْءٍ قَدِيرٌ ﴾
سورة آل عمران

²⁶ Say, ‘God, holder of all control, You give control to whoever You will and remove it from whoever You will; You elevate whoever You will and humble whoever You will. All that is good lies in Your hand: You have power over everything.

Dome **1g**: II. Inscription on the wall, *thuluth* script.

Sūrah al-Kahf (*The Cave*) 18: 107-110

﴿ إِنَّ الَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ كَانَتْ لَهُمْ جَنَّاتُ الْفِرْدَوْسِ نُزُلًا ﴾ خَالِدِينَ فِيهَا لَا يَبْغُونَ عَنْهَا حِوَلًا ﴿١٠٨﴾ قُلْ لَوْ كَانَ الْبَحْرُ مِدَادًا لِكَلِمَاتِ رَبِّي لَنَفِدَ الْبَحْرُ قَبْلَ أَنْ تَنْفَدَ كَلِمَاتُ رَبِّي وَلَوْ جِئْنَا بِمِثْلِهِ مَدَدًا ﴿١٠٩﴾ قُلْ إِنَّمَا أَنَا بَشَرٌ مِثْلُكُمْ يُوحَىٰ إِلَيَّ أَنَّمَا إِلَهُكُمْ إِلَهٌ وَاحِدٌ فَمَنْ كَانَ يَرْجُوا لِقَاءَ رَبِّهِ فَلْيَعْمَلْ عَمَلًا صَالِحًا وَلَا يُشْرِكْ بِعِبَادَةِ رَبِّهِ أَحَدًا ﴿١١٠﴾
سورة الكهف

¹⁰⁷ But those who believe and do good deeds will be given the Gardens of Paradise. ¹⁰⁸ There they will remain, never wishing to leave. ¹⁰⁹ Say [Prophet], ‘If the whole ocean were ink for writing the words of my Lord, it would run dry before those words were exhausted’

– even if We were to add another ocean to it. ¹¹⁰ Say, ‘I am only a human being, like you, to whom it has been revealed that your God is One. Anyone who fears to meet his Lord should do good deeds and give no one a share in the worship due to his Lord.

Dome **1g**: III. Inscription on the wall, *thuluth* script.
Sūrah Āl ‘Imrān (*The Family of ‘Imrān*) 3: 17-20

Dome 1h



Fig. 26. Center of dome 1h.

Dome **1h**: I. Inscription at the center of the dome, *thuluth* script.
Basmalah and *shahādah*.

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ لَا إِلَهَ إِلَّا اللَّهُ مُحَمَّدٌ رَسُولُ اللَّهِ

In the name of God, the Merciful, the Compassionate.
There is no god but Him, Muḥammad is the Messenger of God.

Dome **1h**: II. Inscription in the upper band, *thuluth* script.
Sūrah al-Baqarah (*The Cow*) 2: 255 (‘The verse of the Throne’)

﴿اللَّهُ لَا إِلَهَ إِلَّا هُوَ الْحَيُّ الْقَيُّومُ لَا تَأْخُذُهُ سِنَّةٌ وَلَا نَوْمٌ لَهُ مَا فِي السَّمَاوَاتِ وَمَا فِي الْأَرْضِ مَنْ ذَا الَّذِي يَشْفَعُ عِنْدَهُ إِلَّا بِإِذْنِهِ يَعْلَمُ مَا بَيْنَ أَيْدِيهِمْ وَمَا خَلْفَهُمْ وَلَا يُحِيطُونَ بِشَيْءٍ مِنْ عِلْمِهِ إِلَّا بِمَا شَاءَ وَسِعَ كُرْسِيُّهُ السَّمَاوَاتِ وَالْأَرْضَ وَلَا يَئُودُهُ حِفْظُهُمَا وَهُوَ الْعَلِيُّ الْعَظِيمُ﴾
سورة البقرة

²⁵⁵ God: there is no god but Him, the Ever Living, the Ever Watchful. Neither slumber nor sleep overtakes Him. All that is in the heavens and in the earth belongs to Him. Who is there that can intercede with Him except by His leave? He knows what is before them and what is behind them, but they do not comprehend any of His knowledge except what He wills. His throne extends over the heavens and the earth; it does not weary Him to preserve them both, He is the Most High, the Tremendous.

Dome **1h**: III. Inscription on the wall, *thuluth* script.
Sūrah Āl ‘Imrān (*The Famili of ‘Imrān*) 3: 190-194

Dome 1i



Fig. 27. Summit of dome **1i**, before restoration.

Dome **1i**: I. Inscription at the center of the dome, *thuluth* script.
Sūrah al-Baqarah (*The Cow*) 2: 1-3.

﴿ اَلَمْ ؕ ذٰلِكَ الْكِتٰبُ لَا رَيْبَ فِيْهِ هُدًى لِّلْمُتَّقِيْنَ ۝۲ الَّذِيْنَ يُؤْمِنُوْنَ بِالْغَيْبِ وَيُقِيْمُوْنَ الصَّلٰةَ
وَمِمَّا رَزَقْنَاهُمْ يُنْفِقُوْنَ ۝۳ ﴾
سورة البقرة

¹ *Alif Lam Mim* ² This is the Scripture in which there is no doubt, containing guidance for those who are mindful of God, ³ who believe in the unseen, keep up the prayer, and give out of what We have provided for them.

Dome **1i**: II. Inscription in the upper band, *thuluth* script.

Sūrah Yā Sīn (*Ya Sin*) 36: 80-83

﴿ الَّذِي جَعَلَ لَكُم مِّنَ الشَّجَرِ الْأَخْضَرِ نَارًا فَإِذَا أَنْتُمْ مِنْهُ تُوقِدُونَ ﴾ ﴿ أَوَلَيْسَ الَّذِي خَلَقَ
السَّمَاوَاتِ وَالْأَرْضَ بِقَادِرٍ عَلَىٰ أَنْ يَخْلُقَ مِثْلَهُمْ بَلَىٰ وَهُوَ الْخَلَّاقُ الْعَلِيمُ ﴾ ﴿ إِنَّمَا أَمْرُهُ إِذَا أَرَادَ
شَيْئًا أَنْ يَقُولَ لَهُ كُنْ فَيَكُونُ ﴾ ﴿ فَسُبْحَانَ الَّذِي يَدِيهِ مَلَكُوتُ كُلِّ شَيْءٍ وَإِلَيْهِ تُرْجَعُونَ ﴾ ﴿

سورة يس

⁸⁰ It is He who produces fire for you out of the green tree – lo and behold! – and from this you kindle fire. ⁸¹ Is He who created the heavens and earth not able to create the likes of these people? Of course He is! He is the All Knowing Creator: ⁸² when He wills something to be, His way is to say, “Be” – and it is! ⁸³ So glory be to Him in whose Hand lies control over all things. It is to Him that you will all be brought back.

Dome **1i**: III. Inscription on the wall, *thuluth* script.

Sūrah Āl ‘Imrān (*The Family of ‘Imrān*) 3: 34-37

9. Memorial monuments

The bodies of al-Malik al-Ashraf Ismā‘īl and of other family members were buried in the reserved ground in the cemetery zone of the al-Madrasah al-Ashrafiyyah complex.⁶³ The main cenotaphs are found in the small internal courtyard, indicated on the plan with the

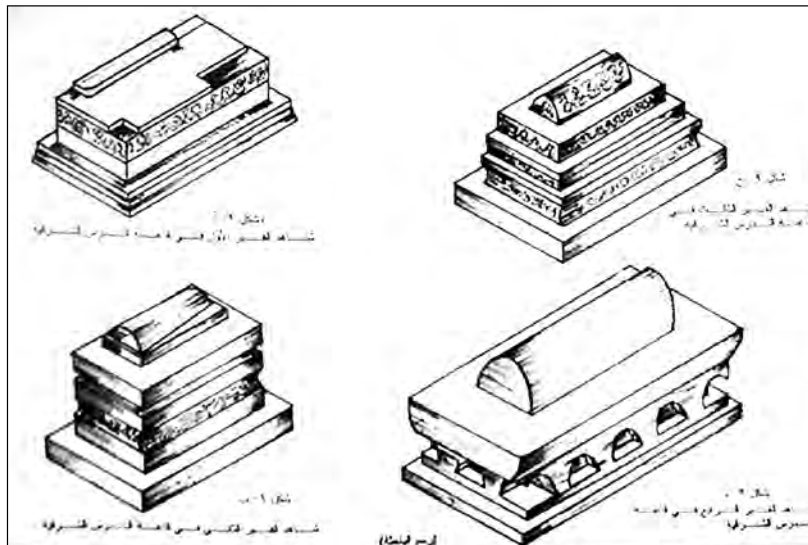


Fig. 28. Models of cenotaphs (after al-Aṣḥabī 2004).

⁶³ According to al-Kibsi, burials in the Madrasah would include: 1. al-Ashraf Ismā‘īl ibn ‘Abbās (d. 803 h.); 2. al-Nāṣir Aḥmad ibn Ismā‘īl (d. 829 h.); 3. al-Manṣūr ibn al-Nāṣir (d. 830 h.); 4. al-Ashraf Ismā‘īl ibn al-Nāṣir (d. 831 h.) (*al-Laṭā‘if al-saniyyah*, 163-164).

letters 2a, 2c, 2d (see Fig. 29). The other cenotaphs are located in the library section (*qā'at al-dars*), indicated with the letters 4a and 4b.

The inscriptions are relatively legible after the removal of the many coats of plaster and green paint that covered the monuments. The photographic documented provided by the IVBC was intended more for the restoration than for the inscriptions as such. A reading at the site could clarify any residual doubts about interpretation. The transcriptions offered here rely in particular on the research done by the architect Ālā' al-Aṣḥabī, published in 2004 (before IVBC restoration). She also drew the cenotaphs, highlighting four models.⁶⁴

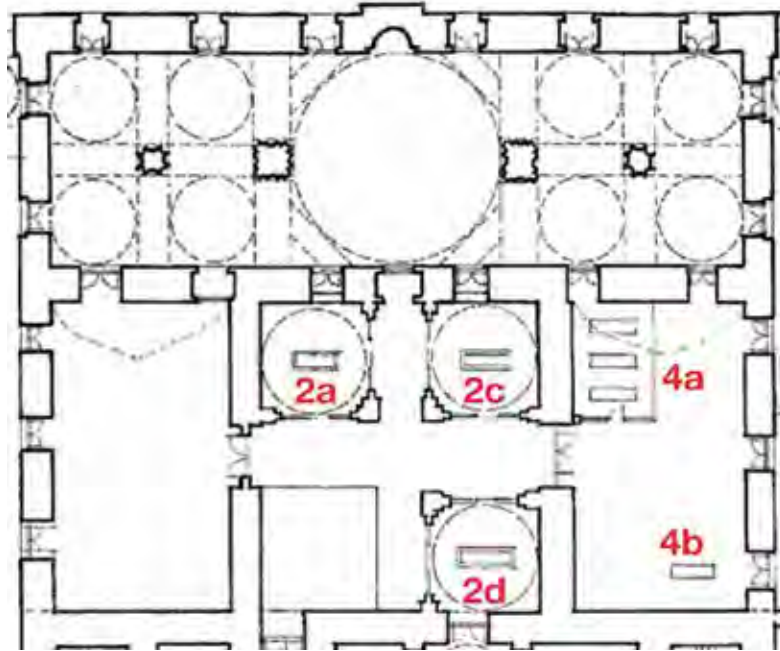


Fig. 29. Distribution of the cenotaphs (see also Fig. 3, plan).

Here is a list of the deceased on the basis of the inscriptions:

1. al-Malik al-Ashraf Ismā'īl, d. 803
2. al-Malik al-Nāṣir Aḥmad ibn Ismā'īl, d. 827
3. a wife of al-Malik al-Ashraf Ismā'īl (?)⁶⁵
- Four more cenotaphs are found in the library:
4. al-Malik al-Zāfir Ḥasan ibn al-Malik al-Ashraf Ismā'īl (d. 802)
5. (A son of ?) ... al-Malik al-Nāṣir Aḥmad ibn Ismā'īl (d. ?)
6. al-Malik al-Mujāhid ... (?) 'Alī ibn al-Malik al-Nāṣir Aḥmad (d. 826)
7. ... al-Malik al-Mufaḍḍal Muḥammad (d. 847).

⁶⁴ Al-Aṣḥabī 2004: 104-120, 320 (*shakl* 9).

⁶⁵ According to oral evidence, she would be Jihah al-Tawāshī Mu'tab, wife of al-Malik al-Ashraf. However historical sources say that the queen was buried in Zabīd in 796 (*Tārīkh al-dawlah al-rasūliyyah*, 121; al-Khazrajī, *al-Uqūd al-lu'lu'iyah*, vol. 2: 252). Al-Aṣḥabī points out that construction of al-Madrasah al-Ashrafiyyah only began in 800 h. (2004: 105). This could be the sultan's second wife, Jihah al-Tawāshī Marjān (see *Tārīkh al-dawlah al-rasūliyyah*, 121).

Cenotaph 1: al-Malik al-Ashraf Ismāʿīl (2a)



Fig. 30. The cenotaph al-Malik al-Ashraf Ismāʿīl before removal of the green paint.



Fig. 31. Inscription in gold letters on the north side of the cenotaph.



Fig. 32. The *basmalah*.

At the bottom we can see mosque lamps (*thurayyāt*) as decorative elements. The lamp could evoke the verses of the Light (Q 24: 35-36).



Fig. 33. North side of the cenotaph with the name of sultan al-Malik al-Ashraf.

بسم الله الرحمن الرحيم
 هذا قبر العبد المفتقر إلى عفو الله تعالى و رضوانه مولانا السلطان العالم
 العادل مالك أمر الفضائل الملك الأشرف
 إسماعيل بن العباس ابن علي ابن داود ابن يوسف ابن عمر ابن علي ابن رسول
 توفي إلى رحمة الله تعالى نهار السبت ثامن عشر ربيع الأول سنة ثلاث وثمانماية
 ﴿اللَّهُ لَا إِلَهَ إِلَّا هُوَ الْحَيُّ الْقَيُّومُ لَا تَأْخُذُهُ سِنَّةٌ وَلَا نَوْمٌ لَهُ مَا فِي السَّمَوَاتِ وَمَا فِي الْأَرْضِ﴾
 سورة البقرة آية الكرسي

In the name of God, the Merciful, the Compassionate.

This is the tomb of the servant imploring the pardon of God, the Highest, and His favor, our master, the sultan al-Malik al-Ashraf Ismā'īl, the learned, the righteous, the excellent, Ismā'īl ibn al-'Abbās ibn 'Alī ibn Dāwūd ibn Yūsuf ibn 'Umar ibn 'Alī ibn Rasūl. He died on Sunday, the 18th day of Rabī 'I, in the year 803.⁶⁶

“God: there is no god but Him, the Ever Living, the Ever Watchful. Neither slumber nor sleep overtakes Him. All that is in the heavens and in the earth belongs to Him” (Q2: 257).

Cenotaph II: al-Malik al-Nāṣir Aḥmad (2c)



Fig. 34. Cenotaph of al-Malik al-Nāṣir Aḥmad.

⁶⁶ Historical sources: al-Khazrajī, *al-Uqūd al-lu'lu'yyah*, vol. 2: 317; *The Pearl-Strings*, vol. 2: 286; *Tārīkh al-Dawlah al-Rasūliyyah*, 131; Ibn al-Dayba', *Bughyat al-mustafīd*, 104; Yaḥyā ibn al-Ḥusayn, *Ghāyat al-amānī*, vol. 2: 558; al-Kibsi, *al-Laṭā'if al-saniyyah*, 163. See also al-Aṣbahī 2004: 109-110.

هذا قبر العبد المفتقر كرم الله تعالى مولانا السلطان الملك
الناصر صلاح مصلح الدنيا
وعز الدين أحمد بن اسماعيل ابن العباس ابن علي ابن داوود ابن يوسف
ابن عمر ابن علي بن رسول توفي نهار الاثنين سادس عشر شهر جمادى الآخر سنة سبع
وعشرين وثمان مائة

This is the tomb of the servant imploring the generosity of God, the Highest, our master the sultan al-Malik al-Nāṣir, he who promoted integrity in earthly life and strengthened the religion, Aḥmad ibn Ismā‘īl ibn al-‘Abbās ibn ‘Alī ibn Dāwūd ibn Yūsuf ibn ‘Umar ibn ‘Alī ibn Rasūl. He died on Monday, the 16th day of Jumādā II, in the year 827.⁶⁷

Cenotaph III (2d)



Fig. 35. Cenotaph in wood.

The cenotaph was found in a very poor state of conservation and lacking the entire upper portion. What remained of the original inscription is limited to the *basmalah* and the beginning of the Verse of the Throne of Surah al-Baqarah (Q 2: 255).⁶⁸ No name of the deceased.⁶⁹

67 Historical sources: *Tārīkh al-Dawlah al-Rasūliyyah*: 207 (d. 25 Jumādah II, year 827?); Ibn al-Dayba‘, *Bughyat al-mustafid*, 108; Yahyā ibn al-Ḥusayn, *Ghāyat al-amānī*, vol. 2: 566; al-Kibsi, *al-Laṭā‘if al-saniyyah*, 164. See also al-Aṣḥabī 2004: 111.

68 For the theory as to the person to whom the memorial is dedicated, see note 66 above.

69 See al-Aṣḥabī 2004: 111.

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
 ﴿اللَّهُ لَا إِلَهَ إِلَّا هُوَ الْحَيُّ الْقَيُّومُ لَا تَأْخُذُهُ سِنَّةٌ وَلَا نَوْمٌ لَهُ مَا فِي السَّمَاوَاتِ وَمَا فِي الْأَرْضِ﴾ سورة البقرة

In the name of God, the Merciful, the Compassionate.

²⁵⁵ God: there is no god but Him, the Ever Living, the Ever Watchful. Neither slumber nor sleep overtakes Him. All that is [in the heavens and in the earth] belongs to Him.

Cenotaphs in the Library

Cenotaphs IV and V (4a)



Fig. 36. Cenotaphs of Ḥasan, son of al-Malik al-Ashraf, and of al-Malik al-Nāṣir Aḥmad.

Cenotaph IV: Ḥasan, son of al-Malik al-Ashraf, died in childhood.

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
 ﴿كُلُّ مَنْ عَلَيْهَا فَانٍ وَيَبْقَىٰ وَجْهُ رَبِّكَ ذُو الْجَلَالِ وَالْإِكْرَامِ﴾
 توفي الطفل المرحوم مولانا
 الملك الظافر أسد الدنيا والدين حسن ابن مولانا السلطان
 الملك الأشرف إسماعيل بن العباس في آخر شهر ربيع الآخر سنة اثنين وثمانماية

In the name of God, the Merciful, the Compassionate.

“Everyone on earth perishes; all that remains is the Face of your Lord, full of majesty, bestowing honour” (Q 55: 12-27).

...He died in childhood, our beloved lord al-Malik al-Zāfir, lion in the earthly life and in the religion, Ḥasan son of our master the sultan al-Malik al-Ashraf Ismā‘īl ibn ‘Abbās, at the end of Rabī‘ II, year 802.⁷⁰

Cenotaph V: al-Malik al-Nāṣir Aḥmad (4b)



Fig. 37. Cenotaph of (the son of ?) al-Malik al-Nāṣir Aḥmad.

بسم الله الرحمن الرحيم
 كُلُّ مَنْ عَلَيْهَا فَانٍ وَيَبْقَى وَجْهُ رَبِّكَ ذُو الْجَلَالِ وَالْإِكْرَامِ
 هذا قبر... مولانا السلطان الملك الناصر أحمد بن اسماعيل بن العباس بن علي بن
 داود ...

In the name of God, the Merciful, the Compassionate.

“Everyone on earth perishes; all that remains is the Face of your Lord, full of majesty, bestowing honour” (Q 55: 12-27).

This is the tomb... of our master the sultan al-Malik al-Nāṣir Aḥmad ibn Ismā‘īl ibn al-‘Abbās ibn ‘Alī ibn Dāwūd...⁷¹

⁷⁰ See al-Aṣḥabī 2004: 118.

⁷¹ *Tārīkh al-dawlah al-rasūliyyah*: “al-Malik al-Mujāhid ‘Alī died and was buried (*qubira*) in al-Madrasah al-Ashrafiyyah on 10 Rabī‘ II year 826” (p. 203). See Ibn Dayba‘, *al-Faḍl al-mazīd*, “The deceased was taken to Ta‘izz, where he was buried in his father’s Madrasah” (p. 108).

Cenotaph VI (4a)



Fig. 38. Cenotaph of al-Malik al-Mujāhid (‘Alī).

Nothing but the base remains of the original cenotaph. With the restoration, it was possible to rejoin the parts, integrating the missing ones (see Section 3 – Chapter 2, Figs. 85-98). There is still some doubt as to the reading and interpretation. It was perhaps dedicated to al-Malik al-Mujāhid ‘Alī, son the the sultan al-Malik al-Nāṣir and grandson of al-Malik al-Ashraf.⁷²

بسم الله الرحمن الرحيم
 كُلُّ مَنْ عَلَيْهَا فَانٍ وَيَبْقَى وَجْهُ رَبِّكَ ذُو الْجَلَالِ وَالْإِكْرَامِ
 هذا قبر مولانا الملك المجاهد ... علي بن مولانا السلطان الملك الناصر
 أحمد بن إسماعيل توفي في شهر صفر سنة ست وعشرين وثمان مائة

In the name of God, the Merciful, the Compassionate.

“Everyone on earth perishes; all that remains is the Face of your Lord, full of majesty, bestowing honour” (Q 55: 12-27).

This is the tomb of our master, al-Malik al-Mujāhid (another honorific title follows) ‘Alī son of the sultan al-Malik al-Nāṣir Aḥmad ibn Ismā‘īl, who died in the month of Ṣafar, in the year 826.

⁷² See Aṣḥabī 2014: 117, fig. 54. It should be noted that the sons of the sultan maintain the title of *malik*.

Cenotaph VII: al-Malik al-Mufaḍḍal Muḥammad (4b)

The cenotaph is located in the southeast corner of the Library, at some distance from the other three, which are grouped inside a wooden structure. The restoration made it possible to read parts of the inscriptions. On the top are the *shahādah* and on the north side the *qiblah* la. Two Qur’anic verses are written along the faces of the monument: Q 13: 23-24 and 2: 255, the “verse of the Throne”. The lower portion, in smaller scripts, is more difficult to read.⁷³



Figs. 39-40. Cenotaph of al-Malik al-Mufaḍḍal (?).

This cenotaph required a laborious process of restoration (see Section 3, Chapter 2, Figs. 107-131). The script presents a number of gaps.

⁷³ See al-Aṣḥāḥī 2014: 119-120, fig. 56.

بسم الله الرحمن الرحيم
 لا إله إلا الله محمد رسول الله
 ﴿جَنَّاتُ عَدْنٍ وَمَنْ صَلَحَ مِنْ آبَائِهِمْ وَزَوَاجِهِمْ وَذُرِّيَّاتِهِمْ.
 وَالْمَلَائِكَةُ يَدْخُلُونَ عَلَيْهِمْ مِنْ كُلِّ بَابٍ سَلَامٌ عَلَيْكُمْ بِمَا صَبَرْتُمْ فَنِعْمَ عُقْبَى الدَّارِ﴾
 ﴿اللَّهُ لَا إِلَهَ إِلَّا هُوَ الْحَيُّ الْقَيُّومُ لَا تَأْخُذُهُ سِنَّةٌ وَلَا نَوْمٌ لَهُ مَا فِي السَّمَوَاتِ وَمَا فِي
 الْأَرْضِ ...
 وسع كرسيه السموات والأرض ولا يؤده حفظهما وهو العلي العظيم﴾
 ... (ال) عبد المفتقر إلى الله مولانا ... الملك المفضل ...
 سنة سبع وأربعين وثمانماية تغمده الله برحمته. واسكنه فردوس ..

In the name of God, the Merciful, the Compassionate.

“They will enter perpetual Gardens, along with their righteous ancestors, spouses, and descendants; the angels will go in to them from every gate. Peace be with you, because you have remained steadfast. What an excellent reward is this home of yours!” (Q 13: 24-25).

“God: there is no god but Him, the Ever Living, the ever Watchful. Neither slumber nor sleep overtakes Him. All that is in the heavens and in the earth [belongs to Him].

His throne extends over the heavens and the earth; it does not weary Him to preserve them both. He is the Most High, the Tremendous.” (Q 2: 255)

... the slave who trusts in God, our master al-Malik al-Mufaḍḍal Muḥammad son of our master ... in the year 847. God forgive him with His mercey and settle him in Paradise...⁷⁴

10. Two works signed by the respective artisans

During the restoration works, cleaning the layer of decorated plaster an inscription with the name of the (first?) stuccowork artisan accidentally came to light. The script is in clumsy *naskhī* characters. The artisan's name was ‘Umar ibn ‘Alī, ibn ‘Abd al-‘Azīz and the signature is dated in the year 802 h. (1401-1402).

بسم الله الرحمن الرحيم
 لا إله إلا الله محمد رسول الله
 هذا النقش الذي في المدرسة المباركة
 عمل العبد الفقير على عفو الله تعالى
 عمر ابن علي ابن عبد العزيز
 سنة اثنين وثمان مائة

⁷⁴ Ibn al-Dayba‘, *Bughyat al-mustafīd*, 116; al-Malik al-Mufaḍḍal Asad al-Dīn Muḥammad ibn Ismā‘īl ibn ‘Uthmān ibn al-Afḍal ibn al-‘Abbās. See also al-Aṣḥabī 2004: 119-120, fig. 56.

In the name of God the Merciful the Compassionate
 There is no god but God, Muḥammad is the apostle of God.
 This engraving (*naqsh*) that is found in the blessed Madrasah
 was made by the poor slave [who trusts] in the forgiveness of Almighty God,
 ‘Umar ibn ‘Alī ibn ‘Abd al-‘Azīz.
 Year 802.



Figs. 41-42. The inscription which came to light during the restoration work.

The artisan who built the western door of al-Ashrafiyyah Mosque and Madrasah complex carved a celebratory panel above the lintel on the outside of the southern door. It contains the name Ḥājī ‘Abd Allāh al-Jawharī, and the date 894. The script, in *naskhī* characters, is confused in the final part, apparently due to an erroneous division of the spaces. This date probably indicates the completion of the works done to expand the Madrasah, works that had begun almost a century earlier.



Fig. 43. Inscription over the southern door on the outside of the south wall.

عمر هذا الباب المبارك حاجي عبد الله
الجوهري في شهر رمضان سنة أربع وتسعين و ثمنمائة.
هذا من فضل ربي

This blessed door was built by Ḥājī ‘Abd Allāh
al-Jawharī in the month of Ramaḍān, in the year 894.

(Lower panel)

This by the grace of my Lord.

11. The Rasulid emblem

We have observed the use of the five-petalled Rasulid rosette in many of the decorations in al-Madrasah al-Ashrafiyyah. The color red seems to predominate, but sometimes the rosette is white. Here are two significant examples:



Figs. 44-45. Five-petalled rosettes.

Ibn [Abū?] al-Makhramah recalls in the *Kitāb al-Nisbah* that Ta‘izz was considered “the Damascus of Yemen for its flowers, fruit trees and places of amusement”.⁷⁵ The Rasulid sovereigns loved their gardens, and often the gifts received from embassies, delegations and foreign merchants included exotic flowers and plants.⁷⁶ Al-Malik al-Muẓaffar Yūsuf devoted a number of pages in his book on *al-adwiyah al-mufradah* to the rose, citing Ibn al-Bayṭār and other botanists. *Ward* indicates the bloom of every plant, but with time its meaning was narrowed to ‘rose’. The rose is very widespread in the “land

⁷⁵ Mentioned by al-Ḥajarī 1984: s.v. Ta‘izz, vol. 1: 145. See Serjeant 1958: 262, which reports the gift from the sultan Ṣalāḥ al-Dīn ibn Ayyūb of fruit trees from Syria to his brother Tūrān Shāh in Yemen. These trees were later planted in the garden Tha‘bāt in Ta‘izz.

⁷⁶ Among them, *full abyaḍ wa-full asfar wa-ward* “yellow and white jasmine, and roses” (al-Khazrajī, *al-Aqūd al-lu‘lu‘iyyah*, vol. 2: 139).

of the Arabs”, including a variety of mountain rose. Roses are mainly either red or white, occasionally yellow, and in Iraq there are even black roses.⁷⁷

Daniel Varisco devoted a chapter in his volume *Medieval Agriculture and Islamic Science*, to “Flowers and aromatic plants”, based on the agricultural treatises of al-Malik al-Ashraf and al-Malik al-Afḍal. In the *Bughyah*, al-Malik al-Ashraf mentions twenty-four types of flowers, first and foremost is the rose (*ward*). “This cold and dry flower has a variety of medicinal uses, as well as the flavoring of rose water. The wild variety in Yemen is *Rosa abyssinica* (Fleurin and Pelt 1982: 96; Scott 1942: 94).” The rose starts to bloom on March 1. Abū al-‘Uqūl noted that roses were present at Jabal Ṣābir.⁷⁸

A *ḥadīth* attributed to the Prophet, on the authority of Anas, tells the origin of the three main colors of the rose, linked to his miraculous ascent into heaven (*mi‘rāj*).

“The white rose was created from my sweat the night of the *mi‘rāj*; the red rose from the sweat of the angel Gabriel; the yellow from the sweat of my (horse) al-Burāq”.⁷⁹

The epigraphist Gaston Wiet called the attention of Max Meyerhof, historian of Islamic science, to the fact that the Rasulid dynasty in Yemen is the only dynasty to have a blazon. Among the objects of the Mamluk sovereigns of Egypt and Syria there are blazons, but they are strictly personal and not dynastic. For Wiet it could be the representation of a jasmine, which was cultivated extensively in the royal Yemeni gardens, but its blossom has pointed petals, so that in the end he opted for a simple rose with five rounded petals.⁸⁰

A red rose or a white one? In the decorations of al-Madrasah al-Ashrafiyyah the difference of color could depend on the background on which the rosette is painted: red on the light background like the plaster inside the domes, white on a dark background. The historical sources recall, as we have seen, the Rasulid banner with red roses on white fabric. If we examine trays, inkwells, bronze braziers or glass bottles with Rasulid insignia, we find the five-petalled rosette either red or white depending on the material on which it is depicted.⁸¹ Noha Sadek wrote an essay on the subject, with the significant title “Red Rosettes: Colors of Power and Piety in Rasulid Yemen”, in which she devotes particular attention to the decorations of al-Ashrafiyyah and al-Mu‘tabiyyah.

The viewer of al-Ashrafiya is immediately struck by the proliferation of one particular motif: a red five-petaled rosette, particularly frequent in the small domes. Although the color red on a white background predominates, other color variations exist for smaller

77 Al-Malik al-Muẓaffār Yūsuf, *al-Mu‘tamad*, 544. See also Ibn al-Bayṭār, *al-Jāmi‘*, vol. 2: 490-491.

78 Varisco 1994: 30, 198-201.

79 This *ḥadīth*, considered “weak”, is contained in the collection of Ibn al-Jawzī, *K. al-Mawḍū‘āt*, vol. 2: 257.

80 See Meyerhof 1943-44: 65. Mayer observes in his survey of Saracenic Heraldry, in connection with the rosette: “It was one of the oldest devices used under the Ayyubids, and became a badge of the Rasūlids and Rāsīd dynasties, and to judge from its frequent occurrence on pottery, must have been very popular with the early Mamluks. The Ayyubid and Mamluk rosette is usually six-petalled, and the Rasūlid five-petalled” (1933: 24).

81 The most recent study on Rasulid objects in the museum collections was written by Ellen Kenney (2021).

five-petaled rosettes, including white on a red ground and yellow on red or green grounds. This rosette has been identified as the Rasulid heraldic emblem (...).⁸²

However, a question springs immediately to mind: what color is the variety or rose that grows wild in the Yemeni climate, particularly in the mountainous region of Ta'izz – Jabal Ṣabir? The Scottish botanist Robert Brown (1773-1858) identified the single wild rose that grows in Ethiopia, Eritrea and Yemen. He called it *Rosa abyssinica*. The botanist Paul-Émile Botta recalls having seen roses in 1837 at heights greater than 2200 meters. Albert Deflers reports finding the *Rosa abyssinica* in Manākhah and in the zone of Shibam Kawkabān.⁸³ In the *Handbook of the Yemen Flora* published by the Royal Botanic Gardens, Kew, J.R.I. Wood writes:

ROSA ABYSSINICA *R. B.*: Wild rose. Erect shrub to 4m. Flowers in terminal corymbs, fragrant, petals 5, white, up to 1.5cm long. (...) Flowers throughout the year but especially after the spring rains. Widespread on the escarpment and high plateau from 1500 to 3100m, but only common in areas of average to good rainfall: it is sometimes abundant notably at high altitudes on J. Ṣabir and in part of the central escarpment. Outside southwest Arabia it is only known from Ethiopia.⁸⁴

* * *

The rose is also one of the most common flowers in Arabian poetry, symbol of love, purity, delightful fragrance. Several verses by a Sicilian poet, al-Ballanūbī, who lived between the 12th and 13th century, could very well be describing a scene that took place before a Rasulid sultan:

I found myself before the supreme *Raʿīs* when they brought him a great tray of red and white roses. And so, I began to recite some verses, improvising:

“As if the roses, whose fragrance fills the air with the excellence of your virtues were the blood shed by your enemies, that your white hands held in them.”⁸⁵

82 Sadek 2011: 230, 232. Figures 148-151 (al-Ashrafiyyah); 157-158 (al-Muʿtabiyyah). The author writes of a possible interpretation of the rosette as an astral symbol, and the relationship of the color red with Ḥimyar. The root Ḥ-M-R indicates the color red.

83 Varisco 1889: 44, 70, 137.

84 Wood 1997: 50, 137. He adds: “Roses have been cultivated in Yemen for centuries and are generally called ‘Warad’. Much the most common cultivated species is *Rosa x bifer* (Poir.) Pers (*R. damascene* sensu Schwartz) which is widely grown in old gardens for its attractive red flowers and in the past was doubtless used to make rose water and perfumes”.

85 Licitra, I., *Il canzoniere di al-Ballanūbī: studio, edizioni, traduzioni*, Roma: Istituto per l'Oriente C.A. Nallino, 2021, 49: 242-243.



Figs. 46- 47. *Rosa Abyssinica* (after Wikipedia).⁸⁶

⁸⁶ “*Rosa abyssinica* is a prickly evergreen shrub, creeping or often climbing, capable of forming small tree up to 23 feet (7 meters) tall. (...) Flowers are of fragrant white-pale yellow, and are usually 3 to 20 in dense heads, each stalked, the sepals long, narrow and hairy, soon fall, and have 5 petals about 2 m long, tip rounded to square, with many stamen. Common and local names: Kega (Ethiopian-Amharic), Ward (Yemeni-Arabic), Qaqawwii (oromo), Dayero (Somali)”. (*Wikipedia*, “*Rosa abyssinica*”, with bibliography).

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Section 2

THE PRAYER HALL

- Ch. 1 - Structure, materials and construction methods
- Ch. 2 - State of fact and analysis of deterioration
- Ch. 3 - The training project
- Ch. 4 - Restoration works



THE PRAYER HALL STRUCTURE, MATERIALS AND CONSTRUCTION METHODS

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THE ITALIAN-YEMENI TEAM

Introduction

Al-Ashrafiyyah Mosque and Madrasah, with its twin minarets, probably intended to emphasize the power of the reigning family, has not undergone significant alterations over the centuries, with respect to the original nucleus. This nucleus can be divided into two main areas. The first, positioned longitudinally to the north, is the prayer hall, while the second, occupying the south side, can be divided in turn into three zones: an inner court placed centrally with respect to large lateral halls.



Fig. 1. Al-Ashrafiyyah Mosque and Madrasah. View from west side, taken in 1947.

The prayer hall is an elongated rectangular room lying longitudinally with respect to the north axis and surmounted by nine domes: the largest placed at the center over the *mihṛāb* area, divides the smaller ones exactly, with four to the east and four to the west. The interior is ornate, with finely carved stuccoworks and precious mural paintings, including geometrical designs, floral patterns and epigraphs.

The courtyard, lying to the south of the prayer hall at the center of it, was originally empty and served as the main entrance. Later three funeral pavilions were erected, with richly decorated domed cenotaphs featuring mural paintings and gilding, carved openwork wooden elements and marble cenotaphs that were decorated and gilded. The particularity of these domes, with respect to the Yemeni tradition of the time, is that they were decorated and painted on the outside as well, with a decoration that took up the theme of the red floral rosette, symbol of the Rasulid family. Probably there were also bands of Qur'anic inscriptions at the base of the domes as well. A few traces of color, too little to permit more than a guess at the original composition, were found during maintenance works on the exterior, but certainly, considering the opulence of the interior, they must have been richly decorated and colored, with a powerful visual impact.

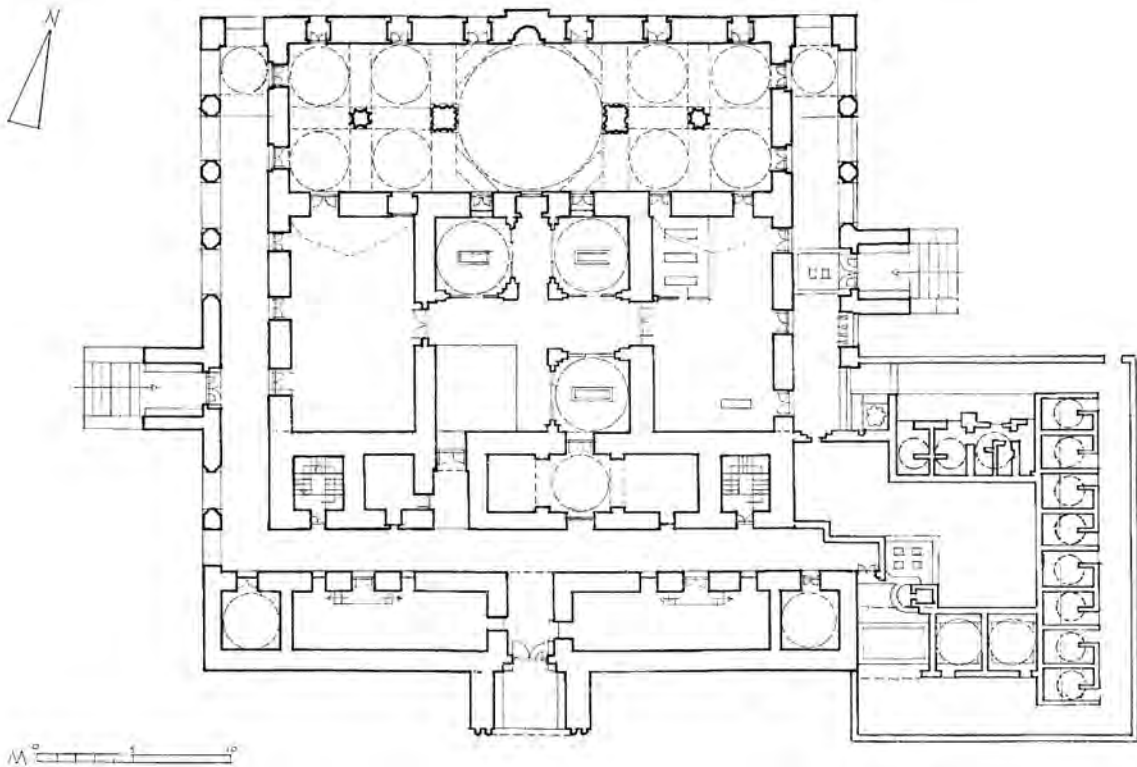


Fig. 2. General floorplan of al-Ashrafiyyah Mosque and Madrasah.

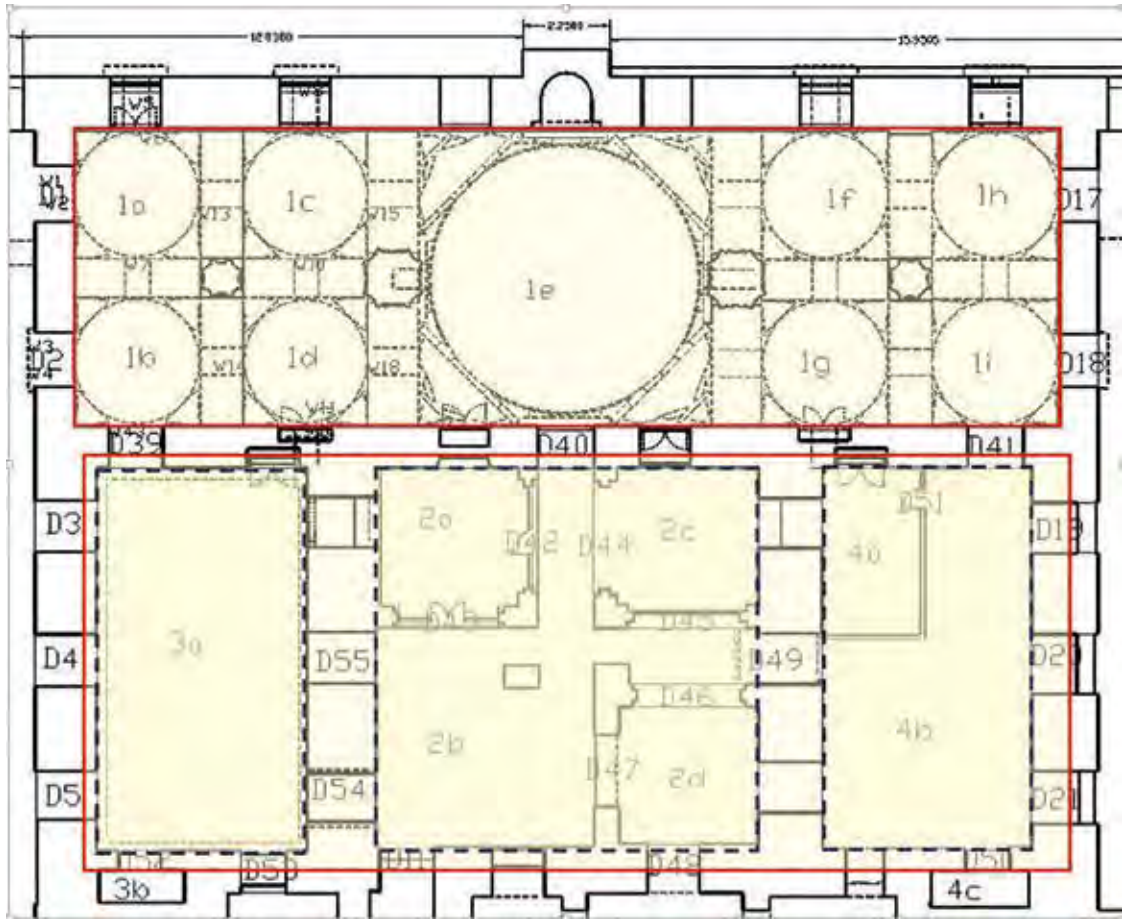


Fig. 3. Layout of al-Ashrafiyyah Mosque and Madrasah, detail of the main nucleus. The mural decorations are located in the red squares. In the project of the Istituto Veneto per i Beni Culturali, the floorplan of the mosque has maintained the system of numbering the spaces in the different sectors according as established in the latest UNESCO report. In the prayer hall, the main dome at the center is indicated with the number 1e. The four small domes to the west are indicated with numbers 1a, 1b, 1c, 1d. The four small domes to the east are indicated with numbers 1f, 1g, 1h, 1i. The quadrangular space of the court that accesses the prayer hall is indicated with number 2b and the three funeral pavilions with the cenotaphs of the members of the royal Rasulid family numbered 2a, 2c are decorated, while 2d is decorated with carved an perforated stuccowork.

Structure of the main dome

The prayer hall¹ is an elongated longitudinal structure on a rectangular base measuring 25 meters in length and 7.60 across divided into two naves by arches resting on octagonal pillars. At the center is a great decorated dome 15 meters high, which rises above the space in front of the *mihrāb*. The various sectors of the building were conceived according to the classical canons of Islamic architecture that we can define as canopied: a square

¹ The photographs illustrating this paragraph, showing architectural and decorative shapes found in al-Ashrafiyyah Mosque and Madrasah, were taken after it was restored.

base closed by a dome supported by pillars, where the passage from the square design of the base to the circular shape of the dome is mediated by an intermediate element, called the tambour, achieved with a skillful play of oblique panels, where the insertion of niches at the corners transforms the square into an octagon which on which the ring of the dome rests.



Fig. 4. Main dome, second register, octagonal tambour, details. Kiosk in stucco over the *miḥrāb*, ogival pentalobate window and, in the corners, niches with ogival arches.



Figs. 5 and 6. Details, floral decorations of the niches.

At the base of the east and west sides of the main dome, crosswise with respect to the longitudinal length of the building, two large pillars support the intradoses of the barrel vaults, which are, in turn, adorned along the line atop the arches with writing and geometric designs in carved stuccowork. The *miḥrāb* is also bordered by a frieze with Qur'anic verses in *thuluth* calligraphy, surmounted by a projecting plaster openwork cornice with a kiosk structure, skillfully carved with geometric designs, some even having naturalistic features, a splendor that emphasizes the holiness of the site around it. During the restoration works, an important discovery was made, hidden in a central boulle in plaster, written by the master artisan, certainly the author of the carving in the *miḥrāb*, and probably in the entire prayer hall of the mosque. The writing, in addition to giving the name of the master, 'Umar ibn 'Alī ibn 'Abd al-'Azīz, indicates the date of execution as 802 h. (1399/1400).

The decorative arrangement of the area, like the architectural structure, can be divided into 4 registers.

The first register includes the lower portion of the walls, characterized by the absence of painted decorations. The walls of the prayer hall, up to a height of about 2 meters, are plastered in *qaḍāḍ* (a lime-based mortar, traditional in Yemeni architecture) and left white.



Fig. 6b. General view of the *mihrāb*. Photo taken in January 2021 by the Yemeni artist Nezar Moqbel.



Figs. 6c and 6d. Detail of the writing found etched on the plaster behind a carved boulle.

They end in a band of Qur'anic inscription in sculptured stuccowork which runs around all four walls of the entire prayer hall and divides it from the richly decorated upper portion. The inscription in plaster that separates the first two registers contains the entire Surah al-Raḥmān (55) of the Qu'ran and concludes with a historical script that bears the name and title of the patron, the al-Malik al-Ashraf Ismā'īl, with the date of completion of the construction in the month of Muḥarrām 803/August 1400. Another inscription on the lintel of the door to the east minaret gives the date of the start of construction, Rabī' II 800/November-December 1397. Construction thus took almost three years.

In the main dome, the space rising above the height of the *mīhrāb* forms the second register, consisting of walls with large ogival niches in the four corners. The niches are separated by ogival windows in pentalobate shape with faux windows on the inside in stuccowork. The wall surfaces of the niches and polylobate windows are adorned with refined symmetrical decoration of stylized flowers.



Figs. 7 and 8. Main dome, third register, octagonal tambour. Floral decorations between the windows and the niches in perforated plaster.



Figs. 9 and 10. Hemispheric dome. Detail of pergola.



Fig. 11. Hemispheric dome: first section with broad calligraphic band, which stands out against a carpet of red floral designs. Qu'ran 3: 27.

The third register is the tambour, also octagonal, marked by four openwork arch-shaped windows that allow the hall to be inundated by a profusion of natural light, also exalting the splendor of the mural decoration.² In the tambour, the space between the windows is occupied by rib vaults painted with a dense design of palmette, in a rich interplay of skillfully contrasting tonal shades.³

The tambour terminates on high with a circular toothed crown, slightly projecting, on which the fourth register rests, consisting of the hemispherical dome, harmoniously painted with a decorative design in three concentric ascending modules.

The first decorative module is the broad calligraphic band which stands out on a red and blue floral background and is interrupted at the four cardinal points by large purplish rosettes surrounded by petals and a polylobate band.

The second module, which is the largest and predominant, is in the middle and represents a refined gilded pergola on a blue background, resting its foundations on Kufic inscriptions. The arms of the pergola, hatched in orpiment to evoke the preciousness of gold, are separated by curling polylobate shapes within which eight large circles stand out. An intense turquoise sky forms the animated background, in energetic spiral patterns with vegetable elements in red and white.⁴

Finally, there is another large *thuluth* calligraphic inscription in circular shape, also on a reddish floral background, with the *basmalah* (invocation to God) and the *shahādah* (profession of faith). A projecting stuccowork rosette marks the center point.⁵

2 Finster, B., *The Architecture of the Rasūlids*, in W. Daum (ed.), *Yemen, 3000 Years of Art and Civilisation in Arabia Felix*, Innsbruck – Frankfurt/Main: Penguin, 1987: 254-260.

3 For a more thorough study that examines the decorative elements of the Rasulid style from a historical standpoint, with specific references to the mosque of al-Ashrafiyya, we recommend Sadek, N., *Patronage and Architecture in Rasūlid Yemen, 626/858 A.H./1229-1454 A.D.*, PhD. Thesis, University of Toronto, 1990.

4 Lewcock, R.B., *The Painted Dome of the Ashrafiyyah in Ta'izz, Yemen*, in Bidwell, L.R., Smith, G.R. (eds), *Arabian and Islamic Studies. Essays presented to R.B. Serjeant*, London – New York: Longman, 1983: 100-117.

5 Sadek, N., *Red Rosettes. Colors of Power and Piety in Rasulid Yemen*, in *Proceedings of Symposium on Islamic Art and Culture 3*, 2009: 225-241.



Fig. 12. Apex of the hemispheric dome with the *basmalah* and the *shahādah* in *thuluth* calligraphy.



Fig. 13. Octagonal tambour and hemispheric dome, general view. Qu'ran 3: 26-27.

Structure of the smaller domes

To the east and west of the main dome, the longitudinal area of the prayer hall continues with the space of the lateral naves, consisting of two sections, each topped by four domes 7 meters high. The four domes are separated by a central pillar which supports four ogival archways.

The decorative plan of these areas can also be divided into four registers.

The first register, in this case, corresponds to the area of the wall at ground level of the hall, finished with white *qaḍāḍ* plaster and lacking any painted decorations. The inscription in carved plasterwork which runs around the entire hall, divides the first register from the second in this section, from which the painted decorations start.

From the level of the upright at the top of pillars and along the perimeter of the archways, there is a painted calligraphic band with Qur'anic verses, while the intradoses of the arches are decorated with geometric designs. The tips of the archways determine the string course of the second register, indicated by a decorative band painted in geometrical designs that crown the four walls.



Figs. 14 and 15. Small domes, general view of east sector.



Figs. 16 and 17. Small domes, general view of west sector.

The third register is that of the tambour with corner niches (a plastic solution probably derived from the *muqarnas*) separated by windows in carved stuccowork. The octagonal tambour supports the last register, that is the dome, which is formed by a perfect hemisphere with extensive mural painting that can be schematized as having three main parts.

The base of the dome is outlined by a band of Qur'anic inscription with white letters on a red background or black letters on a yellow background. A second band of Qur'anic inscription closes the summit of the dome and has the same stylistic features as the inscription at the base.

The central part, placed between the two inscriptions, is the most characterized portion of the dome and is organized into two main types of decoration.

The first features rounded designs that echo the shape of the pomegranate, on a white background, separated by red flowers with five petals, symbols of the Rasulid dynasty. The second contains eight hexagons on a green background, inscribed with circles whose decorations are reminiscent of those used in the decorative pomegranate designs.



Fig. 18. Small dome 1a in west sector.



Fig. 19. Small dome 1b in west sector.



Fig. 20. Small dome 1g in east sector.



Fig. 21. Small dome 1h in east sector.



Figs. 21a, b, c, d. Small domes, types of decorations of the hemisphere.

Construction materials and techniques

In 2008, with the beginning of the project for restoration and conservative recovery of the decorations of al-Ashrafiyyah Mosque and Madrasah, the experts of the Istituto Veneto per i Beni Culturali undertook an important exploratory campaign, which continued more in depth during the following works, to broaden their knowledge of the monument they were going to restore and to be able, on the basis of this knowledge, to develop the most advantageous operating strategy.

Knowledge of the materials and methods used to build the mosque, as well as documentary research of various archives, were studied while the works on the architectural structure were ongoing, operating in collaboration with the building restoration company working at the site. It was thus possible to identify materials and methods used in different parts of the structures that compose the vast monumental complex.

In general, the construction materials used to erect the mosque were traceable to the area or adjacent zones, as is often the case, according to the local building tradition. However, it is also possible that particular materials were sourced outside Ta'izz, as is likely, for example, in the case of the lime (lime putty),⁶ which was an essential element of the mortar used in the building structures of the mosque.

The load-bearing walls were built using blocks of sturdy material,⁷ probably granite blocks extracted during works of leveling the rocky bed of mount Jabal Šabir where, on the first slopes south of Ta'izz, the mosque was built. The stone blocks, cut with hammer

6 Corradi, M., *Il colore dell'architettura di terra: Shibam*, Genoa, Polytechnical School, 2015: 8: "Lime was produced in small kilns built with mud bricks that used manure as fuel. When the lime was sufficiently baked, it was mixed with water in a trench, and then pounded by ten or up to twenty men with heavy stakes used to break all the lumps in the mixture; the men worked standing on opposite sides of the trench to alternate their blows and make the final compound uniformly smooth." (Trans. K. Fay)

7 Ruiz, A., *Reflections. An Engineer's Story*. PE, United States of America, 2013: 127: "In 1956, Geukens did some research on the geology of Yemen. He reports that the country stands on a bed of metamorphic rocks. These are probably of Precambrian origin, and include micaschists, gneiss, quartzites and marbles, through with vast banks of basalt intrusion. Later, in an order of geological ages, horizontal Jurassic lime beds formed a base for the sandstone formations of the Cretaceous period. The Tertiary rocks include the marine formations of the salt mines located at Salif and volcanic tuff, basalt and andesites".

and chisel in variegated, irregular shapes, were stacked in the construction of the masonry and bound together using bedding mortar made of lime and clay soil. In the building, at variable heights, however within a meter and a half, the walls were linked along the outer perimeter by beams of unfinished wood with a cross section of approximately ten by ten centimeters. This type of construction with stone blocks, was mainly used for the massive vertical load-bearing walls, while for the arches, vaults and domes, bricks were more commonly used,⁸ with linkage to the load-bearing wall at the base, consisting of wooden beams.

Samples were taken of the decorations in the Prayer Hall, and laboratory tests were carried out, not only to identify the problems of deterioration but also to determine the nature of the construction materials originally used and the techniques used in the paintings.

The tests made on the samples, both of the preparatory plaster and on the paint film of the decorations, revealed enormous technical and executive differences in the decorative plan of al-Ashrafiyyah Mosque and Madrasah between the eight lateral domes and the central dome, which made it appear likely that different teams had worked on them, probably at different times.

The technique used to decorate the eight smaller domes is similar to the mezzo fresco technique widespread in the western world from about the 16th century. This consists of wall painting on a plaster base already carbonated but not yet completely dry. The analysis of this technique will be examined more in depth later in this chapter.

For the main dome and the three domes of the mausoleums in the courtyard, the decorations were colored with the technique of tempera on plaster, according to the classical tradition of the region. These two major technical differences confirm the theory put forward by the experts at UNESCO, that two different groups of workers succeeded one another in the decoration of the mosque at different times.

Main dome: executive technique

With reference to the structure of the main dome, a first layer of bedding mortar consisting of a lime and clay soil mortar mixed with chopped vegetable fibers, was applied on the masonry built with stone blocks and terracotta bricks, then smoothed to cover the joints between the blocks and even the surfaces. On this even level, when dry, a moderately coarse layer of *qaḍāḍ* was applied at a variable thickness between 0.5 and 2 centimeters. Finally, after the *qaḍāḍ* had dried, a preparatory layer of plaster was applied, on which the painting would be done.

The final plaster coat was tested and found to consist of plaster, applied to an average thickness of half a centimeter. From the analyses it was possible to surmise that protein binders consisting of animal glue had been added to the plaster.

The fine plaster base thus prepared to receive the decoration was then coated with a

8 Galdieri, E., Alva, A., *Visual Inspection of the Al-Ashrafiyyah Mosque*, Restricted Technical Report RP/1979-80/4/7.6/05, Serial No. FMR/CC/CH/81/144E, Paris: UNESCO 1981: 16.

starchy paste, i.e. an additional diluted protein binder, similar to that used thereafter to mix with the pigments. The starch coating reduced the porosity and permeability of the plaster, thereby facilitating the spread and fluidity of the brushstrokes as the painting was being done. Later Fourier Transform Infrared Spectroscopy analysis revealed the presence of a lipoprotein substance in the paint layers, which could be a binder consisting of animal glue.⁹

The palette of colors used is rather limited and includes yellows, reds, blues, black and white. The main pigments used are, for the reds, cinnabar mixed with vermillion but also red earths, mainly clays tinted by ferrous oxides. For the dark and light blues, natural azurite was used, for the yellows, in addition to the natural earth, orpiment, and kaolin for the whites.

With respect to the smaller domes, the decoration in the main dome appears more refined and variegated in the pictorial composition: the preparatory design has a precise organization, the palette is richer, the style skillful and modulated and the use of orpiment gives the work great elegance.



Figs. 22 and 23. North dome interior. First ring with *thuluth* calligraphic band, details.



Fig. 24. Northwest niche, detail.



Fig. 25. Southwest niche, detail.

⁹ Bensi, P., *Risultati delle indagini diagnostiche effettuate sui campioni prelevati da intonaci gessosi della moschea di Ta'izz (Yemen)*. [Typewritten report of tests on samples of plaster taken from the Ta'izz mosque (Yemen)], Venice: Istituto Veneto per i Beni Culturali 2011: 11: "We cannot exclude that vegetable glues might also have been used, such as gum arabic or tracanthe, typical of the Middle-Eastern painting tradition and also seen in the decoration of the Qubba Dar al-Manjara l-kubra in Granada (Bueno, Florez 2004). However we cannot dismiss the idea that the lipidic and proteic substances derive from a subsequent restoration of the decorations". (Trans. K. Fay)



Fig. 26. Northwest dome interior, detail.

The formal language of this area hints at a later period chronologically, with respect to the small lateral domes, above all for the decorative similarity with the cenotaphs in the inner courtyard, which are certainly of later construction than the mosque.

Small domes: executive technique

The masonry structure of the two lateral groups of small domes is similar to that of the main dome. Also in this case, on the surface of the walls, a coat of bedding mortar was applied, consisting of a mixture of lime and clay soil containing vegetable fibers, which served to unify the exterior aspect and conceal the joints between the stone blocks.

When this base coat of mortar was dry, a coat of *qaḍāḍ* plaster was applied, to a depth of several centimeters, and the decoration was then drawn and painted on this.

The *qaḍāḍ* was a special type of mortar traditionally used in Yemeni construction, suitable for use in building with stone blocks, particularly in ancient times, as a coating for exterior, thanks to its exceptional strength and water repellence.¹⁰ The *qaḍāḍ* plaster, according to the local tradition, consisted mainly of three coats of mortar previously amalgamated, consisting of lime putty and inert materials of different granulometry and, in this particular case, of volcanic rock and lime sand and gravel, as can be seen in the diagnostic studies of the domes of al-Ashrafiyyah Mosque and Madrasah.¹¹ The inert material, as well as the architectural stone blocks, was quarried on the mountain where the mosque was built.

10 Maury, B., *Le qaḍāḍ*, in S. Ory, B. Maury, C. Robin (eds), *De l'or du sultan à la lumière d'Allah, La mosquée Al-Abbās à Asnāf (Yémen)*, Damas: Centre Français d'Études Yéménites de Sanaa, 1999: 49.

11 Gambirasi, A., Melica, D., *Moschea Al-Ashrafiyyah, Indagini condotte sui dipinti murali* [Typewritten report of studies and tests made on the mural paintings at the al-Ashrafiyyah Mosque and Madrasah], Venice: Istituto Veneto per i Beni Culturali: 2008.

The *qadād* technique calls for a first stage of grinding the stone dry and when the granulometry reaches the proper size, mixing it with lime putty and crushing it in large marble mortars. Proceeding in this way, continuing to pound it with a hammer, the mixture is further ground to almost millimetric consistency (about 0.05 to 2) and is also perfectly amalgamated. The petrographic study of a narrow section of different fragments of the plaster coating taken from different representative points of the domes, reveals the same characteristics for every sample tested.

In the diagnostic studies, the preliminary macroscopic composition for each sample revealed an overall whitish color with gray inert material, a uniform structural aspect with a high degree of cohesion. The mixture contained fragments of intrusive and effusive volcanic rock and carbonatic granules. The ratio between binder (lime, CaCO_3) and inert material (gravel) is 1:1 on average and in some cases 1:1.5 in volume.

In the structure of the plaster coating the percentage of pores is low (less than 15% in volume). The test also reveals that the composition of the binder matrix CaCO_3 is produced using aerial or weakly hydraulic lime. The study of the composition of the plaster highlights the tenacity and compactness of the mixture, which is still in excellent condition.

Beyond the description of the scientific studies and laboratory tests, it is possible to show how the tradition of this technique of coating with *qadād* plaster has continued through the centuries arriving at our own time, taking as example the works of resurfacing the plaster done at the mosque. The three coats of plaster are applied one over the other in close sequence on the masonry, and it is continuously pounded with the sharp edge of a stone during application. After the first rough coat has been applied but is still wet, a second coat of medium granulometry is applied, followed by a third of finer quality, constantly pounded until the mortars are penetrated completely one in the other.



Figs. 27, 28 and 29. Example of last application with fine plaster, pounded with the sharp edge of a stone and smoothed with a flat stone during reconstruction of the *qadād* finish on the outer walls of al-Ashrafiyyah Mosque and Madrasah.

The work of application of the exterior coating goes on for days. With the layers still wet, continuing to spray water, the last coat of fine plaster is finished by smoothing with the flat side of a stone, until the surface becomes extremely smooth and hard as marble.

After this last finish, the *qaḍāḍ* is wetted every day to ensure that no craters or cracks form and, consequently, it must be kept damp for several days or at least a week.

On the *qaḍāḍ* finished in this way and still humid, a surface coating rich in calcium hydroxide forms like a thin film, on which the workers trace the guidelines in which the preparatory design of the composition is then drawn freehand with brushes. Finally, the paint fills in the design on the still damp surface and for this reason the technique is called “mezzo fresco”.

It was not possible to identify the progression of applications of the plaster, however it is presumable that the layers were applied gradually, by registers, in the project of the decoration.

According to the historical practice of mural painting, one can suppose that in the domes it was done from the top down, and thus with plastering of the entire hemisphere, proceeding with the relative pictorial decoration until it was complete. After completing the hemisphere, the bridges in the dome would have been removed and the plaster prepared for the tambour and niches, followed by the painting and then the decoration of the walls down to the height of the calligraphic band in stuccowork of the first register, which defines the ground floor of the Prayer Hall.

Alongside the painters, as the work progressed, the “stucco artists” engaged in creating the geometric/vegetable decorations or inscriptions in carved stucco would also be busy.

In some parts of the domes it is possible to see that the stuccoworks were applied after the decoration in the architectural partitions, because the stuccoworks lie atop the decorated plaster.

In some sections, to achieve greater luminosity of the base of *qaḍāḍ*, for example between the two calligraphic bands in the hemisphere of the small domes, inside the circumference of the base and the circular portion at the top, still on the damp plaster, a layer of lime putty was spread before painting the decorative portions.

The technique used for decoration of the eight smaller domes is comparable to what in the Western world is identified as fresco painting on plaster or, more accurately, mezzo fresco, since it is a mural painting done on already carbonated but not entirely dry plaster, so that the color that remains on the plaster has the ability to adhere to the calcium hydrate, once it is carbonated to the plaster itself. In fact, the particular technique of application of the *qaḍāḍ* plaster which, as we have seen, requires keeping the surface very damp for an greatly extended period of time has created the typical conditions for the mezzo fresco technique once the painter is given the opportunity to paint on it. It is hard to say, for lack of thorough historical and technical documentation, whether the mezzo fresco mural paint technique occurred here by chance or was known and already part of the local tradition that exploited the particularity of the *qaḍāḍ* wall finish. The technique of painting on plaster or “mezzo fresco” painting, for its similarity to fresco painting, was

in any case a time-saving technique as it was possible to work on much larger extensions of plaster, maintaining the characteristic appearance and beauty of the fresco albeit, as can be seen from direct comparison, in more muted colors.

To compose the paints, the pigments were mixed with lime or lime putty for thicker paint, uniformly applied without shading, to obtain richer layers, sometimes even in relief.

Later, where deemed appropriate, the borders of the calligraphic or geometric/floral sections were edged by a black or red line to define the shapes. On close inspection, it is possible to follow the direction of the brushstrokes.



Figs. 30, 31 and 32. Close-up of preparatory design etched in the mortar.

The chromatic range of the decorations includes five basic shades: red, green, yellow, obtained from different minerals, plus black from powdered coal and white from lime.

With this procedure the colors adhered to the plaster, forming a resistant paint film in the process of carbonation. In al-Ashrafiyyah Mosque and Madrasah, therefore, the surfaces of the smaller domes were decorated with the mezzo fresco technique at the end of the 14th century, as also observed in another mosque built around the same time as Ta'izz,¹² as a legacy probably derived from the ancient Roman mural painting tradition.¹³

12 Ravagnan, R., Zocca, J.P., *Progetto per il restauro delle decorazioni murali della moschea madrasa Al-Mu'tabīyah in Ta'izz – Yemen* [Typewritten project report "Project for the restoration of the mural decorations of the Mosque-Madrasa Al-Mu'tabiyah in Ta'izz – Yemen", Venice: Istituto Veneto per i Beni Culturali: 2014: "During the inspections and surfaces carried out in the months of August and September 2014, we were able to confirm that the mural decorations are comparable to the same executive technique observed in the eight smaller domes of al-Ashrafiyya Mosque and Madrasah. That is to say, a plaster support produced in qadad on which, still wet, the paints were applied using pigments mixed with lime putty". (Trans. K. Fay)

13 Mora, P., Mora, L., Philippot, P., *La Conservazione delle Pitture Murali*, Bologna, 1999, p. 96: In India, "The use of lime-based plaster appears for the first time at the beginning of the 7th century on one of the walls of the temples of Bagh, next to traditional plastering with earth, with a surface layer of lime or plaster. The painting is done in glue on clay surface finishes and in lime on lime-based finishes (...) so that we wonder if this was an independent discovery of a later penetration via Iran of a technique that originated in Rome. The almost complete disappearance of Sassanid mural painting does not facilitate the solution of the problem". (Trans. K. Fay)

The first samples of cleaning done on limited areas of the decorated surfaces still in good conditions, by applying compresses of paper pulp and ammonium carbonate in deionized water, confirmed the excellent resistance of the paint film, even with prolonged exposure to contact.



Fig. 33. Stuccowork decoration on mural painting.



Fig. 34. Detail of application of fresco painting on plaster.

The preparatory design

In both sectors of domes, large and small, the preparatory design for the paintings was produced without intermediate passages, directly on the preparatory layer of plaster. In other words, the sectors of the architectural structures were divided: hemisphere, tambour, niches and walls, from the top down, laying out schematic guiding lines etched with a sharp tool.

Only in the small domes, however, to outline some sections with geometrical designs consisting of simple square, the technique used was to flick a string soaked in red pigment against the plaster facing.

To mark the decorative sections of the design, following the guidelines etched previously, they were gone over freehand with a brush, establishing the composition and details of the ornamental designs and calligraphy.¹⁴

The “preparatory design”¹⁵ for all the painting techniques, as well as for the architectural decoration, has a fundamental role in the sphere of the executive method.

14 Zizola, C., *Notes on the execution of the paintings*, in *Madrasa Amiriyah. Conservation of the Mural Paintings*. Rome: CCA, 2005: 77-80: *Project of the decorative elements*. In this paragraph, the author described in great detail the method used to produce the paintings found in the Madrasah al-‘Amiriyyah: from the initial project to the preparatory design to the execution of the paintings.

15 Giannini, C., Roani, R., *Dizionario del restauro e della diagnostica* (Dictionary of restoration and diagnostics), Florence: Nardini Editore, 2000: 64: preparatory drawing: “this is the step considered final of the creative and design process of a work, from which we can imagine also the preparatory sketches that preceded it and that served to fix and develop the initial idea”. (Trans. K. Fay)



Figs. 35 and 36. Small domes: detail of repeated design made using paint-soaked cord and finished by etching.



Figs. 37 and 38. Dome 1f and under-arch 1f-g. Close-up of details of preparatory design or etching. On the right we can see evidence of a correction, the green on red.



Figs. 39 and 40. Main dome: interior, close-ups highlighting the etched lines.



Figs. 41 and 42. Main dome: interior, close-ups highlighting the etched lines.



Fig. 43. Main dome: interior. The photo exemplifies the precise symmetry of the decorative project.

Historically, in the western world, it can be considered the preliminary operation to creation of the work, while in the Islamic world, as the Islamic art critic Valerie Gonzolaz points out, the abstract or Arabesque geometrical and floral designs are “both the means and the end of the artistic creation”.¹⁶

¹⁶ Gonzalez, V., *Geometry in Islamic Art*, in http://www.arab.it/islam/geometria_arte_islamica.html.

The graphic media and technical methods used in conceiving and completing the design vary in the Arabian peninsula depending on the historical period, the nature and various political regimes, from artist to artist and depending on the geographical area.

For a first reflection on the operating technique regarding the preparatory design of the artists of the past in the Middle East, and specifically in Yemen, we can plausibly formulate a number of flexible hypotheses. Our suppositions could be examined later in accordance with what was observed visually and inspected from the scaffoldings, but also with the aid of the diagnostic analyses on the different decorative architectural works at Ṣan‘ā’ and Ta‘izz.¹⁷

The techniques of the preparatory drawings for the decorations found were: direct design and project design.

By direct design is meant a drawing made “freehand” on the base, etched with a sharp metal point and outlined with a brush dipped in paint or ink, directly on the surface prepared in plaster or mortar. In these cases, the artists could draw the ornamental design, conceiving it and perfecting it on the spot, in the same graphic execution on the surface of the structure, as they went along.

This procedure could imply that the artisan-decorator was able to rely on the formal idea from a pre-defined geometrical example designed in a personal “pattern book”, i.e. a notebook of sample drawings or memorandum containing a set of archetypes to which he could refer. We understand these personal “notebooks” to have been sheets of parchment bound together or in scrolls, grouping a variegated set of model drawings with Qur’anic verses, geometrical shapes and abstract floral patterns, with symbolic meanings.

In addition to the models on parchment, however, they could also have been annotated on blocks of wood, or even on textiles, surely on manageable and easily portable supports that they could take with them to the architectural worksites.

The surveys of the different sites, the Great Mosque of Ṣan‘ā’, for example, confirmed that the modules of the design were, in general repeated along structural elements in wood, like the reproduction on coffers of the same contiguous row, or the symmetries developed along an entire beam, that were executed according to two different modes. One done freehand, without particular reference points, very roughly, the other having defined in advance a geometrical structure with the aid of tools, such as a ruler and compass, in order to produce guiding lines etched on the wood or on the prepared base. Though it was a repetition of the same ornamental design, it was possible to observe differences from one to the other.

The second method, we have called “project design”, is more detailed and advanced in the technical procedure than the previous.

¹⁷ In the specific case, the studies of the executive technique were carried out by the experts of the IVBC on paintings at the following monuments: the decorated wooden ceilings of the Great Mosque al-Jāmi‘ al-Kabīr at Ṣan‘ā’ (first founded in the 7th century and various restructurings between the 8th and 13th centuries), the wall decorations of al-Mu‘tabiyyah Mosque and Madrasah in Ta‘izz (dating from about 796/1393), the mural decorations of al-Muẓaffār Mosque in Ta‘izz (dated between about 647/1249 and 694/1295) and, of course, the decorations at al-Ashrafiyyah Mosque and Madrasah (datable about 800/1397).

The design was conceived preliminarily, as proposed, to establish a guiding idea of a complex decoration or an organic set of decorations in an architectural environment in the form of small “sketches” to develop a program of model-studies.

This task was probably assigned to someone who worked with the architect and who we can compare to the role of *Magister pictor*, who met with the client, the sultan-patron, to decide, define and agree on the final global plan of decoration.

Later, each separate design developed to complete the decoration was reproduced in a smaller version, however in scale, with respect to the measurements of the architectural monument.

The elaborations of the drawings, as specified hereafter, were taken from manuals of Islamic art and were executed very precisely, studied and formulated at the drawing table with compass and other geometric devices on adequate supports. After completing the project design, agreed and approved by the client, the drawings were given to the workers at the construction site, artisans and decorators, to be transferred onto the prepared surfaces. While conforming to the reduced drawings, the designs were copied on the surfaces of the architecture in real scale using mathematical ratios with proportional measurements,¹⁸ under the guidance of the *Magister pictor*.

An interesting issue concerns the types of supports used to prepare these project drawings in reduced scale, which could certainly be parchment, but even paper may have been used. A very detailed study on *The Arabic manuscripts and its papers*, by Geneviève Humbert,¹⁹ confirms that paper was produced and was fairly widespread from the 8th century in various regions of the Arab peninsula including Iraq and Yemen, areas which were under Persian influence. The use of paper was notoriously focused mainly on manuscripts and official documents, and elsewhere as wrapping for goods, but we can suppose that paper may also have been used to set down the project drawings for the architectural decorations. There are a number of different technical manuals on medieval Islamic art and on the applied arts, however most of these precious treatises have not been published as yet. One of them, now published, targeting practical uses, is worth mentioning here as it is strictly concerned with the topic of drawings. This manual illustrates the use of geometry in designing any item. We are told that already in the 10th century, in the Abbasid capital Baghdad, great mathematicians had developed handbooks showing the possible practical applications of their theories, useful to the skills of the artisans. These treatises were later copied, expanded, edited, translated into Persian and used for centuries. It is just to these handbooks that many researchers attribute the extraordinary

18 Zizola, C., *Notes on the execution of the paintings, in Madrasa Amiriya*. “The need of project drawings even for the painted decorations, and not only for the architectural structures, should not surprise us because not only these would have made it possible to show the client the final results planned, and thus to receive his eventual and necessary approval, but it would have been an essential tool for planning the operations, from the distribution of resources to the procurement of materials; from the recruitment and organization of the workforce to the calculation of the time needed to complete the works, and even to preparing the executive project for the scaffoldings, as was always done in every monumental work of architecture.”

19 Humbert, G., “Le manuscrit arabe et ses papiers”, *Revue du monde musulman et de la Méditerranée*, 99-100, Nov. 2002.

spread, starting in the 9th century, of the use of a refined geometry in the design and decoration of buildings (and objects).²⁰

For more in-depth study of the question of the existence of reference models, there are a number of *aides-memoires*, for architects and artists, particularly the discovery in 1965, of a parchment scroll 29.5 meters long containing 114 ink drawings showing project options for different types of two and three dimensional geometrical ornaments. The parchment found was probably made in Persian at the end of the 15th or early 16th century and is kept at Topkapi Palace in Istanbul. The geometrical ornaments shown on the scroll illustrate concepts characteristic of Islamic Art in architecture, miniatures and artistic products in general, and have been the subject of important studies.²¹

20 Grabar, O., *Technology, Islamic Art*, in *Encyclopedia of Medieval Art and Architecture*, 2012.

21 Necipoglu, G., Al-Asad, M., *The Topkapi Scroll: Geometry and Ornament in Islamic Architecture*, Oxford: Oxford University Press, 1996.







Section 2 - Chapter 2

THE PRAYER HALL STATE OF FACT AND ANALYSIS OF DETERIORATION

RENZO RAVAGNAN – JEAN PIERRE ZOCCA
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Introduction

In the fall of 2007, the experts of the Istituto Veneto per i Beni Culturali (IVBC) made a first inspection of the mosque to carry out a preliminary survey of the state of conservation and outline a project program proposal. At this time, an initial search was made of the archive, concerning the technological aspects of construction and an art historical appraisal of the monumental complex. At the same time, a first report was drafted on the state of conservation of the decorative elements of the Prayer Hall, the cenotaph pavilions and at the south entrance.

In the preliminary inspection, several problems were noted, having to do with both natural and anthropic factors. The action of these factors, along with prolonged neglect¹, had accelerated the constant deterioration to an exponential level. Among the natural factors, the climatic characteristics of the area play an important role.

In the eastern portion, the region is mountainous and the highest peak, Jabal Şabir, exceeds 3000 meters and is located south of Ta'izz where, as the slope begins its ascent, al-Ashrafiyyah Mosque and Madrasah is situated. The mountains trap the annual monsoons between April and October that, with their intense rainfall, drench the entire area. In the months of heavy rain, on the flat surfaces of the monuments intense rivulets form and, where not adequately channeled, these tend to soak deeply into the exterior walls.

The rainwater, in addition to infiltrating every fissure and crack in the walls and roofing, during violent storms also penetrated the interior, in rivulets flowing from the carved openings in the stuccowork and the tambour increasing the damage over the long term.

¹ Niebuhr, C., *Viaggio in Arabia e in altri paesi dell'oriente*, Italian edition edited by Carla Neri, Venice: Istituto Veneto per i Beni Culturali, 2017, 223 p. In the Sixties and Seventies, Niebuhr spent a few days in the city of Ta'izz, and noted in his diary: “Numerous abandoned mosques, in ruins at this point, including one that, for the taste of its architecture, unusual for this zone, seems to have been built by some Turkish pasha. The devout who thought they were handing down their memory to descendants with these monuments were wrong: their name is forgotten and the temples are collapsing”. (Trans. K. Fay)



Fig. 1. Small domes. Fracture across the apex of the northwest archway.



Fig. 2. Main dome, north wall with the *mihrāb* before restoration.

Other consequences were traced back to the many earthquakes that struck the geographic area of Ta'izz through the centuries, causing grave damage to the monumental complex. In time, the earthquakes caused landslides around the foundations and the drift of constructive elements of the architectural monument, leading to fissures and fractures in several parts of the masonry and extradoses of the domes.

In the main dome, at the center of the Prayer Hall, the pillars that support the east and west walls as far as the hemisphere, it was possible to see two deep vertical cracks that caused the structure of the walls to sag, creating weak points that also affected the structures of the lateral elements in the smaller domes.²

Fractures had formed in the walls of the eight smaller domes on the east and west sides, and in both sides of the main dome, with severe fissuring of the niches and tambours. To deal with this situation, deemed critical, and to prevent further damage, in the period from 1978 to 1980, as noted in the UNESCO reports, static structural works deemed urgent were carried out.

The smaller domes

In the 1978-1980 period, just to remedy the static problems, fortunately excluding the main dome, it was found advisable to insert into the framework of the eight walls of the smaller domes, between the supporting arches and the tambour, reinforced concrete beams about 40 cm high, which formed a ring around all the sectors at the level of the intrados uprights supporting the hemisphere. It has been calculated that in the works for insertion of the concrete beams, about 40 square meters of painted decoration were lost.



Figs. 3, 4 and 5. Small domes, fissures caused by structural sagging and detachment of the decorated plaster due to seepage.

However, although the work turned out to be destructive for the mural decoration, in technical inspections made by the IVBC experts in 2007, the glass fissurimeters positioned

2 Barban, L., *et al.*, *Il restauro delle decorazioni murali della moschea al-Ashrafiyya in Ta'izz, Yemen*, Proceedings of the 10th International Forum "Le vie dei mercanti" (The Merchant Roads), Capri-Naples: La Scuola di Pitagora (e-book), 2011: 3-4.

in 1981-82 in the cracks on different walls inside the building, confirmed that the static problems had been stabilized.

In inspecting the sections of the room and on the extradoses of the nine domes of the building, the masonry of which is covered by a thick plastering of *qaḍāḍ*, a number of breaks and fissures were found, although in many cases they had been hastily patched with cement.

The static damage on the inside had, however, implicated axial repercussions and tensions between the plastering and the wall structure, in some zones causing detachment and separation between the layers of preparation of the decorations. Moreover, the trend lines of the fissuring indicate that over the decades the frequent meteorological events favored seepage through the walls, damaging the smaller domes but also, as reported earlier, due to the water streaming directly from the windows of the domes onto the internal walls, damaging the mural paintings and stuccoworks.

The water and humidity, as in most cases for the mural decoration, were one of the main causes of alteration, having triggered in the preparatory layers of mortar in the masonry, erosive phenomena, processes of solubilization and formation of saline efflorescences which would migrate gradually toward the surface. The constant presence of moisture in the areas involved with this phenomenon weakened the stability of the decorations.

The dissolution and drawing upward of substances internal to the masonry structure, particularly the loosening caused by lime and clay, were revealed by large brownish, yellowish and grayish stains on the summits of the hemispheres of some of the domes.

In the base mortars of *qaḍāḍ* of the lateral structures the salts, crystallizing, had caused large areas of detachment of the preparatory layers of the masonry, with calcareous concretions of notable thickness on the surfaces. The laboratory analyses made on samples of surface concretions reported the presence of chlorides, nitrates, sulfates and oxalates.

In some portions of the domes, bubble-like swellings had formed, significantly lifting the edges of the plaster, with exfoliation and pulverization of the pictorial film and surface erosion of the decorations.



Figs. 6, 7 and 8. Small domes: examples of gaps, swelling, lifting, bubbles and powdering. Details.

In some areas, the infiltrations had caused fragments to chip away, bringing bits of painted plaster with them and revealing the underlying masonry structure.

Up to the height of the tambour, the decorated walls were usually uniformly primed with a lime whitewash, which also splashed into the niches.



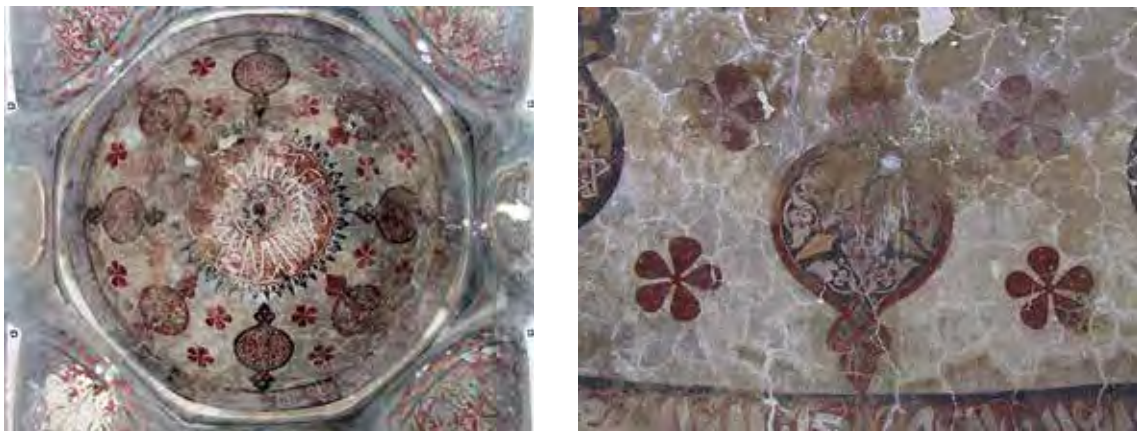
Figs. 9 and 10. Domes 1f and 1h, gray edging in reinforced concrete.



Figs. 11, 12 and 13. Dome 1a. Detail of intrados and tambour.



Figs. 14 and 15. Dome 1f. Detail of niche of tambour and intrados.



Figs. 16 and 17. Dome 1h. Detail of intrados and a pomegranate.

The main dome

In the central portion of the Prayer Hall, the plasterwork, very fragile by nature, suffered even more from the deterioration problems affecting the decorations and stuccowork, particularly visible at the height of the walls of the tambour, where large gaps formed under the apertures in the stuccowork perforated in an open design. Through these apertures, with the passage of time, the streamlets of rainwater had created weaknesses in the wall first, with later disintegration of much of the plasterwork.

The continuous flow of water on the surface dissolved layer after layer of the plaster, until the erosion reached the top bedding mortar layer of lime, clay soil and vegetable fibers, leaving it bare.

These phenomena cause the loss of large portions of the decorations and stuccoworks on the octagonal sides of the tambour.

In the past, in an attempt to block the intense wetness, the apertures were closed and clumsily repaired.



Fig. 18. Tambour on west side.



Fig. 19. Tambour on east side.

The plastering of the main dome, a treatment that is particularly sensitive to changes in moisture, had lost consistency in time, eventually flaking off entirely. The mechanical erosions were visible on the surface: patches that were detached from the masonry, plaster in a state of pulverization, paint film weakened on all the surfaces.

In the area of the tambour of the main dome, the apertures in the stuccowork, as they crumbled, created numerous openings toward the outside. In time, the dome had become the habitat of birds. The painted area, underneath the string course, showed clear streaks and stains due to the excretions of the birds, also absorbed on the inside of the porous plaster supporting structure. In addition, in order to cling to the string course where they built their nests, the birds had scratched the paint badly with their claws.

On the second register, two of the large niches with ogival arches in the four corners, richly decorated with stylized floral motifs, revealed a particular problem. Once, from the



Figs. 20, 21 and 22. Tambours on west, south and east sides.

top of the arches, chains were hung, connected to a bowl which held an oil lamp. The system for raising and lowering the bowl in order to light and extinguish the lamp, worked like a pulley. From time to time, in raising and lowering the chains, the bowl was overturned, spilling oil on the decorated walls and leaving obvious grease marks.

In the weeks preceding Ramadan, in the past, it was the custom to clean the mosque to receive the faithful. So for decades, once every year, in the entire Prayer Hall, the walls were whitewashed however to reach the upper portions, this was achieved by throwing buckets of the milky lime, which reached the decorations about halfway up the tambour, with obvious spattering and dripping. This practice led to a thick layering of whitewash in spots, sloshing onto the decorations and carved stuccowork.

A fragment of the stratification was sampled and analyzed in the laboratory using a light polarizing optical microscope, which confirmed that the sample consisted of at least ten layers of whitewash.



Figs. 23 and 24. Northwest niche of tambour, general view and detail of southwest niche.



Fig. 25. Main dome, east side. General view.



THE TRAINING PROJECT

RENZO RAVAGNAN – THE ITALIAN-YEMENI TEAM

Introduction

The project for architectural restoration of the entire complex, planned and supported by the Social Fund for Development (SFD) got under way in 2003/2004, under the direction of the architects Abdulhakim Al-Sayaghi (project director for the SFD) and Alaa Al-Habashi (project director for UNESCO, Cultural Heritage Division) with the supervision of the Director for the Antiquities of Ta'izz, Mr Al-'Izzi Muhammad Muslih.

The Istituto Veneto per i Beni Culturali, which had been operating in Yemen already since 2006 on the project for restoration of the Great Mosque of Şan'ā', submitted a proposal to perform the same work on al-Ashrafiyyah, with a project of conservative restoration of the decorated portion, which would also involve the training of local professionals, according to the principle on which its incorporation was based.

In view of the excellent results they were already obtaining at Şan'ā', in the worksite opened in the Great Mosque in the Old Town, the Istituto was invited by the Social Fund to undertake, initially, the restoration of the mural painting and, later, the other decorated portions of the al-Ashrafiyyah Mosque and Madrasah in Ta'izz, invitation which the Istituto accepted, completing the assignment in 2015.

Here again, the plan to provide training was developed with great aspirations. Beyond the intent to educate the operators involved and offer them real prospects for the future, there was also a desire to raise awareness in the community of the region and encourage the participation of the people in safeguarding their heritage and the countless extraordinary historical, artistic and cultural treasures of the country.

The new task prompted the organization to significantly increase the number of educators engaged to teach the courses, with the desire to expand the training activity, refining communications and relations with the leadership and coordinate teaching and logistics. The many commitments and complexity of the topics effectively required the Istituto to open new opportunities for many Italians desirous of taking on new professional challenges that, it should be noted, required great skills, the ability to organize the

worksite and deal with unexpected problems. Above all, the activity required the ability to kindle the enthusiasm of the students/apprentices for a wholly innovative process.

The courses involved qualified teachers of different subjects: from basic chemistry to chemistry applied to restoration, from the traditional methods of intervention to the use of the most modern materials.

Diversified training courses were evaluated and prepared with respect to those usually taught in Italy, considering that the conditions in which the trainees would be operating were different and specific. In Italy, for example, courses are held over a period of three to five years. In Yemen we tried to abbreviate the theoretical instruction and focus mainly on the practical applications, employing, as we have said, the ancient method of apprenticeship, combined with some classroom instruction along the way.

Theoretical courses and training on the job

Before starting to restore the ceilings, theoretical courses were held, attended by several young Yemenis, selected among students who had completed a university degree in archaeology, architecture or ancient history. The course consisted of 400 hours of theoretical subjects and about 500 of practical application, for a total of 900 hours on the consolidated model of three-year courses for restoration experts at Italian schools.

The coordinators, project managers for the Social Fund for Development, arranged to recruit candidates at Ta'izz for a first assessment, in accordance with the profiles required to perform the works for the conservative restoration of the paintings at the mosque.

Early in 2008, a selection of young graduates in archaeology or architecture, and expert artisans in architectural and artistic sectors, participated in the activities preparatory to the actual training course, following a first cycle of lessons on theoretical subjects and practical-laboratory activities supported by restoration experts and teachers from the IVBC. The theoretical lessons were taught by teachers who collaborate with the IVBC in Italy, through an Arabic language interpreter, and explored more in depth with the aid of video and multimedia material and reading material in Arabic. Later, they began the practical work on the site, where the concepts acquired through study could find adequate application. In the preparatory stage of professional training the local students made a report, for each dome of the lateral east and west wings, on the state of conservation with a graphic relief mapping the deterioration and a set of detailed photographs.

At the end of the course, the students were subject to a selection based on the judgments expressed by their teachers on both the theoretical and practical parts of the course. The period of training, as it proceeded, was thus able to prepare a team of local Restoration Experts who continued in the practical applications of the worksite-school, while the scaffoldings were being erected in the west wing of the Prayer Hall.

In the spring of 2008, the team of the Yemeni training course started its first activities, working alongside the restoration experts of the IVBC, in the four western domes



Figs. 1 and 2. Preparatory training course, classroom lessons.



Figs. 3 and 4. Training course, appraisal of state of conservation and tests of surface adhesion.

corresponding to sectors 1a, 1b, 1c, 1d. The Istituto is not new to promoting and coordinating operations of this particular type, organized according to a method that has been thoroughly tested over the years both in the content and in the results: selection of the students, identification of teachers-tutors of proven experience to appoint, logistic organization for their lodging at the site, planning of the activities, etc. The work-site-school is a fundamental service of refinement of the capability and project planning for the student, called upon to apply on actual objects the theoretical lessons recently acquired.

An innovative aspect of the project can be seen in the advantage of combining the technical and scientific skills of those who teach and the enthusiasm of those who are learning new work methods and putting them into practice. It is at the worksite, where the students are cheered by the good outcomes but also forced to deal with daily problems, that the training activities are put to the test and the individual talents measured. More than that, the students themselves report having lived through a life-altering experience of collaboration, a meeting of cultures and teamwork. And in fact, an effective cooperation was established here, with an excellent understanding of the job and daily life, based on reciprocal esteem and respect of the differences.

These are the true training results that sustain and spur the commitment of all the people involved, at the institutional level or elsewhere, and that reward them for all the complications that arise in carrying out the courses and performing an operation of restoration in the form of a worksite-school in a place that is as marvelous but as far away as Yemen.

The first operations carried out in the four west sectors were the facing of the loose, endangered decorated plaster and the removal of the thick coating of whitewash that covered most of the surface of the mural paintings and stuccoworks, up to the tambour.

At the same time, the pilot worksite, having completed all the sample operating stages, focused on dome 1a, with a program that included: stabilizing the plasterworks, fixing the paint film, removal of the whitewash and previous patching with stucco, cleaning, repairing fissures and gaps, retouching of the painted decoration for a unified and balanced esthetic presentation.

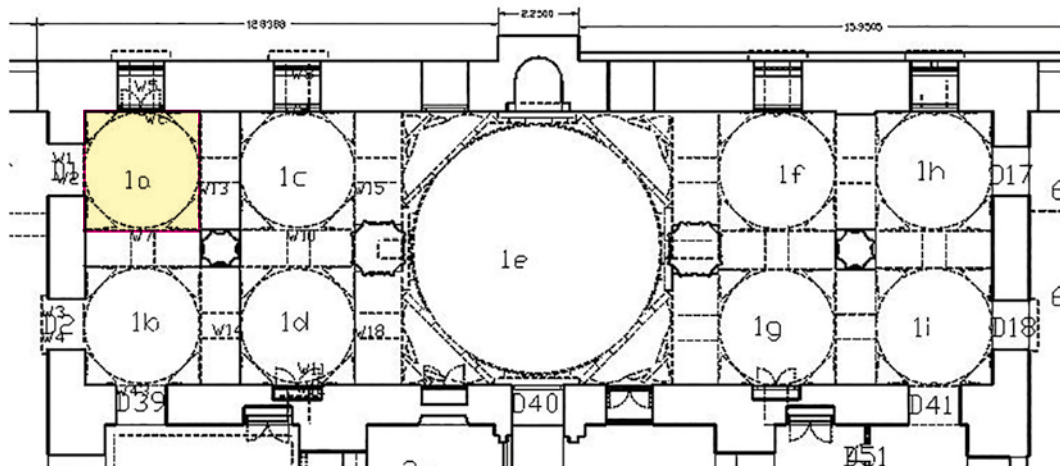


Fig. 5. Floorplan of the Prayer Hall. In yellow, the west wing, small dome 1a, pilot-worksite.

In the development of the works, operating methods and materials used were tested by making numerous samplings, discussing them with the works directors and lead teachers-restoration experts from IVBC at the worksite, in order to agree and decide on the results to be sought

The pilot-worksite in sector 1a, consequently enabled the Italian restoration experts to make an in-depth appraisal of the problems and technical solutions to be attempted, introducing the local operators gradually to the practical experimentation of a complete cycle of actions for the conservative recovery of the mural paintings at the mosque.



Figs. 6 and 7. Removal of lime whitewash and surface concretions using scalpels.

Course for restoration of woodworks

On January 15, 2013 the course teaching restoration of wooden materials began, with the aim of preparing the students for work on the *mashrabiyyahs* in the sepulchral complex, dedicated to the family of the Sultan al-Ashraf II, and on other woodworks in the mosque.

The first stage of the course was to teach the theoretical rudiments of different wood types, the more common wood species and those used for the works of interest in the structure, the derivatives and characteristics of each material. Later, the participants learned the basics of restoration carpentry, gaining practice with the manual tools and special machines for woodworking.

The activity consisted concretely in the construction of a prototype, corresponding to the original lathed modules of the *mashrabiyyahs*, but only after careful study, also including a drawing. At the same time, the mechanical cleaning of a panel of the *mashrabiyyah* 2A1 was carried out, with removal of a modern coat of green paint, with proper attention to maintain the original patina and colors.

The students also had the opportunity to learn how to prepare and apply the consolidating agent Paraloid B72 to strengthen the wood, where that might be necessary. Hours were dedicated to drawing, in particular to the relief of the *mashrabiyyahs* found in the school of al-Ashrafiyyah.

The students also attended two seminars held by the contact person of the Italian team of the Istituto Veneto per i Beni Culturali. They acquired information on the subject of fresco painting, from the historical standpoint as well as from that of the methodology.

The course started with a work group of 10 apprentices.

It was held in the following sequential stages:

- organization of the workshop and maintenance of the machinery and tools to be use for the restoration works on the *mashrabiyyahs* (it was also decided to devote two hours a week to cleaning and fine tuning the equipment);
- presentation of the machines and tools, many of which did not exist in Yemen or were not usually used in traditional carpentry;
- study and discussion about the approach to the work, weighing the hypothesis of dis-assembly and the problems that this solution would imply;
- detailed explanation of the stages of work through photographic documentation (digital photos) at various times (before, during and after restoration) and written reporting (daily);
- technical drawings of the *mashrabiyyahs* in three stages: illustration on a sheet of drawing paper, numbering of the separate parts and reproduction on tracing paper. The assignment of making the survey was divided among the students, forming groups, two people per *mashrabiyyah*;
- some were given the task of producing prototypes on a lathe, which would be used to complete the *mashrabiyyas*, measuring 18 x 18 mm. In this connection, it should be noted that the executive drawing for the lathed elements was prepared by the teacher Albarà Allubadi, and was the reference from which the models to be completed were derived;
- others worked on removing the coating of recent color from the door catalogued as 2A1D, after dismantling both sections. Here again, the drawing (in color) was produced by a teacher as a reconstructive hypothesis for *mashrabiyyah* 2A2; note the approach to the method of use and application of Paraloid B72.

The training project - A contribution to the social and cultural growth of Yemen¹

Restoration of al-Ashrafiyyah Mosque and Madrasah in Ta'izz is part of a process of discovery and valorization of the historic and artistic heritage of Yemen, a country rich in traditions and culture. Ta'izz, the ancient capital of the country, has been designated the cultural capital of Yemen since 2013, as it is one of the oldest cities in Yemen and has always been active in the country's cultural production.

Ta'izz possesses rare jewels of Rasulid architecture, including al-Ashrafiyyah Mosque and Madrasah. After eight years of restoration works, the mosque was returned to the community in 2015.

¹ The Istituto Veneto per i Beni Culturali is based in Venice and is a non-profit association. The IVBC has been active in Yemen for ten years, at Ṣan'ā' and at Ta'izz, where two mosques have been restored, respectively the Great Mosque and al-Ashrafiyyah. Coherent with the principles of the Institute, the Yemeni project has training local restoration expert, providing advanced courses taught by Italian experts. After 2015, following the outbreak of civil war in Yemen, the IVBC had to suspend the projects and activities in progress.



Figs. 8 and 9. Students of the carpentry course engaged in lathing and finishing tasks.



Figs. 10 and 11. Graphic reconstruction of a *mashrabiyyah*.

The goals achieved by this all-encompassing restoration project were numerous. Above all, the restoration and conservation of one of the oldest monuments in the city. Now entire new generations will be able to explore and understand their past and will feel it a part of themselves. It is only with profound knowledge and understanding of the past that people can look to the future with greater awareness.

The restoration enabled us to implement a training program relative to conservation for young Yemeni students, with the creation of new jobs and the training of a generation of artisans whose qualifications are aligned with international standards.

A more general result thus includes a contribution to the social and cultural growth of the country and to the economy of the city. We want to thank all those who participated in this work, whose results is the product of a collective effort.

The result was achieved thanks to all those who worked with passion and devotion for years, learning to understand and appreciate the traditional construction methods, and rediscovering a glorious, fertile past.

We hope that in the near future new conservation programs can be implemented, as a necessity for a community that wants to take back possession of its monuments.

We also hope that the social and political conditions allow this dream to come true, because it is only in an atmosphere of peace that there can be development, growth and wellbeing.²

² Renzo Ravagnan, architect and director of the Istituto Veneto per i Beni Culturali, introduction to the brochure *Restoration of the Mosque and Madrasa of al-Ashrafyyah*, on the occasion of the inauguration in January, 2015. Published by IVBC, Venice, 2015.



RESTORATION WORKS

RENZO RAVAGNAN – JEAN PIERRE ZOCCA
THE ITALIAN-YEMENI TEAM

Introduction

The project for restoration of the al-Ashrafiyyah Mosque and Madrasah, programmed by the Social Fund for Development (SFD)¹ was developed between 2003 and 2004². In 2008, the Istituto Veneto per i Beni Culturali of Venice (IVBC) was asked to restore the historical and artistic elements, in particular the mural decoration, wooden and stonework, and to provide consulting services with regard to any structural works.

The program also included the training of local professionals, under the direction of teachers and experts from the IVBC. The main objective of all the organizations is to provide an orientation and guidelines for the valorization of Yemen's extraordinary historical and artistic heritage and to increase awareness of the enormous value of the works located in that country, testament to a great and glorious past.

At the time of the first inspection in 2007, it was possible to reach considerable heights in the Prayer Hall using a mobile platform structure. In some areas of the domes it was possible to make accurate observations of the executive technique, the materials used in construction and the problems causing deterioration. A first series of diagnostic investigations was launched at that time, taking samples of the plaster, the pictorial material, the stuccoworks and performing some trial cleaning processes in the small domes in areas where the decorated surfaces showed good adhesions and strength.

On the basis of the notes made at that time, a technical report was drawn up with proposals accompanied by a project for performance of the works.

At the time of the first inspection, a local building restoration company was engaged in some structural works on static elements, and providing to repair small cracks in the masonry and exterior finish. In particular, the works in progress were focused on the

1 An office of the Yemeni government that is actively engaged in the development and social promotion of the countries in various sectors, in addition to the field of culture.

2 Works Directors: the architects Abdulhakim Al-Sayaghi (project director for the Social Fund) and Alaa Al-Habashi (project director for UNESCO, Cultural Heritage Division) with the supervision of the Superintendent of the Antiquities of Ta'izz, Mr Al-'Izzi Muhammad Muslih.

roofing and on the extradoses of some the domes and the wall finish of the two minarets. With these interventions, the company was resolving one of the main factors of deterioration of the mural paintings and stuccoworks in the prayer hall, by preventing the continued seepage of rainwater from the roof and walls.³

At the end of 2007 the project proposal for restoration of the mural paintings was completed and rapidly approved by the client, the Social Fund for Development, sponsor of the project. After selecting the group of operators who would work alongside the Italian team, the restoration works were undertaken at the beginning of 2008.



Fig. 1. East side. Overview from outside the mosque.



Fig. 2. South side. View of dome extradoses.



Figs. 3, 4 and 5. Workers from the building restoration company repairing cracks in the extradoses of the small domes.

The small domes: restoration works

Based on the experience gained during the pilot project carried out in the dome with the restoration experts of IVBC and the Yemeni team, the restoration works continued in the sectors relative to the three small adjacent domes, in sectors 1b, 1c, 1d. Later, the work was completed on the mural decoration of the east wing, in sectors 1f, 1g, 1h, 1i.

The decorations of the eight small domes were produced using the mezzo fresco technique, a type of mural painting done on plaster that, while generally already carbonated, was not entirely dry, using color made from pigments diluted with water and lime,

³ *Moschea Al-Ashrafiyya-Taizz, Relazione sopralluogo Novembre 2007* [Typewritten Inspection Report], Venice, Istituto Veneto per i Beni Culturali, 2007 (April 27, 2008).



Fig. 6. The building restoration company resurfacing the *qadād* on the extrados of the main dome.

which were then carbonated to the surface of the still damp plaster. Thus, in the dual process of carbonation of the substratum of plaster finished in *qadād* and the paint film applied on it, perfect adhesion was ensured.

In accordance with the identification of the phenomena of deterioration observed in the different areas, the materials and methods used for the works were chosen among the most appropriate for this particular painting technique.

Pre-fixation of lifting of plaster and fixing of the paint film

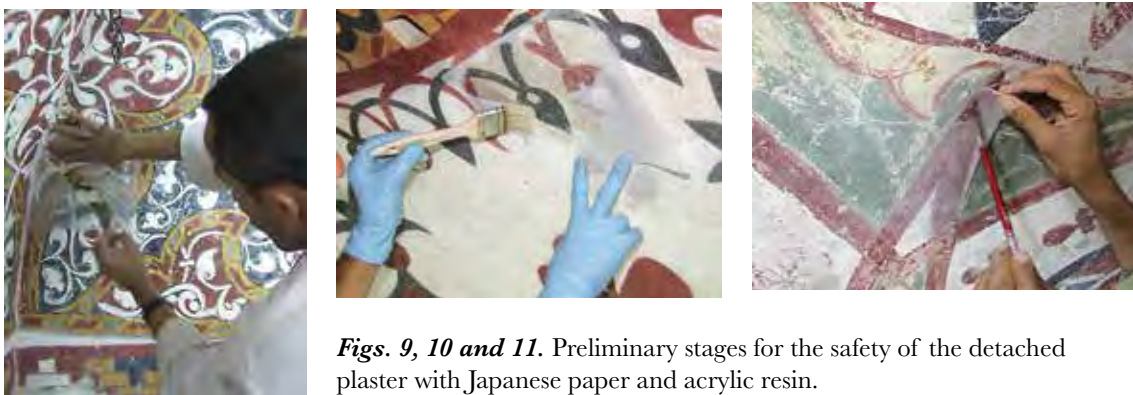
After removing the deposits of loose dust with soft brushes, the fragments of plaster, detached and precarious, were secured by means of application of cotton gauze and acrylic resin Paraloid B72 at 10% in acetone. This was a necessary step and would precede any work of re-adhesion carried out during the consolidation process, described hereafter.

Where the paint film revealed lack of adhesion in the form of flakes and fragments or exfoliation, several different specific methods were used case by case, as needed.

Zones of detachment with flake-like thickness were first repaired with Paraloid B72 at 5% in acetone and Japanese paper. Later, starting from the edges of the flaking, localized injections of Primal AC33 in variable concentrations, not over 10%, were applied to the substrate with gentle pressure using a steel putty knife.



Figs. 7 and 8. Preliminary stages for the safety of the detached plaster with cotton gauze and acrylic resin.



Figs. 9, 10 and 11. Preliminary stages for the safety of the detached plaster with Japanese paper and acrylic resin.

After adhesion, the Japanese paper was removed.

Where the paint film was found to be in a condition of fragile exfoliation or powdery disintegration, sheets of Japanese paper were spread and moistened with natural sponges dipped in deionized water. After that, Gelvatol, a vinylic alcohol resin, at 5% in water was brushed on and the paint film was made to adhere to the substrate with the aid of a putty knife after first applying a polyester film such as Melinex, and then padding gently with small tufts of cotton.

Removal of whitewash and previous stucco works

Removal of the multiple coats of whitewash and lime paint that covered parts of the painted areas was done gradually using small chisels, scalpels and finishing with a glass fiber sticks.

On some portions of the east sector, removal of the whitewash was particularly difficult due to the crystallization of salts on the walls, a phenomenon caused by the seepage of rainwater.

The stuccoworks from previous maintenance work were removed with scalpels and small chisels. The concrete stuccoworks found in some deep gaps were first consolidated, then removed mechanically with hammer and widia chisel.

Consolidation of plasterworks

Proceeding from the lower part of the walls upward toward the dome, in vertical sections, the re-adhesion and consolidation of detached portions of plaster from the wall sections was achieved using salt-free pozzolanic lime-based binders (Albaria, Basf), mixed in demineralized water. The method used ensured that, along the fissures in the plaster and the abrasions of the paint film, small holes were bored with a hand drill into which adhesives with different degrees of fluidity could be injected using a needle and syringe, after moistening with water and ethanol (1:1) to facilitate the passage of the material through the hole.

In areas with accentuated and complex situations of detachment of the painted plaster from the masonry structure below, after applying tissue paper, the sections were repositioned on the original site using props to hold them in place. The props were designed to apply gradually increasing pressure so as to make the plaster adhere slowly in the imprint of the original base. Later, the borders and raised edges of the gaps were fixed using a light mortar of putty and fine sand (ratio of binder to inert material 1:2).



Figs. 12 and 13. Consolidation of plaster detached from a portion of the masonry.

Lowering of the concrete beam

The beams in reinforced concrete inserted between 1978-80 in the walls of the small domes were, at the same level as the mural decorations, if not higher. Regardless of the choice that would be approved later to restore the final esthetics, it was necessary to move the concrete structure to below the level of the paintings. Therefore, after consolidating

the decorated enclosing walls and welding the relative perimetral borders, a thickness of about 3 cm was removed, using hammer and chisel, so that the entire surface would be uniform and would facilitate the subsequent processes of applying the plaster finish.



Figs. 14 and 15. Reducing the surface of the reinforced concrete beams using hammer and chisel.

Cleaning

The preliminary operation consisted of removing the loose dust sediments with soft brushes and a controlled-flow vacuum cleaner.

With a series of targeted samplings it was possible to determine the best way to reduce and remove the layers of deposits covering the decorations and those clinging most tenaciously to the surface, even proceeding with several methods in gradual sequence.

The paint film of the fresco on plaster showed a good resistance to the watery environment, so cleaning was done by applying a layer of Japanese paper and brushing it with a solution of inorganic salts at 50% in demineralized water (100 gr of ammonium carbonate per liter).



Fig. 16. West dome 1a. Cleaning test.



Fig. 17. Dome 1c. Cleaning test.

Application timing was variable depending on the tenacity and thickness to be eliminated, however it averaged between ten and fifteen minutes.

In some domes, the solution of inorganic salts was supported with compress of cellulose pulp. Rinsing was done with deionized water and sponges, finished with soft brushes and cotton batting for padding.

Later, on the dry surface, the residues of incrustations and saline efflorescence were removed dry with scalpels, pens with fiberglass and Wishab sponges⁴.



Figs. 18, 19 and 20. Various methods of cleaning: with compress of paper pulp, with Japanese paper and AB 57.

In certain areas, particularly in the four domes in the east zone where the deposits to be removed appeared more difficult, a sequence of different cleaning systems was used. In areas with sulphatation the anion exchange resin was applied on Japanese paper for the desulphating chemical cleaning treatment, which made it possible to remove loose surface deposits.

Later, in the same dry area, the gel AB57⁵ was applied by brush on japanese paper, oscillating with timing from 5 to 15 minutes and rinsing carefully with deionized water and soft brushes.

A particularly difficult situation arose on the domes in the east zone where, due to seepage, saline efflorescences had formed with carbonatic concretions, tenaciously incorporated in the surface of the paint film and plaster substrate. To eliminate these saline concretions, after applying AB57, we proceeded with a painstaking process of mechanical removal using scalpels. Where the decorations exhibited brown stains caused by migration of the clay bedding soil, with efflorescence on the surface or, in some areas stained because of the smoke from oil lamps, we applied compresses of sepiolite and demineralized

⁴ The main components of the akapads (wishab sponge) are synthetic latex and factice (cross-linked natural castor oil and/or canola oil), gently vulcanized under defined conditions.

⁵ AB 57 mixture: Formulation developed by the ISCR (Istituto Centrale per il Restauro, Rome) and used to clean frescos and painted stone surfaces. It is one of the least damaging methods for the chemical cleaning of surfaces, and is a mixture of salts, complexants, thixotropic elements and absorbents. Components: Water 1000 cc.; Ammonium bicarbonate 30 gr.; Sodium bicarbonate 50 gr.; E.D.T.A. (Disodium salt) 25gr.; Desogen (quaternary ammonium salt) cc10 (surfactant, fungicide); Carboxymethylcellulose g 60. The pH is around 7-5 and the quantity of E.D.T.A. may vary, if necessary, from 100 – 125 g.

water on the surface and left it to dry. Later, the treated surface could be cleaned of the residue using sponges and soft brushes. The applications of sepiolite were repeated until they achieved a reduction of the stains.



Figs. 21 and 21a. Dome 1f. Qur'anic inscription in the first ring of the dome, before and after cleaning.



Figs. 22 and 22a. Dome 1g. Qur'anic inscription in the apex before and after cleaning.

Stuccoing of gaps

After many trials and assessments, the mixtures of mortar for stuccoing the small and medium-sized cracks and gaps were prepared using lime putty and powdered local stone with characteristics relative to granulometry and coloring similar to the original mortar.⁶

To repair the base layer, coarser inert materials were used in the composition of the mortar, in a 1:2 ratio between binder and inert material, while for the intermediate layer, a plaster with fine granulometry was used, with a ratio of 1:1 between binder and inert material. For the top layer, filled to the level of the original plaster, a stucco composed of lime and fine sand was mixed with ventilated white powder (binder-inert ratio 1:3). This last reparatory layer served to provide a smooth surface, however, while it was still damp, in expectation of the paint addition, and was therefore delicately roughened to make it more suitable for the application of watercolor paints. In fact, the various tests for repair of the painted decoration carried out previously to determine the “grip” of the watercolor but also its chromatic “vibration”, required a surface prepared as described above.

The glaring gaps in the decoration from the height of about 40 cm, which encircled every sector above the arches following the insertion of the reinforced concrete beams forced us to examine a range of options. The results of the tests performed using the traditional *qaḍād* technique to fill the gaps were clearly inadequate. The finished surface would have to be made suitable for the subsequent operation of repairing the decoration as specified in the next paragraph, so the types of mortars already used for repairing the small and mediums gaps were found suitable for repairing the large gaps as well.

Treatment of the gaps and esthetic presentation

The problem with restoring the gaps is the one that is always the most difficult to decide in a restoration, particularly when they concern large areas, as it is are what really determines the overall outcome of the work. The works directors and the restoration experts from the IVBC operating at the site gave considerable thought to a coherent method of integration, in relation to the size of the areas and their location.

A modern conception of restoration allows us to take a “critical” approach to the alterations that different types of gaps cause in the perception of the overall image.

Where possible, it was decided to restore the comprehensibility of the composition as a whole, according to the principle that “reintegration must treat every gap in function of the totality of the work”.⁷ In particular for the mural painting, that is an integral part of the architecture housing it.

6 The lime used was also of local origin. The process of grinding the stone to powder and preparing the mortar for restoration of the decorated walls was carried out by the Yemeni operators of the construction company, who worked on the plastering and flooring of the building.

7 Mora, P., Mora, L., Philippot, P., *La Conservazione delle pitture murali*, 1999: 330.

When minor abrasions to the colors were involved, it was a simple matter to proceed with light undertone veiling, while small stuccoworks were repaired in separate sections.

For the areas that had been washed away and had lost their color, since the surfaces generally still contained etched or painted portions of the design, it was decided to proceed with undertone veiling so as to re-establish the chromatic continuity.

The discussion focused on the appropriate solution for management of the large gaps that, because of their size, created a visual imbalance with regard to the unity of the whole. In particular, these concerned the large gaps above the arches of the small domes, where the concrete beams had been inserted.

These areas, though they had been filled in with plaster of a uniform shade, caused an obvious break in the continuity of the decorative design, interrupting both the geometrical friezes and the Qur'anic inscriptions that, as revelatory elements of an Islamic religious message, transcended the mere ornamental aspect.

In Islamic monuments, the calligraphy has a decorative but even more an iconographic function, comparable to the function of the imagery in the Christian world. It serves to honor and express the word of God. The script, for Muslims, does not reflect the reality of the word, but is, on the contrary, a visible expression of the greatest art of all, that which is expressed by the spiritual world. It is therefore clear that to leave the Qur'anic inscriptions incomplete would be an inappropriate choice. We opted to reconstruct them in the same color using a retouching technique considered appropriate in light of the particular significance of the situation, not only from the esthetic but also from the formal standpoint. Proceeding to study the parts of decoration that were missing, it became clear that the Qur'anic inscriptions could be reconstructed by calligraphic experts without the risk of error, since the remaining evidence in the intact portions made it possible to complete the inscriptions faithfully, using this differentiated technique, as well as the zones where the decoration was missing.

In conclusion, after considerable thought and discussion, the prevailing orientation was to "reduce the alterations (gaps) to restore as much as possible of the image still possible, while respecting the authenticity of creation of the historic document".

It was therefore decided to restore the esthetic continuity, the cultural and religious value of the Qur'anic inscriptions and the plastic-spatial and formal equilibrium of the architecture.

In respect of the historic authenticity, the reconstruction was done using hatch retouching techniques. This is a technique that differs from the original full-field coverage but is not noticeable from the distance required for a unified view of the work, though perceptible on close inspection.

The method used was imposed on the basis of the preparatory design prepared using the surviving models and applied to the plaster using chalk dust.

The bands containing Qur'anic verses had parts of the letters missing, but also entire words, and required a separate study by a Yemeni scholar, expert of the Qur'an and calligraphy who, on the basis of the existing traces, was able to rewrite them coherently.

For the color application, within the lines of the redrawn letters, Winsor & Newton watercolors were used as they are of high quality and exhibit excellent stability in time.



Figs. 23 and 24. Dome 1f. Retracing of preparatory design using powdered chalk.

In short, hatch retouching techniques is based on a system of different colored lines, clearly added, according to the principle of the division of shades. The vibrant and contrasting alignment of tonalities creates the perception of the shading of a single color. The method consists of filling in the light background of the plaster with vertical lines matching the original colors in order to achieve the maximum unity and continuity with the surrounding decoration.

To distinguish the reconstruction further, the details have been simplified and, in some parts, left unfinished. The red or yellow floral designs on the white background of the vaults, like other similar elements, were also resolved through retouching, however not in the vertical direction, but following the direction of the painting, i.e. arranging the colored lines in concentric expansion according to the graphic outline of the shapes.



Figs. 25 and 26. Stages of restoration of painting by retouching.



Fig. 27. Dome 1a. Interior.



Fig. 28. Dome 1a. East wall.



Fig. 29. Dome 1a. South wall and tambour.



Fig. 30. Dome 1a. West wall and tambour.



Fig. 31. Dome 1a. North wall and tambour.



Figs. 32 and 33. West sectors. Overview.



Figs. 34 and 35. East sectors. Overview.



Fig. 36. Restoration works on the mosque were completed in December 2014, and inaugurated in January 2015. This picture taken with a wide-angle lens of the small domes in the west sector, was taken in January 2021 by the Yemeni artist Nezar Moqbel.



Fig. 37. View of the small domes in the east sector. The picture was taken by the Yemeni artist Nezar Moqbel, in January 2021.



Fig. 38. View of the small domes in the east sector. The picture was taken by the Yemeni artist Nezar Moqbel, in January 2021.

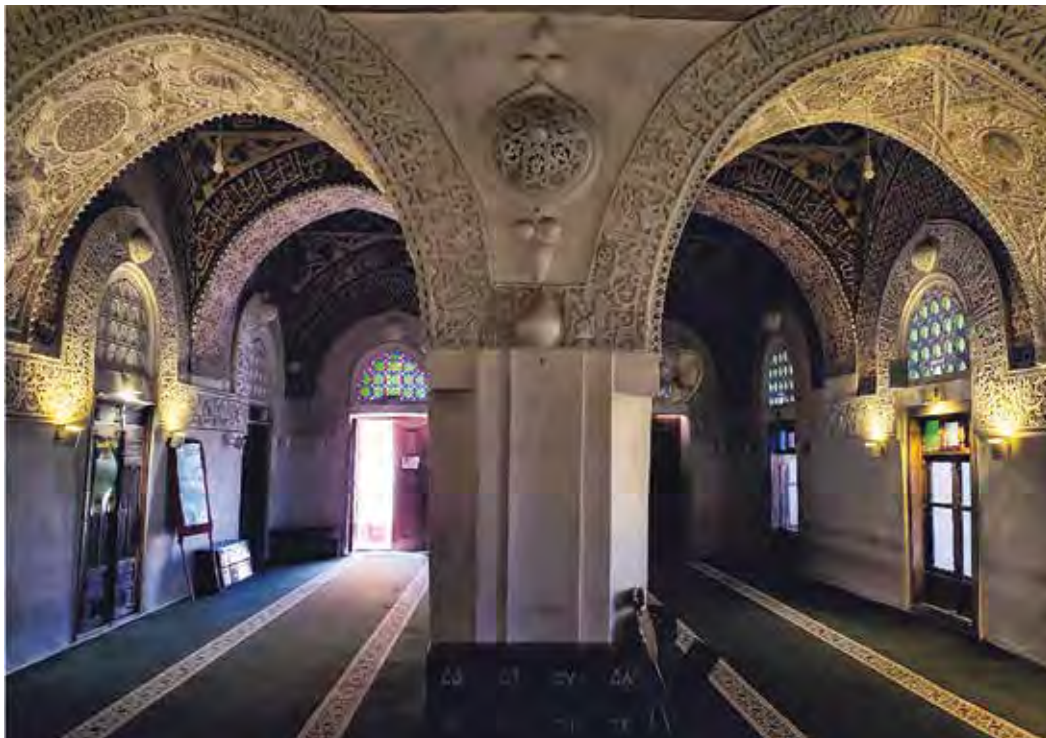


Fig. 39. View of the small domes in the west sector. The picture was taken by the Yemeni artist Nezar Moqbel, in January 2021.

The main dome: restoration works

Unlike the eight lateral domes, the main dome, central focus of the long nave of the Prayer Hall, was painted in tempera on a prepared plaster support, in other words, using a dry mural painting technique. Plaster is a material that is particularly sensitive to moisture by its hygroscopic nature, and had poor physical and mechanical resistance, like the bedding mortar on the wall, composed of lime, clay soil and vegetable fibers. The protein-based medium used in applying the paint is a binder that is also sensitive to water. We have already described, in the chapter on the state of conservation, that the seepage of rainwater over many decades, through the cracks in the base of the dome, has washed away and worn away much of the surface painting on four walls below it. For the most part, the seepage, particularly of rainwater flowing through the broken windows of the tambour, produced large gaps in the areas below. The absorption of water by the hygroscopic plaster of the walls caused evaporation of the moisture in the dome, which was deposited on the fragile surfaces of the walls. These annual cyclic phenomena, over time, weakened the plaster supporting the paint film.

As a consequence of the construction features related to the technique and the problems of deterioration observed, the materials and methods used in restoration were limited in their use of water, as much as possible.

During the preliminary inspections and initial practical tests, a study was made of the state of conservation and, during the works, the main methods of operating and materials used were carefully reported on.

Removal of lime whitewash

During the worksite-training course, in the early stages of the operation, the whitewash was removed from the lower walls by mechanical means, using scalpels or pens with fiber-glass refills. Fortunately, as regards the main central dome, the coating of whitewash only involved the lower portions of the zone of the walls involved and only limited portions of the decorated section.



Figs. 40 and 41. Decorative band in the second register, at the height of the *mihrāb*. Removal of whitewash using a scalpel.

Adhesion of the paint film

Starting from the design in the apex of the dome, and proceeding downward to the string-course of the tambour, the decorated area was carefully studied up close in circumscribed sections, one square meter at a time, to check the adhesion of the paint film and identify any zones of precarious adhesion. Having ascertained widespread instability, with powdering of the paint film in several spots, tests were carried out to determine the best way to consolidate it. As a precaution, an overall pre-consolidation was applied by spraying an acrylic resin in a low concentration (Paraloid B 72 at 5% in acetone) on the entire inner surface of the dome up to the height of the canopy stringcourse of the tambour. The spray, absorbed in the substrate without altering the tonal gradation of the paint film, determined a first stage of blocking and stabilization of the color. Later, in the canopy as well as on the other decorated surfaces of the main dome, we operated where necessary to fix the paint film locally in the weaker zones, first applying Japanese paper and then applying the fixative by brush.



Figs. 42 and 43. Interior of dome. Stages in fixing the paint film.

For the portions of paint film with slight flaking and lifting, microinjections were made along the fissures with a few drops of another acrylic resin (Primal AC33, between 10-20% in water). Later, the paint film was made to adhere to the substratum by interposing polyester film (Melinex) and applying slight pressure with a putty knife. A few days later, the adhesion of the flakes was examined and, where it was deemed necessary, the operation was repeated to ensure adequate stability.

Consolidation of plasterworks

Where the plaster had detached from sections of the wall, we initially focused on the situation of greater gravity and urgency. First operations along the east and west walls repaired deep fractures and long vertical cracks that ran from the base pillars all the way to the hemispheric dome. Caused by structural collapses, the fissured edges of the decorated plasterworks had become detached and lifted from their masonry support.

In a number of areas, particularly at the height of the third register (octagon with niches) and partially at the beginning of the fourth register (octagon of the tambour) under the windows, due to the influx of rainwater, the loss of plaster had cause large gaps that left parts of the bedding layer visible. This was composed of lime and earth, and showed partial past repairs in the brickwork, revealing a overall state of severe deterioration. Consequently, as a preliminary operation, these areas were cleaned down to the bare masonry. After that, ethyl silicate was applied by soaking with a brush, to act as a structural aggragant for the loose porous material.

As a precaution, along the borders of the plaster that had lifted off the wall structure, material similar to the plaster used as preparation for the decorations was applied as a cementing sealant.



Figs. 44, 45, 46, 47, 48 and 49. Profound vertical fractures in the east and west walls. Stages in consolidation.

The deeper vertical fractures reaching into the masonry structure, were cleaned with a vacuum device and dusted. Then they were stuccoed with mortar inserted through rubber tubes to a depth of thirty centimeters. Using large syringes, a consolidating mortar could also be injected through the tubes (Albaria, BASF). Their highly fluid consistency enabled them to reach the deepest meanders. The consolidating mixture used for this work was a compound of pozzolanic lime with the characteristic of maintaining a high degree of fluidity and water retention, without adding moisture to the plasterworks.

To repair the edges of the gaps and more in general on the detached plaster zones, operating from the ground and proceeding upward by circumscribed vertical areas to the inside of the hemisphere, holes were drilled with a manual drill between the substratum of preparation of plaster, the bedding for the *qadāḍ* and the masonry bedding. Using needles and syringes, a natural lime-based mortar was injected (PLM-A, C.T.S. S.r.l.) giving new characteristics of adhesion between the detached parts. This work proceeded, spacing work on the same area, where necessary, to every other day.



Figs. 50, 51 and 52. Interior of dome. Consolidation of detached plaster.

In the areas characterized by only slight detachment, consolidation could be achieved between the lifted portions of the plaster using small, targeted microinjections of acrylic resin (Prima AC 33 at 10% in water). In this second stage, the operating criterion was preceded by small injections of water and ethanol (ratio 1:1) to improve penetration of the product internally, operating on the walls from the bottom up in circumscribed vertical sections.



Figs. 53 and 54. Interior of dome, consolidation of plaster and polylobate arch, fixing of paint film.

Replacement of the beams in the tambour

At the height of the tambour circumference, through the gaps under the windows and also after removing some old patches in the mortar, it was possible to ascertain the state of conservation of the large wooden beams that had been inserted in the masonry structure with a function of structural connection and as seismic shock absorbers. The beams were in a state of severe deterioration caused by the attacks of termites and fungi, to the point that they had completely lost their mechanical function of support and connection. To guarantee the static stability of the mosque, the Works Directorate decided to remove and replace the wood beams, operating from the outside of the tambour, that is at the roof level, at the base of the dome extrados, an extremely delicate operation. To prevent accidental damage to the decorations, in the perimeter at the corresponding height on the inside, a temporary protection was built. The operation consisted of covering the decorated surfaces for a height of about 50 cm all around the perimeter, with Japanese paper and cotton gauze, using a solution of acrylic resin (Paraloid B72, at 10 % in acetone).

The new wooden beams, before being installed in the masonry, were treated by brush with a solution of boric salts in a saturated concentration, dissolved in demineralized water. The impregnation served as a protective action and to prevent future damage.

After repositioning the beams from the outside, the empty cavities between the wood and the masonry were filled with a mortar of lime and plaster, maintained in a fluid state and made to penetrate by gravity, with the aid of special tilted tubing. After completing the complex operation of beam replacement, the protective tissues were removed from the decorated perimeter of the tambour on the inside, using a solutions of solvents (acetone and ethanol 1:1).



Figs. 55 and 56. Steps in replacement of beams from outside the tambour.

Cleaning of decorated surfaces

The operating principle provided only for the removal of surface deposits capable of altering the design, proceeding in a gradual and selective manner, in consideration of the extreme sensitivity of the paint film and plaster wall itself to watery solutions.

The bluish cast, perhaps produced with “atacamite” based pigment, applied in the past on the original azzurrite-based blue between the uprights of the pergola in orpiment in the cup of the dome, was considered historicized and was therefore conserved.

The surface of the canopy was dry-cleaned using Wishab sponges, soft brushes flanked by the tip of the vacuum cleaner, set at low flow power, to remove the disfiguring deposits gently and delicately. Proceeding in this way, it was possible to attenuate the surface dimming caused by atmospheric particulate and the smoke of oil lamps.

The tambour, including the small decorated niches and windows in carved stuccowork, also showed a general darkening due to the stratification of smoke from the oil lamps and the alteration of a past conservative treatment. Moreover, scattered deposits caused by bird excrement contributed to the chromatic alteration. In consideration of the sensitive characteristics of the plaster, we developed a cleaning method that would exclude the use of water.

After a series of preliminary tests, a fat emulsion⁸ was found to be the safest and most effective solution. The operation called for the interposition of Japanese paper in small squares on which the emulsion was applied by brush. After a few minutes, the thin paper was removed and the area was gone over with a light mechanical action using a cotton pad on wooden pick.



Figs. 57, 58 and 59. Decoration of the tambour, stages of cleaning with fatty emulsion.

It was more difficult to remove the thick, solidified whitish stains of excrement, accumulated at the base of the windows where the birds had nested, because the organic material had penetrated in depth. By means of ion-exchange resins (Amberlite IR 120H), interposing a sheet of Japanese paper on the surface and rinsing with demineralized water, using soft brushes, the stains were attenuated.

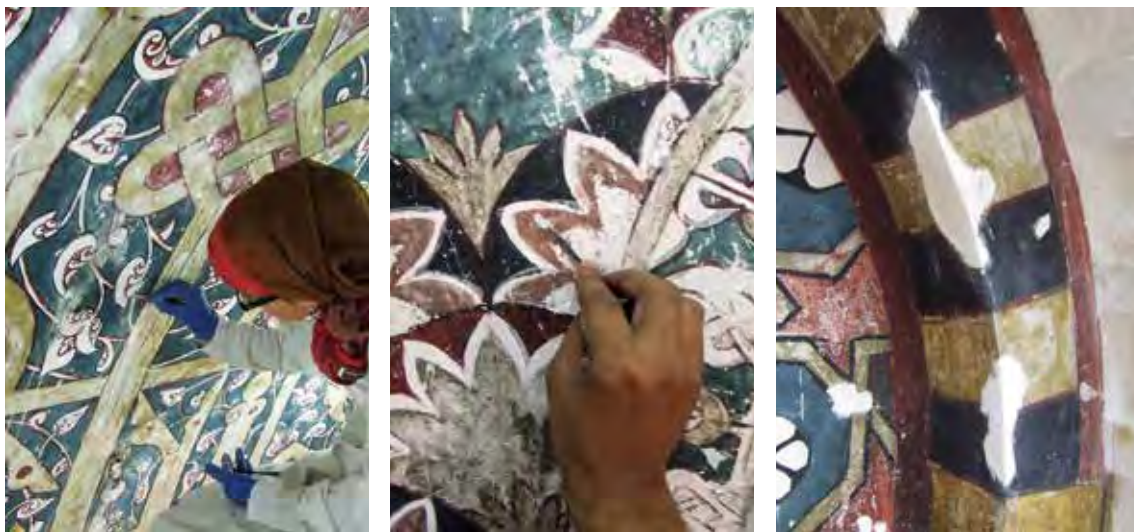
⁸ An emulsion composed of white spirit, demineralized water and the surfactant Twee 20, applied on Japanese paper, finished by padding.

In the sections containing floral decorations, inside the four large niches, the first step was to remove the splashes of lime, at the bottom of the painting, with mechanical means and scalpels. In parallel with whitewash removal, where the paint film was found to be in a precarious conditions, adherence was secured using acrylic resin (Primal AC 33 at 10%), as described previously. Following the work of whitewash removal and adhesion of precarious paint film, the cleaning operation was finished with the fat emulsion.

The entire decorated band, at the height of the aedicule overhanging the *mihrāb*, was covered by a layer of lime which was cleaned delicately by mechanical means, using scalpels. Later, the residues of sulfatation were removed with the fatty emulsion, padding with small tufts of cotton. The paint film of the decorative band was, for the most part, worn and lost, but the etchings of the design of five-lobed palmettos were still visible, as were the Qur'anic inscriptions.

Stuccoing of fissures and small gaps

Stuccoing of small and medium gaps was carried out at the level of the original paint film. Tests were performed first, to identify the best type of stucco, which was found to be a mixture of plaster and lime (Polyfilla, Saudi plaster and lime putty in equal proportions). This mixture, with its content of lime putty ensured a slow drying process, allowing more time for the work. The work of stuccoing the small gaps and micro-stuccoing the fissures started in the apex of the hemisphere, i.e. at the central rose inside the dome, proceeding downward toward the tambour, on all the underlying decorative bands of the octagon and the large niches in the corners, to the register consisting of the band of palmettos at the height of the aedicule over the *mihrāb*.



Figs. 60, 61 and 62. Stages of stuccoing the fissures and small gaps.

Stuccoing of large gaps

The large gaps under the windows of the octagonal tambour, inside the polylobate arches with floral decorations, were considered not subject to pictorial reconstruction.

On the masonry structure in brick a coat of bedding mortar was applied with a first layer of *qadāḍ* plaster with coarse granulometry, followed by a second with medium granulometry, remaining a few millimeters below the surface level.

For the surface finish of the last layer to be applied at the same level as the decorations, several targeted tests were performed. The final plaster coat would have to recreate the unity of interpretation with the adjacent decorated zones and, as tonal reference to imitate, we took account of the surrounding area, where the color had been lost and the underlying plaster visible was no longer white but had acquired a beige-gray tint caused by the natural patina of time.

After many tests we decided to use a mixture composed of lime putty and powdered white marble, appropriately pigmented⁹.



Figs. 63, 64 and 65. East wall. Polylobate arch, removal of stuccoing and stages of applying the first layer of *qadāḍ* plaster.

Workshop-Seminar for completion of the painted decoration

Before starting to complete the painted decoration of the main dome, as preparatory activity, we held a workshop-seminar that was meant as a theoretical and practical update for the local Yemeni team of restoration experts. The program was led by a teacher and restoration expert from the IVBC and covered the analysis from a theoretical standpoint

⁹ In consideration of the size of the gaps, the procedure required us to calculate a large enough quantity to complete all the surfaces similarly affected to this type of repair. For this reason, the mixture was formulated in the following proportions: 4.5 volumes by a liter of lime putty; 4.5 volume by a liter of white marble powder, then the addition of the following pigment 4.5: ml. 40 by volume of yellow ochre; ml. 5 by volume of red veneto earth; ml. 3 by volume of vine black.

of the problems relative to the gaps, on the principles of the esthetic and historical resolutions, seen as philological and critical activities. The practical workshop, which lasted two weeks, included a series of exercises with the retouching and veiling with watercolors.



Figs. 66, 67 and 68. Workshop seminar for integration of painted decorations and initial stages of retouching in the apex of the dome.



Fig. 69. Apex of the dome, the team engaged in the initial stages of retouching the *basmalah* in *thuluth* calligraphy.

Treatment of the gaps and esthetic presentation

The main dome, like the lateral ones, was the subject of intense consideration between the Works Directorate and the instructors operating at the IVBC worksite, to decide the most appropriate manner in which to manage the gaps and esthetic presentation.

The critical-methodological, but also ethical and esthetic approach agreed served to restore the balance and unity of the whole, in consideration of the different situation of gaps on the various levels-registers and decorative portions of the architecture.

The hemisphere and vaults of the tambour show local abrasions and fading of color all over the surface but in relatively circumscribed zones. Thus, using undertone veiling in an adequately balanced manner it was possible to restore a unified impression without too much difficulty.



Fig. 70. Dome, west side. After cleaning.



Fig. 71. Dome, west side. After retouching.

The large gaps under the windows of the tambour required a different critical assessment.

The size of the gaps, in which much of the ornate geometrical repetition had been lost, though potentially recoverable with the undertone method, were such that the preponderance of the decorative floral designs inside the pentalobate frames would have required arbitrary reinventions, falsifying the historical authenticity. Under these conditions, for some of the gaps, it was felt adequate to limit ourselves to applying plaster in a tint similar to the preparatory layer of original plaster of the adjacent mural paintings.

The four large niches in the corners, decorated with refined symmetrical stylized floral decorations presented a general disunity, due to the type of flaking of the paint film and extensive abrasions. By applying undertone integration, without representing the formal design, we were able to restore it in an adequate and balanced manner.

The long decorative band at the height of one meter, running along the perimeter above the *mihrāb* of the main dome presented a different situation altogether. Removal of the many coats of lime whitewash during cleaning had revealed residues and traces of the



Fig. 72. Tambour, north wall, after retouching.

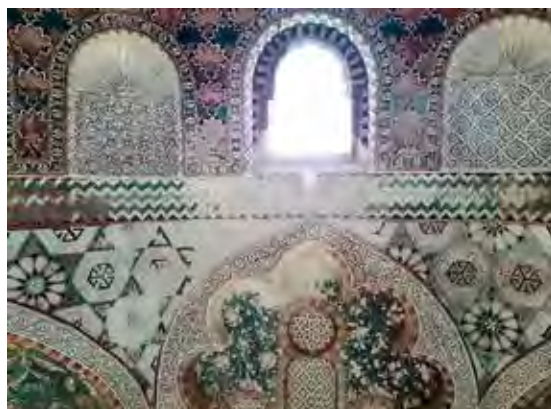


Fig. 73. Tambour, south wall, after retouching.



Figs. 74, 75 and 76. Tambour, north polylobate arch, detail after retouching.



Figs. 77 and 78. Tambour, west vaults, with palmette motif, detail after retouching.



Fig. 79. Northeast niche after retouching.



Fig. 80. Southeast niche after retouching.



Fig. 81. Northwest niche. Detail after retouching.



Fig. 82. Southwest niche. Detail after retouching.

original decoration, on the fine plaster, still almost completely intact. The barely legible traces indicated a long Qur'anic inscription in *thuluth* calligraphy which, with red-violet borders, crept onto the bottom profile and followed the line of the windows in carved stucco. The remaining surfaces of the base were resolved with a dense covering of pentalobate palmettes, inserted diagonally in a semicircle on the gray-black background.

From the standpoint of the plastic-stylistic balance, this decorative band connected the white wall surfaces below in the prayer hall, to the richly decorated upper areas of the register of the large niches and pentalobate arches.



Figs. 83, 84 and 85. Decorative perimetral band over the *mihrāb*. Detail before and after retouching.

The loss of the decorations created, from the formal standpoint and in the architectural balance, a break in the continuity between the two registers. Moreover, the Qur'anic inscriptions of the mosque are elements announcing the Islamic message, in the decorative form and must be restored in any case to a degree of legibility for religious reasons.

Consequently, with a view to restoring a harmonious balance between the two registers, and a comprehensible reading of the Qur'anic inscription, a restoration functional to the comprehension and unity of the architectural space was carried out. After adequate study, the outlines of the Qur'anic inscriptions were traced, the rows of pentalobate palmettes redrawn and veiled in watercolor, maintaining a transparent undertone.



Fig. 86. Main dome, north side, prior to restoration.



Fig. 87. Main dome, north side, after restoration.



Figs. 88 and 89. Overview of tambour and dome before and after restoration.



Section 3

THE CONSERVATION OF THE EXTERNAL STRUCTURES

Ch. 1 - Stone portals

Ch. 2 - The cenotaphs of al-Ashrafiyyah

Ch. 3 - Restoration of wood artefacts



STONE PORTALS

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Introduction

As part of the complex restoration plan of al-Ashrafiyyah Mosque and Madrasah, in May 2013 a project got under way to restore the stone artefacts in the Mosque and Madrasah, outside the Prayer Hall. By agreement with the Yemeni Social Fund for Development, the Istituto Veneto per i Beni Culturali of Venice developed a training course, in line with the traditional Italian restoration method, recognized worldwide. The Yemeni personnel were selected among the operators already working on the external walls of the Mosque and restoring the plasterworks. The trainees selected were thus already in possession of some technical knowledge and manual skills and had sufficient familiarity with the materials that would be used in the work, as well as with the materials on which they would be working.

The group selected had been instructed and trained before the start of the works, with a course consisting mainly of theoretical lessons, and then deepen on the fundamental aspects regarding the restoration of stone artefacts.

The theoretical course and its practical stage in the first worksite school began with the preliminary study of the main phenomena of deterioration, focused on the restoration of the south portal.

South Portal

With the arrival of the Rasulid dynasty in Yemen and the decision to make Ta'izz the center of power, many changes became necessary, not only at the political level but also with regard to architecture. An architectural element that characterized this passage was the use of dome structures for religious buildings. Al-Malik al-Ashraf Ismā'īl built al-Ashrafiyyah Mosque and Madrasah, and chose it as the family burial place. He then adorned it with precious materials like gold, marble and lapis lazuli, a privilege which was strictly limited to the king.



Figs. 1 and 2. View of the portal prior to the restoration works.



Fig. 3. External view of the dome of the north portal prior to the restoration works.

The south portal was the main entrance to the mosque, placed directly in line with the *miḥrāb*. It served as the entryway for the king and all his court. Today that access is almost never used, despite the fact that it is the most interesting access from the standpoint of construction. It is reached from the hilltop where the castle is located, a route that is now difficult and inconvenient to take.

The structure of the portal consists of a stone tower of moderate height, closed at top by a dome in bricks and terracotta. The outside of the dome is covered with *qadāḍ* plaster, while the inside is decorated with polychrome mural paintings. The structure of the walls consists, for both the inner and the outer walls, of large limestone blocks of regular height that, alternating, create chromatic plays of red and green. This particular construction technique is reminiscent of the “*ablaq*” technique, derived from the Mamluk tradition of Egypt and Syria.

The lateral façades are plain. Two large ogival windows on the ground floor are surmounted by relieving arches. Below the springing line of the dome there is a small rounded arch window on each side.

The main external façade consists of a wide doorway with pointed arch, surmounted by a polylobate projecting arch that appeared to have undergone many repairs. In the intrados we found a pendent keystone decorated with a rosette, a design we find often, also in the Prayer Hall, as it was the symbol of the Rasulid dynasty.

The decoration is minimal. A molded frame runs along the three façades and is interrupted only on the main façade by two pairs of semi-columns with a purely decorative function, at the sides of the central opening. Two of the semi-columns that frame the doorway rest on the ground on square bases. The other two start halfway up and stand on a molded base. During construction, wooden beams were also used and some were left bare. Their function as in the case of the domes in the Prayer Hall, is structural, to amortize any possible movements of the tower.

On the inside, two benches are under the side windows while in the upper section there is a triple arcade with niches and decorative designs. The inner door is topped by

three arches that repeat the decorations on the outside, on different levels. The entablature is in marble and an inscription announces that the Sultan ordered the construction of the *madrasah* in 801 h. (1398-1399 CE).

Above the relieving arch, a marble plaque memorializes the date of Ramadan 801 h. (May 1399 CE).



Figs. 4, 5 and 6. Some architectural details of the portal prior to the restoration works.

South Portal: state of conservation

Thanks to the presence of the scaffolding, it was possible to examine all the internal and external risers that were used to map the state of conservation of the structure, make a macroscopic identification of the different types of stone used in the three façades and plan the works. We were also able to distinguish the original stones from those replaced in other maintenance works. This became even easier after cleaning.



Figs. 7, 8 and 9. The pictures show the group of restoration students intent on taking measurements and appraising the relative state of conservation.

Concerning the stone structures, the main problems of deterioration were found on the outside of the portal and were due to fractures and breaks, especially along the tops, but also to exfoliation parallel to the surface of the stone. This latter type of damage is ordinarily only found in the colder regions, and is due to the seepage of water and the actions of cycles of freezing and thawing that create pressure on the pores of the stone. In this context, the damage was probably due to the crystallization of salts that occurred over a long period inside the stone material. The rains in Yemen are infrequent, but at certain times of the year they are abundant and often take the form of brief but very violent

storms with heavy precipitation. Following these rains, the high temperatures cause rapid evaporation of the rainwater which, over repeated cycles, becomes an accelerator of the causes of surface deterioration.

Another cause could be insufficient bedding mortar, which causes tension, especially between stones of different types and different thermal dilations.

The contribution of salts could also be caused by the use of hard water during past maintenance works, in a country where, because of the long droughts, drinking water becomes a valuable commodity.

Another factor of deterioration is linked to a poor choice of materials, also during past maintenance works. We found patching done with plaster and cement, which was also used to anchor precarious stones.



Figs. 10, 11, 12 and 13. These photos show some examples of badly done past repairs, where inappropriate techniques and unsuitable materials were used.

A general fading effect was due to the rain eroding the surfaces of the stone structures, dissolving surface material from the top down with consequent chromatic alteration of the stone blocks.

A thin crust of loose material deposited on the stones covered the entire screen, while several layers of whitewash had been applied in various zones like the internal baseboard and the last rows of stone blocks in the outer walls.

The entire upper canopy to the cornice is not original. The stone replacements, even at a macroscopic observation, differed as to grain and color, and probably came from different quarries than the originals. However, during this maintenance project some attention was given to the choice of harmonization with the original and non-original stones and, initially, the non-originality of the stones was not obvious.

The stone walls in the interior were somewhat better preserved aside from the presence of thin coatings of black crust found mainly in the undercut, and a layer of dust that altered the general enjoyment of the different shadings of stone. The dome, however, was in a state of severe deterioration on the inside. The seepage of water had caused most of the plaster to fall and the masonry itself, also damaged, was almost completely bare due to the large gaps in the plaster. Fortunately, in previous years, works of restoration of the external *qadāḍ* had been done on the dome, as well as some structural consolidation, which had slowed the progress of the deterioration.



Fig. 14. The inside of the dome prior to restoration.

A deep fracture was visible on the right-hand side of the sculptured lintel over the inside door. This problem was evidence of structural movement, probably caused by an earthquake. The stone lintel, being less elastic than the rest of the building, was unable to amortize the movements of the masonry fabric and reacted to the stress by breaking.



Fig. 15. Detail of the lintel with its deep fracture on the right.

South Portal: restoration works

Every step of the restoration was meticulously and constantly accompanied first by graphic documentation and then by photographic documentation, which helped us to decide the best method of approach for the operators based on the state of fact and the progress of the work.

The initial graphic mapping, showing the zones and different types of deterioration, enabled us to draw up a restoration project and a precise program of works which we could then control directly with regard to the timing and consumption of material.

Before the works began, all the elements of the portal were documented in high-resolution digital photography. The most interesting aspects of the different types of damage were photographed, as well as all the areas that needed special work and, as the cleaning

progressed, various cleaned sections were photographed. The photographic documentation continued incessantly as the works progressed, showing details as they came to light while the works were going on, and documenting the different stages of the work, not merely the final results.

After a general dry dusting, starting from crowning over the portal, cleaning was initiated using demineralized water and soft brushes to eliminate any loose deposits. This enabled us to identify all the precarious parts that then had to be secured. All the fragments of stone were returned to their proper place and fixed with slow-hardening bicomponent epoxy resin. The smaller breaks were treated with injections of fluid mortar with a base of hydraulic lime.

After completing the step of pre-consolidation we began the delicate stage of thorough cleaning.

To remove dry deposits, we applied compress of paper pulp soaked in a saturated solution of ammonium carbonate in demineralized water. In general, this method was used on all the stone surfaces with different variants depending on the problem to be dealt with, as we went on with the work. In some cases it was necessary to add EDTA in low concentration, in other cases we had to prolong the time of contact with the pad. In the presence of very hard incrustations, we used ion exchange resins, which gave good results.



Fig. 16 and 17. Cleaning with compress of paper pulp soaked with ammonium carbonate.



Fig. 18. Cleaning step using ion exchange resins.



Fig. 19. Cleaning step using micro-sandblasting.

Almost always, after cleaning with chemical means, it was necessary to go over the area mechanically using scalpels and micro-chisels. Where the presence of coats of whitewash was particularly hard to remove, we developed a system of localized micro-sandblasting to reduce the thicknesses covering the baseboard zone of the interior walls and the last three rows of stone blocks in the exterior walls.

This method was also used for the interior stonework, where special attention was given to the inscription over the northward opening. Traces of red were found to the right of the inscription, probably the same that were found in the tambour. The fragmented gaps left every possible interpretation open although the continuity with the mural decorations of the vault made it seem probable that they dated back to the first period of the doorway's construction.

The operators were thus able to test different cleaning methods on the stonework, revealing the true chromatic value of the interior and exterior façades of the doorway. The cleaning stage also involved removal of all the old stuccoing in plaster and cement, and of all the loose material present between the stones.

During this stage, the differences between the stone blocks used in maintenance works and the originals became clear. The former were only coverings while the latter



Figs. 20, 21, 22 and 23. Consolidation stage. The sequence of photos illustrates the operations of repositioning beams or stones found to be disconnected and precarious.

had considerable structural depth. In many cases it was deemed advisable to remove some stones and reposition them using a lime-based mixture as mortar. In general, considering that the lack of bedding mortar concerned above all the higher blocks, it was necessary to perform a major work of consolidation beyond simple stuccoing, injecting a fluid hydraulic mortar. This was done with great care over a large section of the west wall.

After sealing the stone blocks, we proceeded to a localized consolidation starting from the bottom and working upward, injecting the consolidating fluid through pipes positioned between the joints. The operation was carried out repeatedly on different sections. The missing stones were replaced with new blocks, attempting to match the colors of the original stones as closely as possible.

Restoration of the wood inserts was done jointly with the carpentry team. It was necessary, for example, to replace the missing lintel along the entire length of the front portal. For all the additions or replacements, we used the same wood species as the original elements.

We worked individually on those stones that showed serious exfoliation using a consolidating fluid applied by brush, as much as it would bear.



Figs. 24 and 25. Consolidation of the fractured lintel with insertion across it of bars in fiberglass.

Particular attention was given to structural consolidation of the interior lintel, inserting an 8 mm fiberglass bar and injecting fluid bicomponent epoxy resin so that it penetrated not only the pin hole but also all along the fractures, solidifying the two parts.

After completing these conservative operations, samples were taken for grouting the joints. This consisted of finishing the exterior part of the connections between the stones in the masonry, trying to achieve a neutral shade so as to appear harmonious in its entirety. The mortar chosen was used to stucco the outer walls as well as the interior ones, maintaining a sublevel of tone.

On the inside of the individual stones, we sealed any fractures and reconstructed gaps using a mortar that was chromatically as close as possible to the color of the stone, so as to prevent future stagnation of rainwater.

The mortars were obtained with a mixture of hydraulic lime and inert materials in a ratio of 1:3. Local hand-ground stone powder was used, so as to have different colors to mix with the sand, in particular red and green. We were not always able to arrive at the exact color, due to the variation of coloring among the stones. This forced the operators to make continuous changes in the initial blend.



Fig. 26. Preparation of the stone powder and crushed brick that will be used to color the mortar used to grout between the stone blocks.



Figs. 27, 28 and 29. Stuccoing to finish the grouting between stones of the portal.

After cleaning, during the drying stage, the stones were checked one by one over small areas of the walls for saline efflorescence. To eliminate this problem, we applied cycles of compress made from paper pulp and demineralized water, left in contact with the surface until they had dried completely. This solubilized the salts which were absorbed by the cellulose. The operation had to be repeated many times, however the problem persisted in a few zones. It was decided, by agreement with the Works Directorate, that no protection would be applied either on the inside or on the outside, but

that we would monitor the situation over time to prevent any new formation of saline efflorescence.

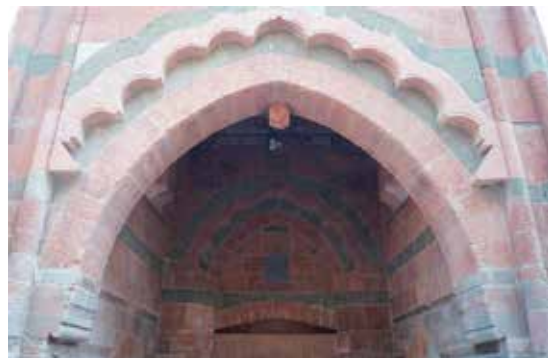
The exterior of the dome was infested by a heavy accumulation of lichen on the recently restored *qaḍāḍ*. We initially opted to treat the surface with a biocide solution, rinsing it afterward with demineralized water. Later, it was necessary to repair the cracks uncovered with a thin fluid mortar and apply localized stuccoing with a mortar of lime, sand and marble powder.



Fig. 30. Detail of the lichen covering the outside of the dome prior to starting the works.



Figs. 31, 32 and 33. Overview of the south portal after completing the restoration.



Figs. 34 and 35. Details of the south portal after completing the restoration.

Interior door – south corridor

On passing through the south portal, one entered a long corridor in which, on the side opposite the main doorway, there are three doors. The outer two doors lead to the minaret stairways, the central one to a hall of the Madrasah.

The three stone doorways are inserted in the north-facing wall and have doors in wood surrounded by rounded arches. The stone lintels contain important epigraphic texts in *thuluth* calligraphy that refer to the construction of the Mosque, particularly, in the central inscription, we can read the name of the al-Malik al-Ashraf Ismā'īl who ordered the construction of the Madrasah. The central door is flanked by two sunken columns at the corners and above the lintel there is a lowered pointed relief arch of red and green stones, while the other two doors have wooden beams. The alternating colored stones are also found in the portion of the wall adjacent to the doors, left uncovered by the *qaḍāḍ* finish.



Fig. 36. West portal prior to starting works.



Fig. 37. Central portal prior to starting works.



Fig. 38. East portal prior to starting works.

State of conservation

At a first visual inspection it could be seen that the doorways were covered with many coats of lime. In fact, in the past, before every Ramadan, as part of a general cleaning and perhaps also disinfection, as was also customary in the Western world, a type of whitewash was applied to all the architectural elements, from the bottom of the walls to the decorations in plaster higher up.

Continuing with a more detailed visual inspection, we found a differentiation between the types of stones used. Also in this case, during past works of maintenance, many

stones had been replaced, and stuccoing in *qadād* had covered and partially hidden the original stones. The last maintenance works were done in 2006.

Erosion, breakage and small cracks were observed in many stones. Aside from the profound cracks along the entire thickness of the lintels on the east and west doorways, their general state of conservation was fair but the lack of uniformity of past maintenance works created a sort of esthetic disorder that disturbed the general visual unity, requiring a serious, carefully planned action of conservative restoration.



Figs. 39, 40 and 41. Details of the lintels prior to restoration.

Restoration works

Our approach to restoration of the stonework on the three doorways followed the method already applied in the restoration of the main south access doorway to the Mosque. Different stages characterized the cleaning of the stonework around the doors, with some differentiation due to the specific cases that had to be dealt with. In general, there was a first dusting with brushes and a gentle washing with demineralized water using soft brushes.

At the same time, the residues of whitewash and old stucco were removed with scalpels and micro-chisels. To ensure a more uniform cleaning of the stone blocks, we opted for a light sandblasting process, calibrating the gauge of the inert material and using a gun with a medium-sized nozzle. In this way, it was possible to remove all the residues of lime, when tended to be very stubborn. In some cases, we also tested an anionic exchange resins, which gave good results.



Figs. 42, 43 and 44. Cleaning the stonework portions of the portal.

The lintels sculptured in gray marble were treated with a careful and meticulous mechanical cleaning with scalpels, to remove all the whitewash. Compress of paper pulp soaked in ammonium carbonate were applied in the corners and on the ledges supporting the lintels, to remove the stains and thin black crusts. We also treated the wooden beam positioned above the lintel. On the west doorway, the beam was cleaned using a pickling gel in a water suspension, which had the ability to swell the black substance that concealed it. On the west doorway, it was necessary to remove a thick layer of plaster and, with the collaboration of the carpentry team, insert two wooden beams to support the original beam, which had been partially damaged. The beams were then consolidated and protected with Paraloid B72 acrylic resin in a 5% solution.



Fig. 45. Cleaning the lintel.



Fig. 46. The lintel after cleaning.

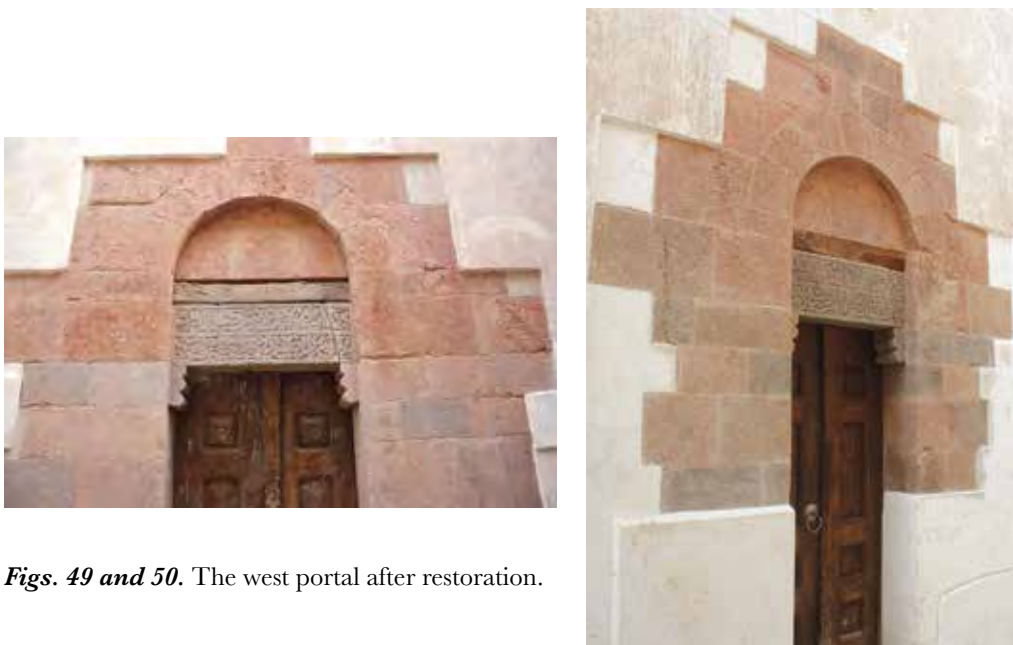
After completing all the stages of cleaning, we concentrated on consolidating the eroded stones, fastening any broken parts and inserting pins to secure the fractures of the lintels. The largest missing parts were replaced with limestone blocks of similar tone and color to the originals.



Figs. 47 and 48. Work of consolidation of the lintel, with insertion of fiberglass bars across it.

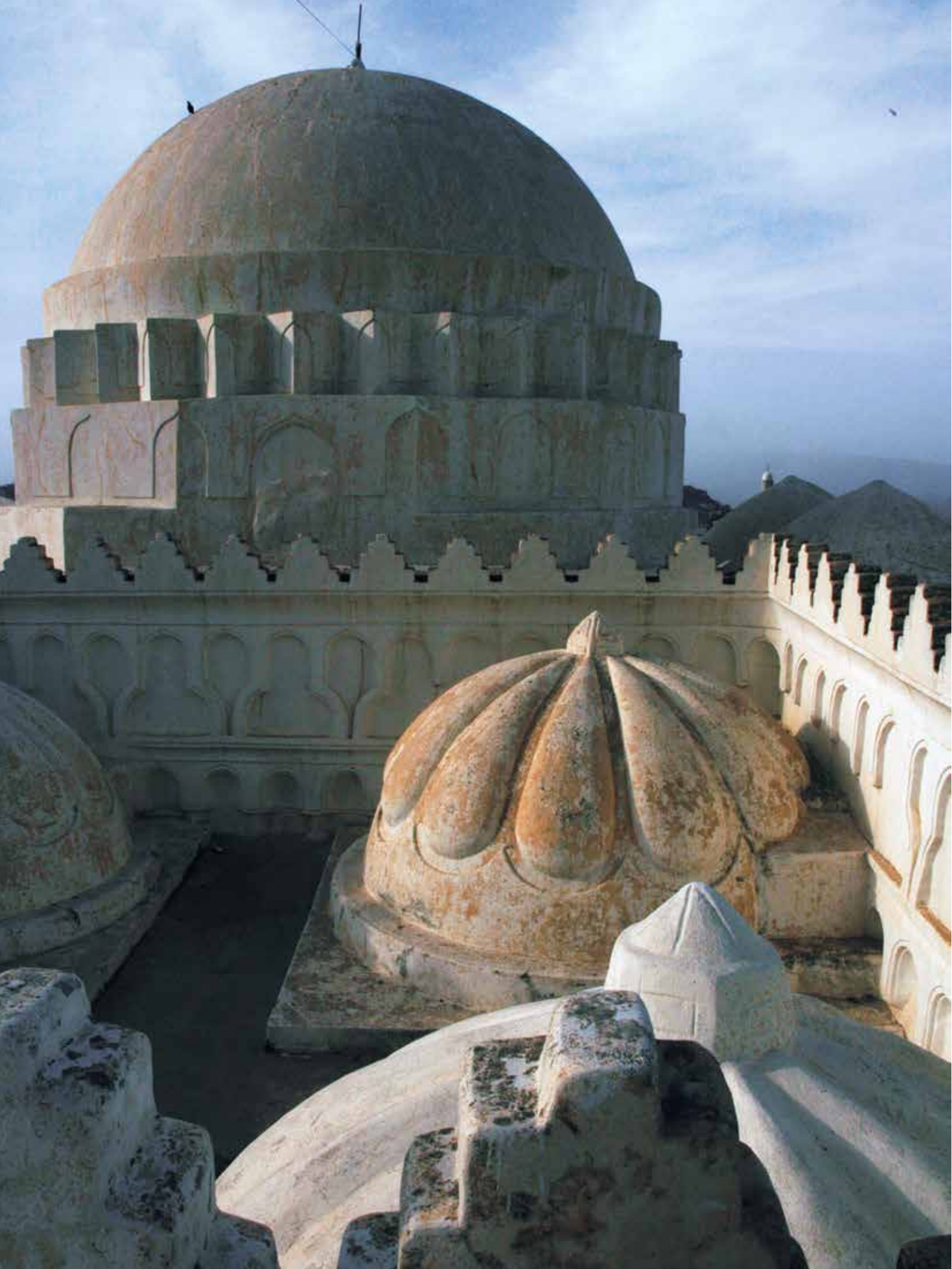
The final work of stuccoing contributed to the general esthetic recovery of the element. The most serious gaps were prepared by applying a rough mortar consisting of one part binder and three parts medium-grain inert material.

As was done on the south portal, we attempted to obtain a neutral shade of color for these three doorways to seal the joints, coherent with the general tone of all the stonework.



Figs. 49 and 50. The west portal after restoration.





THE CENOTAPHS OF AL-ASHRAFIYYAH

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Introduction

Two of fourteen Rasulid kings who reigned over Yemen were buried in the Mosque and Madrasah: the seventh king, al-Malik Ismā'īl, known as al-Ashraf “the Noble”, who gave his name to al-Ashrafiyyah Mosque and Madrasah, and the eighth, his son Aḥmad ibn Ismā'īl. The two kings were buried, respectively, in the spaces indicated as 2C and 2A, in the small inner courtyard of the structure. From the inscriptions found on other cenotaphs, the architect, Alaa Al-Habashi, in his report written for UNESCO,¹ has identified other family members buried in the Mosque and Madrasah: Ḥasan, son of Ismā'īl, 'Umar the grandson of Aḥmad, and two of the sons of 'Umar. These latter cenotaphs are located in the space indicated by number 4.

In addition to these six cenotaphs, there are three more. The first seems to be that of the wife of al-Malik al-Ashraf Ismā'īl, Jihah al-Ṭawāshī Mu'tab ibn 'Abd Allāh al-Ashrafī, buried in the area indicated by number 2d. The second cenotaph, located in the area indicated by number 2b, seems to belong to a servant of king Ismā'īl. Some sources, however, in describing this cenotaph, speak of it as being that of a child.² The last of these cenotaphs is recent, belonging to the 20th century, and belongs to Yaḥyā al-Ḥaddād, father of Muḥammad ibn Yaḥyā al-Ḥaddād, a famous Yemeni historian.

The cenotaphs of the two kings occupy a rather large area in al-Ashrafiyyah Mosque and Madrasah, and celebrate the greatness of the kings buried in them with elegant decorations, refined plaster casts and gilded Qur'anic verses.

The cenotaphs: materials and construction methods

The three cenotaphs located in the inner courtyard of the Mosque and Madrasah are of similar structure and decorative design. The structure is the classical design with the canopy

1 “Mosque/Madrassa of al-Ashrafiyya, Ta'izz: Conservation Report”, written by the architect Alaa Al-Habashi, Nov.-Dec. 2003.

2 Makki-Zaid, Shohd, “Les Écoles Rassulides à Taiz”, unpublished graduate thesis (D.E.A.), École Pratique des Hautes Études de la Sorbonne, IVème Section, undated.

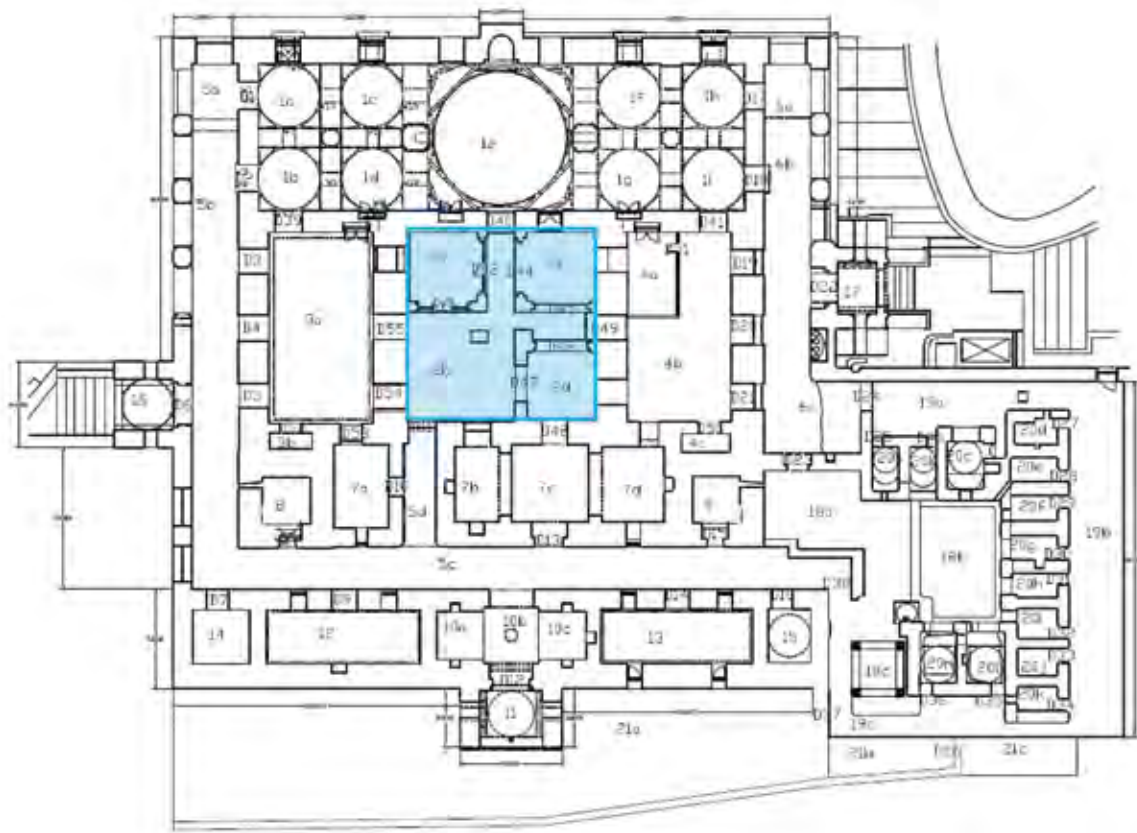


Fig. 1. Scale drawing of floorplan of al-Ashrafiyyah. The area of the small internal courtyard is outlined in blue. This is where the main cenotaphs are located.

on a square base, topped by a true vault dome. The passage from the square shape of the base to the circular shape of the dome is mediated by the octagonal tambour, created by a play of slanting panels where the insertion of a niche at the corners of the cenotaphs turns the square into an octagon. The method used for decoration of the cenotaphs has several elements in common with the main dome of the Prayer Hall and is characterized by painting on plaster and decorative stuccowork sculptures or reliefs.



Fig. 2. Below the large gap around the window, it is possible to see the bedding mortar.

The masonry consists of solid bricks on a bedding mortar of clay, straw and lime, as well as parts of wooden structures. The same compound has also been used as a mortar undercoat on the outside of the masonry, on which to lay the final coat of plaster.

On this plaster, appropriately smoothed and finished, the decorations were applied. The colors used have access to a limited range, as had already been observed with regard to the decorations in the rest of the Mosque and Madrasah, and the analyses made on fragments of paint film confirm the presence of a protein binder.



Fig. 3. Detail of gilded inscription in the lower band of the dome in sector 2a.



Fig. 4. Section of the qur'anic inscription in carved stucco found in sector 2a. The branches of the floral decoration form long coils filling every bit of space between the letters.

A new and difference element that is found among the decorations of the cenotaph is the gold leaf applied with mission gilding on plaster. Gilding is used here to define the lettering of the Qur'anic verses at the base of the dome, and some of the outlines of the large shell pattern that define the shape of the large decoration in the vault of the dome.

Between the letters of the inscriptions and the walls we can see floral designs consisting of various elements like flowers, leaves and racemes. The floral design in the Qur'anic writing of the plaster cast adorning the central part of the wall is unusual, however. Here the vegetable shapes are stylized, turning into a repetitive, geometric pattern. From the central stem a series of secondary vine shoots depart, some bearing leaves or racemes to fill the gaps between the letters.

The plaster casts in the cenotaphs are a further classical example of the skilled craftsmanship of the Islamic artists is designing geometric patterns. These, in the corner niches of the tambour and in the semicircular panels of the walls, also cover a large portion of the external surface, contrasting with the outer walls of the building which, in common with most Islamic buildings, are generally plain and even rather modest, lacking any important ornamental elements.

The geometric designs carved in the stuccoworks of al-Ashrafiyyah Mosque and Madrasah acquire greater significance and, although they were covered by a thick wash of



Fig. 5. Exterior stuccowork in sector 2 prior to restoration works. The geometrical design was disturbed by the thick layer of whitewash.

plaster and white lime, even so, it was possible to perceive the refinement of the decoration.

The decorative designs that adorn the walls outside the cenotaphs, feature geometrical regularities based on repetitive figures that maintain similar patterns and geometrical transformations. The geometry of the decorations allows the viewer to experience different sensations. The repetition of the patterns enlarges the space and the symmetry of the shapes creates an impression of order and harmony.

The richness of the structure was also amplified by the widespread use of gold and color. Indeed, even though today the domes are in a terrible state of deterioration, there are still visible traces of color inside the petals, and gilded threads in gold leaf outlining them.



Fig. 6. Example of niche decorated with stuccowork in plaster found in sector 2a prior to restoration works.



Fig. 7. Decorated lunette on the north wall of sector 2a, prior to restoration work. Also in this case the refined ornamentation was disturbed by the layers of whitewash painted over it.



Fig. 8. View of the base of dome 2a with its characteristic modulation in a shell pattern.



Fig. 9. Detail of the gilding of the internal decoration of dome 2a.



Fig. 10. Detail of the gilded pattern in dome 2a. Note how the gold leaf is set off by two colored lines, red on the inner edge and green on the outer edge.



Fig. 11. Detail of the central shell of dome 2a. Traces of darkened red color can be seen on the inside of the shell.



Figs. 12 and 13. Detail of one of the petals of dome 2a. Fragments of red color are visible, suggesting that they were entirely colored. This is also confirmed by comparison with the tomb in sector 2c.

The raw material used to prepare the stuccowork is plaster, usually mixed with other materials to make it more solid and consistent. In this case the chemical analyses indicate that the materials were a mixture of mortar containing partially hydrated plaster or water-soluble anhydrate, obtained by heating sulfates of dehydrated lime to a moderate temperature (what is commonly called quick-setting plaster).

Another peculiarity of the structure of the cenotaphs is the external coating of the domes. This is characterized by a modulation of petals inspired by the floral symbol of the Rasulid family. These petals were painted with different colors, alternating between red, green and yellow, with at the base a band bearing an inscription from the Qur'an. Evidence of this decorative project were found in the fragments of color on different parts of the exterior finish.



Fig. 14. Exterior view of the dome in sector 2a.



Figs. 15 and 16. Detail of a fragment of color of the exterior finish on the dome.

Factors of deterioration and state of conservation

Given the similar construction features, the state of conservation and deterioration was predictably similar. In this chapter we will discuss two of the three cenotaphs located in the inner courtyard, i.e. the cenotaph of the al-Malik al-Ashraf Ismā'īl and that of his son, sectors respectively identified as 2a and 2c. The third cenotaph, in sector 2d, was completely reconstructed following a drastic action of maintenance, and will not be taken into consideration, as almost nothing is left of the original decorative design.

The two sectors that concern us here appeared from the outset to be in a very advanced stage of deterioration due to a variety of concomitant factors, the most significant of which was the humidity and the deleterious action of water seepage.

The causes of deterioration regarding this sector were the same causes generally affecting other zones of al-Ashrafiyyah Mosque and Madrasah and were largely due to the following factors:

- *Geological damage*, which gave rise to cracks and fissures. Some of these cracks, being located in points of contact with the original walls of al-Ashrafiyyah Mosque and Madrasah, though not appearing particularly deep, bear witness to a structural sag that affected the walls not shared with the Prayer Hall and perhaps just for that reason not as structurally sturdy. This factor, in concomitance with others, is responsible for loss of part of the outer layer of mortar in the dome and tambour, where large areas of bare masonry were visible.
- *Infiltrations of rainwater* from outside, through the roof, had caused large brownish-yellow stains on the painted plaster as a consequence of soaking deeply into the masonry structure with its bedding mortars made of earth and clay. The water then causes soluble salt crystals to migrate to the surface where they form thick concretions. This unsightly problem damaged the decorated parts, particularly the domes, where the situation was often catastrophic, with the pulverization and complete destruction of the paint film, and



Fig. 17. Example of the effect of washout on the color of the Qur'anic inscription in dome 2a. There are also a number of white spots caused by saline incrustations scattered over the entire surface.

loss of adhesion of the supporting plaster, as well as swelling and loss of shape with fragmentation of the finish. On the walls, the decorations were better preserved thanks to the whitewash brushed on top, which acted as a protective coating.

- *Recent maintenance works.* The most obvious result of these works was the widespread application on the walls and part of the tambour of a coat of lime and plaster. Until a few years ago, in fact, before the period of prayer of Ramadan, it was customary to cover the walls of al-Ashrafiyyah Mosque and Madrasah with a coat of whitewash, applied by brush, starting from the columns and continuing up to the base of the vaults. This served to make al-Ashrafiyyah Mosque and Madrasah appear clean and also to disinfect the environment where the faithful would assemble, as well as concealing a few unsightly large cracks and cover painted decorations that were no longer as fascinating as they had once been. The effect of these applications was a thick coating of whitewash that covered the painted decorations all the way to the niches at the corners of the tambour.



Fig. 18. Tests for removal of whitewash from the decorations of the arch in sector 2a.

However, the presence of this whitewash, which had to some extent protected the surface, did not completely prevent problems from developing. From the first assays of removal, it was possible to observe how the bottom layers of plaster had deteriorated, becoming incoherent and powdery, while the color was absent in places.

Among the more recent works the application of a green color was observed on the wooden panels of the partitions in the cenotaphs.

A more recent work of maintenance involved the pouring of concrete that now covers the floor of the entire sector. This new element disfigures the original structure as, in addition to being immediately perceived as an intrusive and extraneous material, it covers the bases of the wooden dividing panels and the step at the base of the cenotaph. This last, originally consisting of stone tiles of different sizes alternating black and white, is thus deprived of a simple but effective chromatic solution that valorizes even more the decorative project of the whole cenotaph.



Fig. 19. Lateral view of the cenotaph in sector 2a.



Figs. 20 and 21. Preliminary cleaning trials. Note how the gold leaf gilding of the letters is outlined by a brown edging and the spaces filled with bright red.



Fig. 22. Detail of the base of the cenotaph in sector 2a. A few stone tiles alternating black and white, emerge from the cement that covers the entire floor.

The latest maintenance work, done about forty years ago, concerns the insertion of a reinforcement at a height of about five meters. This was the long concrete beam was inserted in the masonry to consolidate and reinforce the structure, thus resolving the static problems that affected the entire Mosque and Madrasah and about which we have spoken at length in early chapters. Unfortunately, however, although this stratagem was able to save al-Ashrafiyyah Mosque and Madrasah from possible collapse due to the sinking of the terrain, it caused the irretrievable loss of a large portion of the decoration.



Fig. 23. Sample section of cleaning on gold Qur'anic inscription of the lower band of dome 2a.

Restoration works: interior mural painting and external stuccoworks

As first operation it was necessary to eliminate the whitewash, removing all those coats of lime and plaster that covered and rendered illegible the refined ornamentation of the decorations in painted stuccowork, and the elegant Qur'anic script with gilded lettering. Removal of the whitewash had the advantage of revealing the real state of the original surfaces, making visible all the gaps and cracks that had been sealed over. This operation proved to be quite difficult and delicate as the surface layer of whitewash was thicker than the base plaster, which in turn was highly porous and inconsistent, so that the paint film applied to a surface in those conditions was unable to bind itself effectively. To facilitate the operations, after several trials in which different acrylic and polyvinyl resins were tested, it was decided to resort to pre-consolidation with the acrylic resin "Paraloid B72" diluted in solvent at 5% and injected in depth.

At the same time, efforts were made to consolidate the masonry structure and bedding mortar in the points where it had been left bare by the chipping and flaking of the original plaster. This operation was done using ethyl silicate, which was sprayed on, so as to penetrate the material as much as possible, according to the usual method.

Once the surface was free of the layers of whitewash and the masonry structure repaired, we proceeded to the structural consolidation of the plastering by injections of a consolidating mortar, so that every part was reinforced and securely adherent to the masonry support, and we could proceed with tranquility to the subsequent stage of cleaning the surfaces and the decorations.

The particular executive technique used for the decorations, consisting of painting directly on plaster, made it impossible to use water-based products on a large scale. Even the use of gel was found to be harmful if excessively prolonged. Following mechanical cleaning with Wishab sponges or fiberglass pens, a fatty emulsion was used to remove any dark stains or saline efflorescence. The operation called for the interposition of small squares Japanese paper on which the emulsion had been applied by brush. After a few minutes, the thin paper was removed and the area was gone over with a light mechanical action using a cotton pad on a wooden stick.

On the gilded Qur'anic script, the gold appeared badly deteriorated due to the efflorescence of saline concretions, deposits of dust and organic substances of various kinds. There were also gaps in the lettering due to the constant seepage of water that had dissolved parts of the surface. The removal of the deposits was achieved, after some testing, with a solution of chelating gel pH8, in two or three separate passages. Given the particular fragility of the gold and underlying plaster to most liquids and solvents, every passage required complete drying of the surface from the previous passage, and turned out to be a very time-consuming and delicate process, but with highly satisfactory results.

After cleaning, some areas of the base plaster were found to be particularly fragile and porous. In those cases, it became necessary to consolidate larger or smaller areas with ethyl silicate. This last material, widely used in the field of restoration, is known to

give excellent results on stone, sandstone and similar materials. Its use on badly damaged plaster surfaces is rare, but after some preliminary tests it gave excellent results, giving new consistency to porous, powdery surfaces.

Regarding the stuccowork, in this case we were able to act with a bit more security, based on the experience acquired on the main dome in the Prayer Hall.

To repair small and medium gaps in the stuccowork we used a compound of plaster and lime (Polyfilla, Saudi plaster and lime putty in equal measure). The content of lime putty in the mixture makes it possible to slow the drying process, allowing more time for the work.

The larger gaps, found most often in the dome, were not considered subject to pictorial reconstruction as it had been lost even in the surrounding areas where the base plaster had survived. On the masonry structure in brick a coat of bedding mortar was applied with a first layer of *qadāḍ* plaster with coarse granulometry, followed by a second with medium granulometry, a few millimeters below the surface level. As the last finishing coat on the surface, to be applied at the same level as the decoration, we used a mixture of lime putty and marble powder, adequately pigmented, so as to give an overall shade to the surface that was the same as the general shade.

Also, with regard to completion of the painted decoration of the surface, we relied on the experience acquired in the Prayer Hall to restore a final product that was uniform throughout al-Ashrafiyyah Mosque and Madrasah. The critical-methodological approach served to recover the balance and unity of the whole, in consideration of the different situation of gaps on the various levels-registers and decorative portions of the architecture.



Figs. 24a - 24d.

Some details of the carved and painted stucco at the end of the restoration work.



Dome exterior

Since most of the conservative problems relative to the cenotaphs were caused by poor maintenance of the outer portion of the domes covering them, the natural thing to do before undertaking interior repairs was to restore the external structure.

The first operation was mechanical cleaning of the entire surface with removal of the thin coats of whitewash that had been applied over the year, and the removal of all those stuccoworks, some in cement, that were no longer functional.

Mechanical cleaning was following by cleaning with a solution of ammonium carbonate for the removal of all the coherent deposits, to finish the previous mechanical cleaning. This procedure brought to light the original surface and a few traces of color that enabled us to guess at the chromatic richness the exterior must have once possessed.

The next step was to repair the stuccoing of the external coating of the dome. A complete replacement and restoration of the external covering was not done, as in the case of the dome on the Prayer Hall. In this case it was decided to repair the gaps one by one so as to preserve the fragments of color restored and reconstruct the original smooth aspect.



Fig. 25. Overview of the outside of the dome in sector 2a after restoration.

THE CENOTAPHS

Starting in October 2013, part of the team of the stone sector participated in the restoration of the burial monuments in al-Ashrafiyyah Mosque and Madrasah. Some of these monuments were constructed from sculptured stone that had been gilded and painted, others were finished with the traditional technique of *qadād* with polychrome decorations. The restoration was particularly complex, especially with regard to the operations necessary to clean the stone surfaces and consolidate the structural parts. The operators found themselves having to deal with very complex technical problems on structures that, though quite small, were of immense historic and artistic value.

Stone cenotaphs

The cenotaphs of the sultans appear to be positioned almost off to one side in al-Ashrafiyyah Mosque and Madrasah. The inner court, occupied on three sides by small domed structures containing the cenotaphs, can be accessed from the south corridor or from the Prayer Hall.

On the north side, in line with the Prayer Hall, the two square structures topped by domes contain two of the cenotaphs. The chambers are separated by a narrow corridor and are bordered on two sides by arches in sculptured plaster and by marvelous painted wood screens with ivory inserts. The richness of the decorations prepares us for the importance of the place, for these are the cenotaphs of al-Malik al-Ashraf Ismā'īl and al-Malik al-Nāṣir Aḥmad. At the center of the chambers, we find the cenotaphs, consisting of white marble slabs with gray veining, painted and gilded. The cenotaphs are shaped like sarcophagi and rest on a pedestal surmounted by a canopy, narrower than the cenotaphs, and consisting of long slabs tilted on the longer sides. The slabs to the east and west, perpendicular to the cornice, are painted.

The lower part of each cenotaph is divided into two sections. In the upper section we find scrolls with inscriptions surrounded by a frieze of stylized leaves, while in the lower section there are sculptured lamps, more elaborate on the cenotaph of al-Malik al-Ashraf Ismā'īl, with garlands and rosettes, and more stylized on the other. On both cenotaphs, the projecting border contains a Qur'anic inscription and alternates white marble with gray veining and black carbonate lime.

The inscription on the scrollwork indicates the year of death of the al-Malik al-Ashraf Ismā'īl in 803 h. (1400 CE), prior to completion of construction on al-Ashrafiyyah Mosque and Madrasah, which was carried out by his son.

The cenotaph of the son also indicates the date of his death in 827 h. (1424 CE).

These marble slabs are not very thick, but are meant to be an embellishment only. The internal structure of the cenotaph consists of bricks and lime-based mortar and, to the extent that it has been possible to ascertain, there are also wood inserts that support

the iron framework to which the blocks of marble forming the overhanging cornice are fastened.

The cenotaph of al-Malik al-Ashraf Ismā'īl – State of conservation



Figs. 26, 27, and 28. Views of the cenotaph of al-Malik al-Ashraf prior to restoration.

Both cenotaphs were covered with a thick coat of green paint applied in relatively recent times. Underneath the paint we found another layer consisting of a black, tarry substance that in some points allowed glimpses of the original multicolored decoration and traces of gold leaf. From the structural standpoint, the monument appeared to be in fairly good condition in the lower portion. The most significant problems were found in the projecting cornice and on the cover, which had probably been tampered with to examine the inside. The slabs bore traces of adhesive cement-based mortar, carelessly applied. Some of the stones had also been repositioned incorrectly. A block of the cornice positioned on the south side was overturned and actually belonged on the west side, and another missing block was attached to the monument of the nearby al-Malik al-Nāṣir Aḥmad cenotaph. The four corners of the cornice were precarious because of the movements caused by rusting of the iron framework which, by increasing its volume, had caused detachment of the bedding mortars. The corner decorations, probably representing lanterns, had been lost.



Figs. 29, 30, 31 and 32. Details views of the cenotaph of al-Malik al-Ashraf prior to restoration.

The cenotaph of al-Malik al-Ashraf Ismā'īl – Restoration works

Structural consolidation

The first stage was the work of structural consolidation, made necessary by the presence of endangered elements. All the stones that were not in the proper place or had been positioned improperly were removed. This work involved the cover and the overhanging cornice. Before repositioning each element, particular care was taken to clean the internal structure, removing any deteriorated mortar and all the incoherent material deemed inadequate at this point in time. Where possible, the original internal iron frameworks were preserved, cleaned, treated with a rust converter and protected with Paraloid B72 to delay the formation of future rust. At this point it was suggested to use a system of bricks bonded with hydraulic Lafarge lime to rebuild the missing portions of the internal structure. For the adhesive operation, a slow-drying bi-component epoxy resin was used, with the addition of micronized silica. Where necessary, fiberglass pens were inserted to add stability and security of anchorage. The operation was laborious and time-consuming; the aid of tensioning straps contributed to its effectiveness. After completing the adhesion process, injections of fluid hydraulic mortar were made to fill any possible remaining gaps, so as to give complete stability to the restored structural system.



Figs. 33, 34, 35 and 36. Details views of the cenotaph of al-Malik al-Ashraf prior to restoration.

Cleaning

Before undertaking the cleaning stage, the structure of the decorative system was identified: a rich decoration in gold leaf overlaid on a bole base. The inscriptions in the central part were in red-orange, with a cornice above and lanterns. The zones exhibiting multicolored effects were the sculptured parts. Stone was used in this cenotaph to frame the central inscriptions and form the base structure.

The stratigraphy of the cleaning test later revealed, on the gold leaf, extensive black incrustations that were found difficult to remove.

Cleaning involved several steps. Initially it was done on the stones that had not been decorated, simply removing the green paint with a pad soaked in acetone. Later, a method was excogitated to clean the gilded parts.

First a mixture of Tween20 and ethanol was applied. Working with a cotton swab it was possible to remove the coat of green paint, paying particular attention to the indentations of the gilded bas reliefs, for the presence of the red color and intense blue, extremely

sensitive to any solvent. In many points the gilding was fragmentary, leaving the base preparatory layer visible.



Figs. 37, 38, 39 and 40. Views of the early stages of cleaning of the gold leaf decorations on the cenotaph. The first step was solely concerned with removal of the green paint.



After that, the next stage of cleaning consisted of using a chelating solution with pH 7.5 in a base solution of demineralized water, citric acid and triethanolamine which was able to remove the black substance. In general, the operation was very lengthy and complex. Cleaning was done with a compress and swab of cotton, through a slow but constant action. The workers had to proceed with great care and sensitivity.



Figs. 41, 42 and 43. Views of the later stages of cleaning of the gold leaf. The second step involved removal of the brown deposits and oxidation of the gold leaf.

The polychrome decoration on the outside of the covers was cleaned using the same method. A general refinishing of the traces of green paint left on the unpainted surfaces was done with a passage of ion-exchange resins. These resins were then used to remove the film of dirt and incoherent material on the gray-black stone at the base of the monument, and to remove the yellowing stains that covered the canopy. The outcome was a

balanced cleaning between the parts in bare stone and the decorative gilded and painted parts, restoring the cenotaph of Ashraf to what must have been its original splendor with a play of white and gray stones embellished by gilded decorations.

Stuccoing and final stages

After completing the conservative works, it was necessary to undertake the works of integration. Part of the overhanging cornice had to be integrated, sculpting the missing letters in the same style and choosing a stone similar to the original. The top was hammered like the original stones and a patina was then applied to harmonize with the rest.



Figs. 44 and 45. Views of insertion of a reconstructed portion of the Qur'anic inscription.



Fig. 46. Detail of the process of stuccoing the joints between the stones of the cenotaph.

The joints between the different marbles were then plastered with a mixture of lime, fine sand and marble dust, in an attempt to achieve a neutral tint that would match with the general shading of the lighter stones. Around the gray stones and the gilded decorative parts, it was decided to opt for a lightening of the shade through the application of a veil of color.

All the gilded and painted decorative parts were protected with a coat of Paraloid B72 at 5% in acetone. Any retouching of the painting was only done on the gilded decorations of the central slabs. In the abraded zones and where material was missing, a subtle veiling with paint was applied to rebalance the level of the orange tint of the bole used in the preparation for the gold leaf, harmonizing it with all the surrounding decoration.



Figs. 47, 48, 49 and 50. The cenotaph of al-Malik al-Ashraf after restoration.

Cenotaph of al-Malik al-Nāṣir Aḥmad – State of conservation



Figs. 51, 52, 53 and 54. Views of the cenotaph of al-Nāṣir Aḥmad prior to restoration.

The sculptured parts revealed traces of color hidden by the green paint. The cover consisted of stones, alternating white and gray, and traces of decorations could be observed on the east and west faces.

The cenotaph had been tampered with in the past and had been subject to some cursory works of maintenance. On careful study, it was possible to see that the slabs had been removed and replaced rather clumsily, leaving wide spaces between the stones, which had not been repositioned in their proper place. At that time, the gray stones of the cover may

have been replaced, as those found do not appear to be the original ones. The presence of different types of stuccoing confirms different works of maintenance. The two pinnacles in stone standing on the west face of the cornice do not belong to the cenotaph in question; we still do not know where they came from. Also on the cornice, in the north-east corner, a stone glued there was found to have come from the cenotaph of al-Malik al-Ashraf Ismā'īl, located in the opposite pavilion, indicating just how cursory the works had been in the past.

The stone belonging to the southeast corner had been lost. The base was missing many of the original tiles, revealing the underlying structure in bricks, although partly covered over with later applications of mortar, the east side revealed the labs of marble, original structure consisting of small black and white stones and, on top, of some of which had been lost.

The conservation of the painted decoration was unfortunately much more fragmentary in this cenotaph, perhaps because of the thinness of the preparatory coating applied for the colors and gilding. In the background of the letters, the blue and red pigment were powdery. In the lanterns, the pigments were applied directly on the stone, surely with the use of a binder.

Cenotaph of al-Malik al-Nāṣir Aḥmad – Restoration works

The works were concentrated initially on structural consolidation. All the stones at risk of detachment or positioned erroneously in previous maintenance operations were removed and carefully catalogued. Before removing the stones, the internal structure of the monument was cleaned and all the crumbling and broken material was removed. In a later stage the load-bearing structure was reinforced with lime and sand. Where necessary, portions of bricks and new bedding were inserted to reposition the original stones correctly.

In the same way, the cornice was removed, as well as several precarious slabs. Where necessary, in case of broken pieces or on the cornice, at risk of collapsing due to rusty iron hooks, bi-component epoxy resin reinforced with micronized silica was used. Later, fluid hydraulic mortar was injected to fill any remaining gaps.



Figs. 55, 56, 57 and 58. Views of different stages of the process of structural consolidation of the cenotaph, which involved disassembly followed by complete documentation of part of its elements.

This restored the structural solidity of the monument. The last stage concerned the base. In this case, given the many gaps in the structure, the first task was to clean the few original stones remaining. We removed the buffers in brick and mortar that covered the original structure and, after cleaning the entire zone, we restored the structure of bricks and mortar using hydraulic lime to bed the missing stones.

For the integration, white marble from a local quarry was chosen, without regard to the chromatic play of black and white, as was probably done originally, thus leaving the repair recognizable and privileging the conservative aspect of the work. Before it could be laid, a few new inserts were sanded, some by hand using abrasive paper of different granulometries, in order to age the surfaces.

The missing stone from the southeast corner was added, sculpting the missing Qur'anic verse, and it was lightly hammered to resemble the original stone. A light patina was applied to antique the new stones and harmonize the shading with that of the original structure.



Figs. 59, 60 and 61. Views of different stages of the process of structural consolidation and insertion of a reconstructed element for completion of the Qur'anic inscription.

Also in this case, the cleaning turned out to be a very painstaking operation. The tenacity of the green paint with respect to the delicacy of the original underlying colors limited the use of solvents. Due to this difficulty, it was decided to work step by step on different fronts: to start cleaning with compresses of ammonium carbonate on the stones where there was no painting; in the gilded sections and wherever we encountered colors, an acetone-based solvent gel was used to remove the green paint. It was necessary to go over the areas several times to eliminate all traces completely. Where possible, the gilded zones were treated with Paraloid 5% in acetone to pre-consolidate and allow the solvent solutions to act on the paint that had to be removed. The operation was very time-consuming in general, requiring extreme attention by the workers.



Figs. 62, 63 and 64. Views of various stages of the cleaning process.

The final result brought to light an elegant play of colors alternating with the use of gold leaf in the inscriptions and floral decorations on blue and red backgrounds. The conclusion of the entire cleaning process also revealed the many different types of marble used, with veining and tints that restore much of the monument's original splendor.



Figs. 65 and 66. Details of the decoration and inscription at the center of one side of the cenotaph after cleaning.

The final repairs with stucco were made below the surface with a mixture of lime and marble powder in a neutral tint with respect to the different shades of the marble and polychrome parts. Where necessary, the tint was corrected with a veil of watercolor.

On completion of all the stages of the work, a finish was applied using a base of microcrystalline wax diluted to 4% in white spirit, applied with a brush.



Figs. 67, 68 and 69. The cenotaph of al- Malik al-Nāṣir Aḥmad after restoration.

STONE CENOTAPHS IN THE EAST HALL

Cenotaph of al-Mujāhid

Inside a wooden enclosure in the large east hall, we find two stone cenotaphs and one in painted cement.

The first cenotaph stands in the northeast corner and bears an inscription declaring that it is the burial place of al-Mujāhid, son of al- Malik al-Nāṣir Aḥmad, who died in the month of Ṣafar 826 h. (January 1423 CE).

Atop a lovely white marble molding base runs a strip of black stones, the same stone used in the cenotaphs of the sultans. Above it is a band containing an inscription in bas relief. A row of light-colored slabs placed horizontally, but fragmentary, creates a border for the inscription and in the upper part, closing the cenotaph, there is a large slab of the same dark stone seen below.



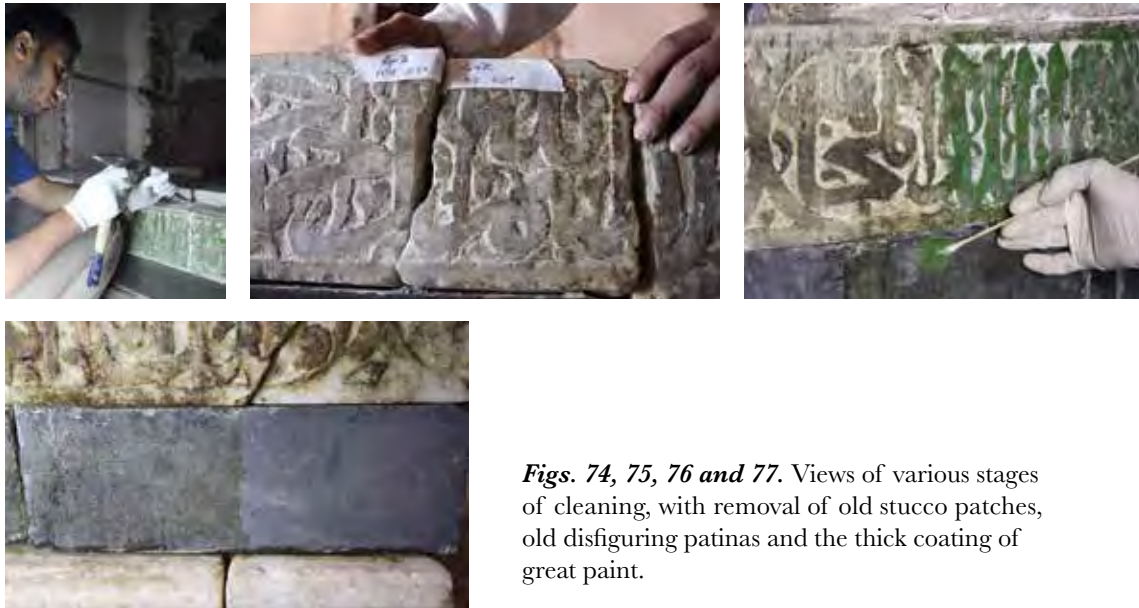
Figs. 70, 71, 72 and 73. Different views of the cenotaph of al-Mujāhid prior to restoration.

The odd shape of this cenotaph with respect to the others gave rise to the idea that the cover might be missing. The misalignment of the stone slabs suggested possible tampering and dismantling in the past, as did the irregular and clumsy applications of stucco between the joints. Like the other cenotaphs, a synthetic green paint had been applied to much of the stone surface, under which it was possible to see a black color and a few traces of gilding. A black border outlined the edges of the gilded letters.

Cenotaph of al-Mujāhid – Restoration works

The first operation we dealt with was removal of the unsightly applications of plaster-based stucco. During this stage, some stone slabs had been removed because they were in danger of falling, and had been repositioned with hydraulic lime-based bedding mortar. The work, which had to be done mechanically with small widia chisels and scalpels, gave the structure a more orderly appearance.

Later, the green paint was removed, with a second passage for removal of the dark underlying coating. The result of the cleaning process on the stones bearing the inscription revealed how badly the original polychrome decoration had been damaged. The cleaning process brought to light traces of bole, probably applied as preparation for gilding, and the lines that marked the borders of the inscription whose lettering is now almost entirely lost.



Figs. 74, 75, 76 and 77. Views of various stages of cleaning, with removal of old stucco patches, old disfiguring patinas and the thick coating of great paint.

More localized cleaning was done depending on the type of marble. On the large gray closing slab we used ion exchange resins, which made it possible to remove stains and tenacious incrustations, while compresses of ammonium carbonate were used to clean the gray stones. These operations made it possible to lighten the heavy accumulations of grease and oily substances that had been applied in the many previous maintenance operations.

All the marble blocks found to be in precarious conditions were detached and catalogued. Following the removal of the inner parts of crumbled mortar and residues of plaster, and after restoring the internal load-bearing structure, we proceeded to the adhesive stages. Where necessary, a first bedding mortar was applied, mixing lime and sand, after which the broken marble blocks were reattached using bi-component epoxy resin. In some cases, fiberglass bars were inserted as well.



Figs. 78, 79, 80 and 81. View of different stages of the process of structural consolidation which required, among the various works, insertion of fiberglass bars.

Following the same operating line of restoration used for the other cenotaphs, we decided to reintegrate the missing parts that in this case consisted of the cornice above the inscription. We were able to procure a local marble with coloring similar to the original, then attempted to adapt the new portion with the existing part by applying an antiquing patina that harmonized while at the same time leaving the addition legible.

On completion of the works on the cenotaph, we performed the final stucco repairs with a mixture of lime, sand and marble dust, slightly below the surface level.



Figs. 82, 83 and 84. The cenotaph of al-Mujāhid after restoration.

Cenotaph of al-Zāfir ibn Ismāʿīl

Another cenotaph flanks the one described above, smaller in size but similar in the decorative structure to that of the kings. The inscription bears the name of the son of al-Malik al-Ashraf Ismāʿīl, al-Zāfir, deceased in the month of Rabīʿ 802 h. (December 1399 CE).

Constructed in a highly precious marble, its base is in white marble. On this base stand two strips of black stone with white veining that frame marble slabs bearing inscriptions sculptured and painted in many colors, but badly damaged. An overhanging cornice tops the structure, on which there must have been a canopy with a kiosk-type cover. Only a few fragments of this cover remained, scattered around other areas of the hall.

The usual coat of green paint covered part of the stone surfaces of the cenotaph. The stones at the four corners of the cornice had been lost, as had the entire west side of the cornice. Numerous clumsy adhesions due to cursory maintenance works remained.



Figs. 85, 86, 87 and 88. Different views of the cenotaph of al-Zāfir prior to restoration.

Cenotaph of al-Zāfir ibn Ismā'īl – Restoration works

As was done for the other cenotaphs, we first put the general structure in order, removing all the clumsy stuccoing done to reassemble the marble slabs during previous maintenance works. After that, we carried out a delicate operation of surface cleaning using the solvents, materials and methods tested previously. The overhanging cornice on the top and the base were both covered with a waxy substance that, in time, had been darkened by the dust trapped in it. An additional cleaning step brought the marble back to its original luminous sheen. Using the same method, we cleaned the fragments of the cover. Sadly, only traces remained of the gilt preparation and black borders around the carved letters.



Figs. 89, 90, 91, and 92. Views of various stages of the cleaning process, including removal of old stucco patches, old disfiguring patina and the thick coating of green paint.



Fig. 93. The cenotaph after cleaning.

After cleaning, despite the traces of gilt preparation and of the blue background of the letters that remained, the polychrome decoration was largely lost.

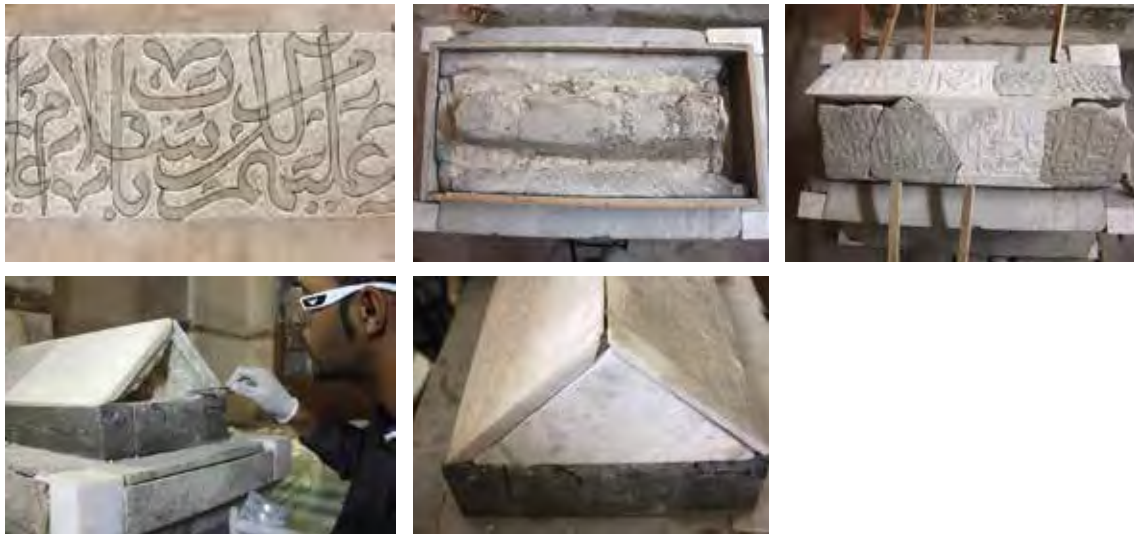
The marble had recovered its brilliance, however, and the gray and brown veining was again visible. We proceeded to reinforce the precarious marble parts and integrate some missing pieces. Also in this case, the materials and methods used were the same that had been tested for the other cenotaphs. Adhesion was achieved using bi-component epoxy resin with the insertion of fiberglass bars where necessary. A few small gaps were reintegrated with new inserts of marble similar to the original.



Figs. 94, 95, 96, 97 and 98. Views of various stages of the process of consolidation of the cenotaph which required, among other things, the including of new sculptured elements appropriately shaped to complete the Qur'anic inscriptions.

Reconstruction of the cover of the monument was a complex, painstaking job. A full-scale model in styrofoam was made by the master plasterer, 'Abd al-Rashīd, and was helpful in assembling the fragments recovered and for insertion of the new stones. After having perfectly drawn the missing parts, the stones were cut. Later, using micro-scalpels, the Qur'anic inscriptions were etched onto them. In this way we reconstructed the north and south sides of the cover.





Figs. from 99 to 106. The sequence of pictures briefly describes the process of reconstruction of the upper section of the cenotaph, with the inclusion of the new elements sculptured to fill the large gaps in the Qur'anic inscription.

To do this, it was necessary to remove the plaster bedding structure that had been applied in previous maintenance operations. A new bed in lime and sand was prepared in which to lay the new stones. Replacement of the surviving stones in the upper part of the cover, harmonizing them with the new stones, was not a simple task: the edges were often chipped and the bedding was not all on the same level.

After reconstructing the cover, all the joints were plastered with a mixture similar to what was used in the other cases.

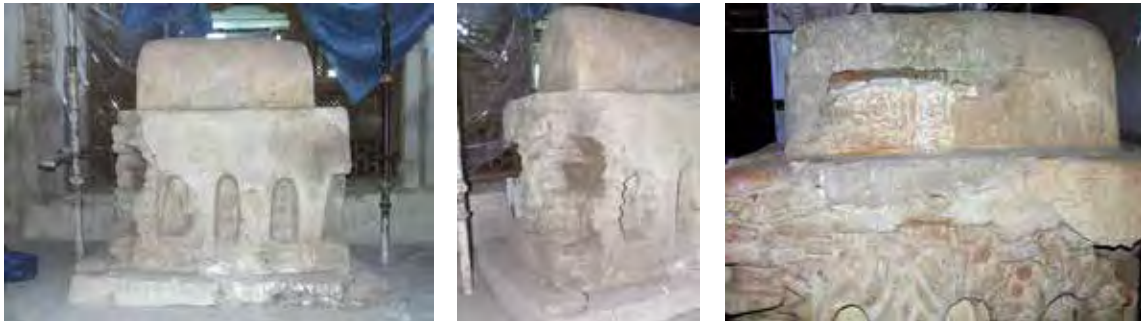
THE PLASTER CENOTAPHS

Cenotaph in the inner court

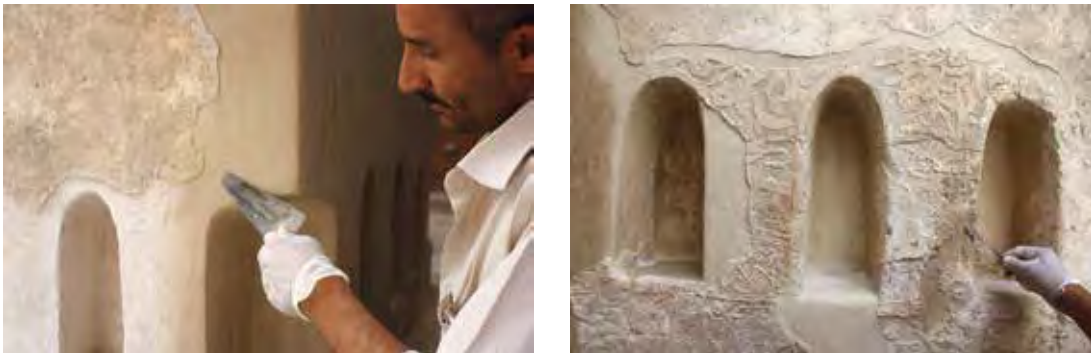
There are three cenotaphs in mortar and plaster in al-Ashrafiyyah Mosque and Madrasah, one in the open in the inner court to one side of the south entrance to the funeral pavilion of the Sultan al-Nabîl. Its position, exposed to weather damage, left it in a particularly poor state of conservation. The internal masonry structure was visible, and what remained of the decoration was very fragmentary, in the zones of the niches in the lower part and on the north side of the cover. On this side, part of the inscription was covered by thick coats of lime due to various maintenance operations. The rest of the inscriptions seems to indicate that it belonged to a woman.

The cenotaph was built on a base bearing a series of small arches and niches that support the cenotaph, crowned by a roof with rounded corners. It had been reassembled repeatedly, as was clear from the many layers of mortar made with mixtures that

differed from the original. Originally, like the others, it must have been covered with floral decorations and polychrome inscriptions. Before this restoration, all the surfaces had been covered by a thick layer of solidified dust and many coats of whitewash. There were numerous additions in cement and crude attempts at stuccoing. The original surface showed many gaps. In several points, the final layer of mortar had separated from the support.



Figs. 107, 108 and 109. Views of the cenotaph prior to restoration.



Figs. 110 and 111. Views of the stuccoing process.

Restoration works

After removing the layer of surface dirt, several coats of whitewash had to be removed by mechanical action using a scalpel. This made it possible to uncover clear portions of the original *qadād*, with respect to that applied during subsequent maintenance works. The borders were carefully cleaned to facilitate reading, and guards were installed to protect the corners, using injections of fluid hydraulic mortar. Considering the historic character of the works undergone by the Mosque and Madrasah, it was decided to remove only those replacements that covered the original inscriptions, conserving those below which there was no original painted layer.

The cement-based mortars were entirely eliminated, however. With this operation we were able to recover small portions of the original decoration, with inscriptions in relief in white, bordered by a thin red painted outline. The inscriptions were cleaned

with a solution of ammonium carbonate and consolidated. The base was restored with a structure in bricks covered with the *qaḍāḍ* technique. The missing parts in brick were reconstructed and, where necessary, a load-bearing structure was created using a grid of fiberglass pins crossed and fastened together with steel wire. After completing this stage, a layer of lime and coarse sand was applied to prepare the rough plaster topped with the final fine plaster finish. After performing various tests, we developed a fine plaster type maintained slightly below the surface level, reminiscent of the different shades of the plaster present. This gave the monument an overall harmony that it had completely lost.



Figs. 112, 113 and 114. Views of the cenotaphs after restoration.

Cenotaph in the east hall of the inner court

Beautifully decorated, sculptured and painted, this monument stood in the southeast corner of the room to the east of the inner court of al-Ashrafiyyah Mosque and Madrasah. On a base of lime and sand stands an architectural decoration with plays of arches and niches, embellished with painted inscriptions very similar to those in the courtyard. In the upper part, slightly projecting, we find a Qur'anic inscription. Closing the monument is a cover decorated with a bas relief in *qaḍāḍ* richly painted.



Figs. 115, 116 and 117. Views of the cenotaph prior to restoration.

State of conservation

With respect to all the other elements taken into consideration, this cenotaph had not been covered with green paint. A thick layer of dust covered the entire surface, together with a coating of blackened organic oil that hid the original polychrome decoration. There were a number of reconstructions in concrete, especially on the corner parts.

Restoration works

We proceeded initially to remove the dust with a soft brush and the use of the Wishab sponge. After fixing the border of the original *qadāḍ* with a mortar of lime and fine sand, we removed all the concrete patches and crude stucco applications. Where necessary, injections of a fluid mortar served to consolidate areas where the plaster had become detached.



Figs. 118 and 119. Views of various stages of the process of consolidation of the cenotaph.

After removing all the improperly applied mortar, the brick structure came to light. This was cleaned of any residues of dust after which it was reconstructed with a mortar of lime and coarse sand to prepare the rough plaster base for the fine finish that gave shape to the exterior construction of the cenotaph.



Figs. 120 and 121. Views of the cenotaph after removal of the stuccowork and with the rough plaster layer ready to receive the finishing layer of fine plaster.

Once the monument had been restored in its basic structure, it was possible to proceed with more thorough cleaning. The greasy substance applied to protect the monument had trapped the dust, forming a thin crust that covered the entire cover and other parts of the decorative design. After various preliminary tests, we opted for cleaning with a cotton pad soaked in a solution of disodium and tetra sodium EDTA in a percentage necessary to obtain a neutral pH, then rinsing with demineralized water. The colors were found to be fairly resistant, with the exception of the red, which been damaged by binder powder.



Figs. 122, 123 and 124. Views of various details of the cenotaph during cleaning of the decorated surfaces.

On completing the conservative stage, preliminary tests were carried out for the final plastering of the gaps. A fine plaster with developed with a slightly warm shading that resembled the lighter portions of the decorative design. The plastering was done slightly below the surface level.



Figs. 125 and 126. Views of different stages of stucco repairs.



Figs. 127 and 128. Views of the cenotaph after restoration.

Cenotaph in the wooden enclosure

Within the wooden enclosure in the room containing the other cenotaphs, this small cenotaph in *qadād* consisted of a base with a crude plastering of lime on which there were three different levels of decoration with designs in white relief on a red background, framed by horizontal borders showing traces of ochre yellow. Crowning the monument was a cover with a decoration in bas relief that had been covered by the usual green paint. The inscription bore the date 847 h. (1443-1444 CE) of the death of the son of Sultan al-Mufaḍḍal Muḥammad.



Figs. 129, 130 and 131. Views of the cenotaph prior to restoration.

State of conservation

A thick layer of dust covered the entire cenotaph. Green paint coated the cover. The lower part of the base had lost much of its decoration in relief. With regard to the static state of conservation, it is the most intact of the cenotaphs, without concrete reconstructions or signs of tampering.

Restoration works

Restoration activities concentrated mainly on cleaning, particularly the removal of the green paint from the cover. After testing various methods, we decided to use a solvent gel that was applied and let stand for a few minutes. This eliminated the green paint from the most stubborn parts without damaging the layer of original decorations. After this first cleaning step the paint was gone, but a blackish oily substance remained on the surface of most of the cenotaph. A second cleaning step was necessary and for this we tested ion exchange resins. As a result, it was possible to remove the oily substance, leaving the decorations visible in their original colors, although badly damaged.

The figures 133-134 clearly show the levels of cleaning on the long sides of the cover: on the left, the state of fact with the green paint coating the cover, at the bottom right the first level of cleaning, revealing the blackened coating produced by the oily substance, while at the top right we can see the second level of cleaning with the remains of the original polychrome design consisting of yellow borders around a central inscription on the red background and around it a floral decoration on a blue background.



Fig. 132. View of a cleaning sample on the decoration and Qur'anic inscription.



Figs. 133 and 134. Views of details of the cenotaph after cleaning.

Cleaning then continued on the lower parts of the monument. A light passage with a solvent solution was necessary to clean the inscriptions and designs in white relief, paying particular attention to the fragile red backgrounds.

The final stages of restoration were the stuccoing and color integrations done lightly with a veil of watercolor.

Cenotaph in the southeast corner of the inner court

This cenotaph is located in the third funeral pavilion in the inner court, not as richly decorated as that of the two kings, and also not as well preserved.

Restoration works

Restoration works on this monument were done in collaboration with the carpentry division. The operators of the “stone sections” worked on restoration of the base. Initially, stratigraphic assays were done to ascertain the presence, under the thick application of concrete, of a wall finished in *qadād*. It was possible to recover large portions of plaster from different periods, the product of many maintenance operations. The base consisted

of two levels, but only the internal core in bricks of the first level remained, and they were out of place and missing in parts. On the second level, we found traces of a decoration of red and white squares painted on a thin coat of plaster. Before proceeding with removal of the restoration *qadād* that covered the oldest part of the decoration, we consolidated the visible parts with injections of a fluid lime-based hydraulic mortar, after carefully removing any loose material on the inside, where possible. The powdery red color was pre-consolidated with Paraloid in acetone at 5% in order to proceed to the subsequent stages.



Figs. 135, 136 and 137. Views of various stages of consolidation and cleaning of the base of the cenotaph.

After fixing all the precarious parts, we proceeded to remove the restoration *qadād*, other faint traces of red color and thin coats of plaster we uncovered on the lower step, as well as faint etching that marked the square.

The two steps were then rebuilt with the traditional *qadād* technique, maintaining on



Figs. 138, 139 and 140. Views of the base of the cenotaph after removal of the plasterworks.



Figs. 141, 142 and 143. Views of the base of the cenotaph after removal of the plasterworks.

the second step, on all four sides, the same level of ancient *qaḍāḍ*, in preparation for the finish in the plaster remaining. After completing the restoration works, we proceeded to fill the gaps in the pedestal to slightly below the original level, before applying a rough coat of lime and sand as bedding for the final plastering applied to match the fragments of red and white decorated band with the structure in wood.

The carpentry division handled the cleaning, consolidation and restoration of the missing wooden portions of the cenotaph.



Figs. 144 and 145. The cenotaph before restoration.



Fig. 146. The cenotaph after its restoration.





RESTORATION OF WOOD ARTEFACTS OF AL-ASHRAFIYYA MOSQUE AND MADRASAH

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NENAD GOOL KEVESIC – THE ITALIAN-YEMENI TEAM

Introduction

As part of the conservative restoration of al-Ashrafiyyah Mosque and Madrasah in 2010, a first program was launched to establish a carpentry workshop in a section of the Madrasah itself, where students could participate in a professional training course for wood restoration.

Organizing this course involved recruiting local personnel to develop a selective preparatory section, which was followed by special training for experts in wood restoration. The introductory course would serve to prepare a team of Yemeni operators capable of carrying out works of restoration on the wooden elements of al-Ashrafiyyah Mosque and Madrasah, coordinated by experts from the IVBC.

The preliminary portion of the course consisted of both theoretical and practical activities, designed to give the students a basic understanding of the work of wood restoration.

The lectures included material of a historical and artistic character on the general principles of wood conservation and restoration, on the nature of the wood species most widely used in architecture and on the artistic wooden elements typical of the Arabian regions. From a scientific standpoint, there were lessons on the biology and chemistry of wood restoration.

During the first practical session of the workshop, the students were able to engage in two different types of activity. One group studied the execution of different types of painted decoration on wood using blocks first prepared with gypsum, then learning about the use of pigments and binders, methods of applying the colors and gilding.

Another group practiced manual carpentry skills using tools and machines for works of cabinetry. That group also experimented with wood carving and cutting boards, the construction of dovetail corners, framing and wood sculpture.



Figs. 1 and 2. These pictures show views of the carpentry workshop used during the restoration project.

Between 2012 and 2013 the carpentry workshop acquired additional professional machinery and tools, and was able to equip the workbenches with a wide range of apparatus. The new specialized equipment came from Italy.

Two wood restoration experts also came from Italy, one a native Arab speaker, and they set up a worksite school with a basic program of instruction. In the three months of the worksite-school, a number of activities were developed, mainly focused on the *mashrabiyyahs*, the delicately wrought wooden screens of the monumental sepulchral cenotaphs in the courtyard outside the Prayer Hall of the mosque.

Briefly, the activities explored in this cycle of professional training at the three-month worksite-school were as follows:

- Analysis for a first visual evaluation on the state of conservation of the woodwork and preparation of a technical-descriptive report;
- Drafting of a preliminary project for the restoration work;
- Programming to establish the priority of scientific investigation to be carried out on samples to ascertain the presence of the original colors, which would then be sent to specialized cultural heritage laboratories in Italy for diagnostics;
- Exploratory graphic drawings of the *mashrabiyyahs*;
- Development of technical drawings for the reconstruction of missing plastic-structural and decorative parts, the windows and grids of spools and nuts, contoured columns;
- Construction of prototypes using the lathe, replacement of missing parts on the basis of the technical drawing in scale 1:1;
- Tests for removal of green paint applied over the earlier decoration, completely covering the *mashrabiyyahs*;
- Organization of teams of trainees for the most urgent restoration tasks on different sections of the *mashrabiyyahs*.

After completing the professional training course at the worksite-school, the students undertook the activity of restoration full-time on all the woodwork of the Mosque and

Madrasah. The *Team of Woodwork Restoration Expert* exhibited excellent ability in the performance of this extremely complex project.

In addition to the *mashrabiyyahs* of the inner court, which contained the monumental cenotaphs, the works were also concerned with other important wood artefacts. Specifically, the *mashrabiyyahs* located in the *madrasah* hall enclosing other cenotaphs, the main western door of the Mosque and Madrasah, the main entrance to the Prayer Hall and all the other decorative woodwork in the different areas of the monumental complex, like the *qamariyyahs*, lintels over the doorways, and the beams installed to absorb the static-structural shocks of the masonry.

The *mashrabiyyahs* of al-Ashrafiyyah Mosque and Madrasah

The *mashrabiyyahs* are complex wooden screens of extraordinary quality, airy, carved and decorated, enclosing the monumental sepulchral cenotaphs erected in memory of al-Malik al-Ashraf Ismā'īl, who commissioned the Madrasah, and son of al-Malik al-Nāṣir Aḥmad. The funeral chambers of the courtyard, which accesses the Prayer Hall and other parts of the madrasah, were built later than the central architectural structure of the Mosque and Madrasah. The buildings resemble closed aedicules and are datable, historically from the end of the 14th or early 15th century. Certainly, they were commissioned by al-Malik al-Ashraf Ismā'īl of the powerful Rasulid dynasty while he was still alive, to perpetuate his own popularity and that of his son.

The external façades of the sepulchral aedicules, built against the corners of the court, are structured in two heights with distinct registers. On the first level, the ground floor, between the vertical wall supports, we find the wooden screens called *mashrabiyyahs*. The two façades of the upper registers are resolved with *qamariyyahs*, large polylobate perforated openwork arches with geometrical designs in stuccowork. In technical-descriptive detail, the *mashrabiyyahs* are wooden panels formed by several boards of different wood

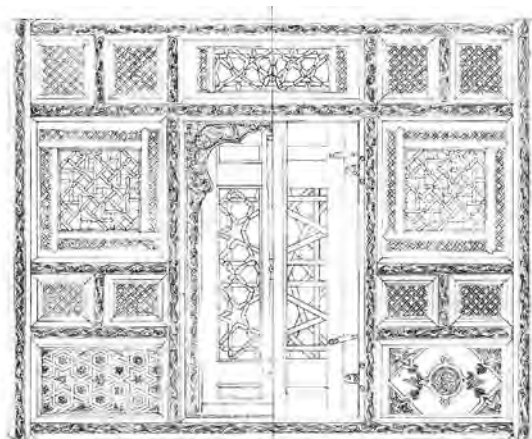


Fig. 3. Drawing of a *mashrabiyyah*.



Fig. 4. Color drawing of the *mashrabiyyah*.

species, such as *tunub* (*Cordia Abyssinica*, which has a brownish, beige tint), *humar* (tamarind, with a reddish tint), *ebony* (which is black) joined in a richly colored plastic composition in molded sections, carved with vinelike designs containing perforated windows with interwoven strips in geometrical patterns. Every section of the panels is rhythmically divided into squares bordered by fancy carved frames with vegetable designs, richly painted with precious pigments (cinnabar, orpiment, lapis lazuli, malachite) in the cavities, creating the impression of being set with precious stones.

The sections of the bottom panels are covered with ivory plating patterned with pentagonal and star-shaped designs, refined by etchings.

At the center of the wooden screens, doors provide access to the cenotaphs, each door having two richly decorated sections.

State of conservation of the *mashrabiyyahs*

At the beginning of the 20th century, al-Ashrafiyyah Mosque and Madrasah was left in a state of abandon, and for many years underwent a change of use with regard to most of its rooms. Indeed, in the Sixties it was turned into a tannery, except for the Prayer Hall. Later, in the Seventies, local authorities undertook a careless, cursory restoration. It is likely that in seeking to refresh or redecorate many of the wooden artefacts, as well as the precious marble and gilded cenotaphs on the inside as quickly and cheaply as possible, someone had the terrible idea of simply painting everything green.

More in general, at the outset of the works, the *mashrabiyyahs* were in a very poor state of conservation. Many elements were missing, the lintels over the doors and other structural parts were, to a large extent, badly eroded internally by termites. For some of these, the situation appeared one of imminent collapse, as the wood was no longer able to support the polylobate arches over the *qamariyyahs*. Many decorative plastic elements of the wooden screens had been detached, others actually removed, probably on purpose. Some of the turned spools of the window gratings were missing. Much of the precious ivory plating in the panels of the lower sections was lost or broken. Many replacements could be observed, and poorly made repairs of wooden elements, some more recent, some remote and not datable. Of the four entrance doors to the main cenotaphs, only two panels remained and they were entirely lacking the lacy geometrical decorative perforations of the windows.

The exterior façade of the *mashrabiyyahs*, relative to the cenotaph dedicated to the son of al-Malik al-Ashraf Ismā'īl, shows a particular surface erosion of the wood species, due to the fact that it faced south. This orientation subjected it to continuous deterioration due to the seepage of rainwater, compared to the other façades with better, steeper roofing.

On the inside of the *mashrabiyyahs*, a thick covering of atmospheric dust clung to most of the wooden parts.

The carved frames with their vegetable patterns that border the sections of the

screens, for the funeral hall of al-Malik al-Ashraf Ismā'īl and that of his son, bear traces of polychrome in the cavities, under the coatings of green paint. To ascertain the real nature of the polychrome decorations on the wood, a targeted study project was carried out. To this end, samples of flakes of different colors were taken and analyzed in the laboratory. The results were surprising. The polychrome decorations were found to be original, made at the time of construction of the *mashrabiyyahs*. The tests showed that the older strata, those in contact with the wood, bore traces of prestigious pigments like lapis lazuli, cinnabar, litharge (lead oxide yellow), azzurrite (adulterated as malachite). In some cases, the remains of organic binders could be identified in the colors, referring to protein substances such as animal glues and egg.



Figs. 5, 6 and 7. A few test sections cleaned to determine the state of any original painted strata.

The tests concerning the green paint applied during previous maintenance, which almost entirely covered the wooden parts, and the residues of the original colors, reveals a green-based pigmentation of phthalocyanine, in use between the Sixties and Seventies of the 20th century. However, from the stratigraphic cross sections and chemical analyses, it became clear that before this painting in the last century, the artefacts had already undergone a preceding painting with Chrome Green. The experts were able to determine that this earlier painting went back to a time that was impossible to specify more definitely than between the mid-19th and the mid-20th century.

Sadly, the coats of green paint had penetrated one another and contaminated the older painting as well, as far back as the original decorations, that were undoubtedly poorly conserved even before this clumsy and deleterious additional damage was done.

Restoration intervention

The work of restoration was undertaken in 2013, when the worksite-school initiated its activity. In addition to drawing up documentation on the state of conservation, graphic reports and a restoration project, tests were done on small portions of the screens, representative of the types of problems that would have to be dealt with. The findings of this initial inspection made it possible to establish the operating guidelines for the entire worksite project, which were added to as necessary as the works progressed.



Figs. 8 and 9. Examples showing the state of conservation of various panels of the *mashrabiyyahs*.

One of the top priorities was to characterize the original polychrome decorations, as well as determining the nature of the overpainted layers done in the past. To this end, targeted samplings were done, taking small portions of material for testing in a diagnostic laboratory.

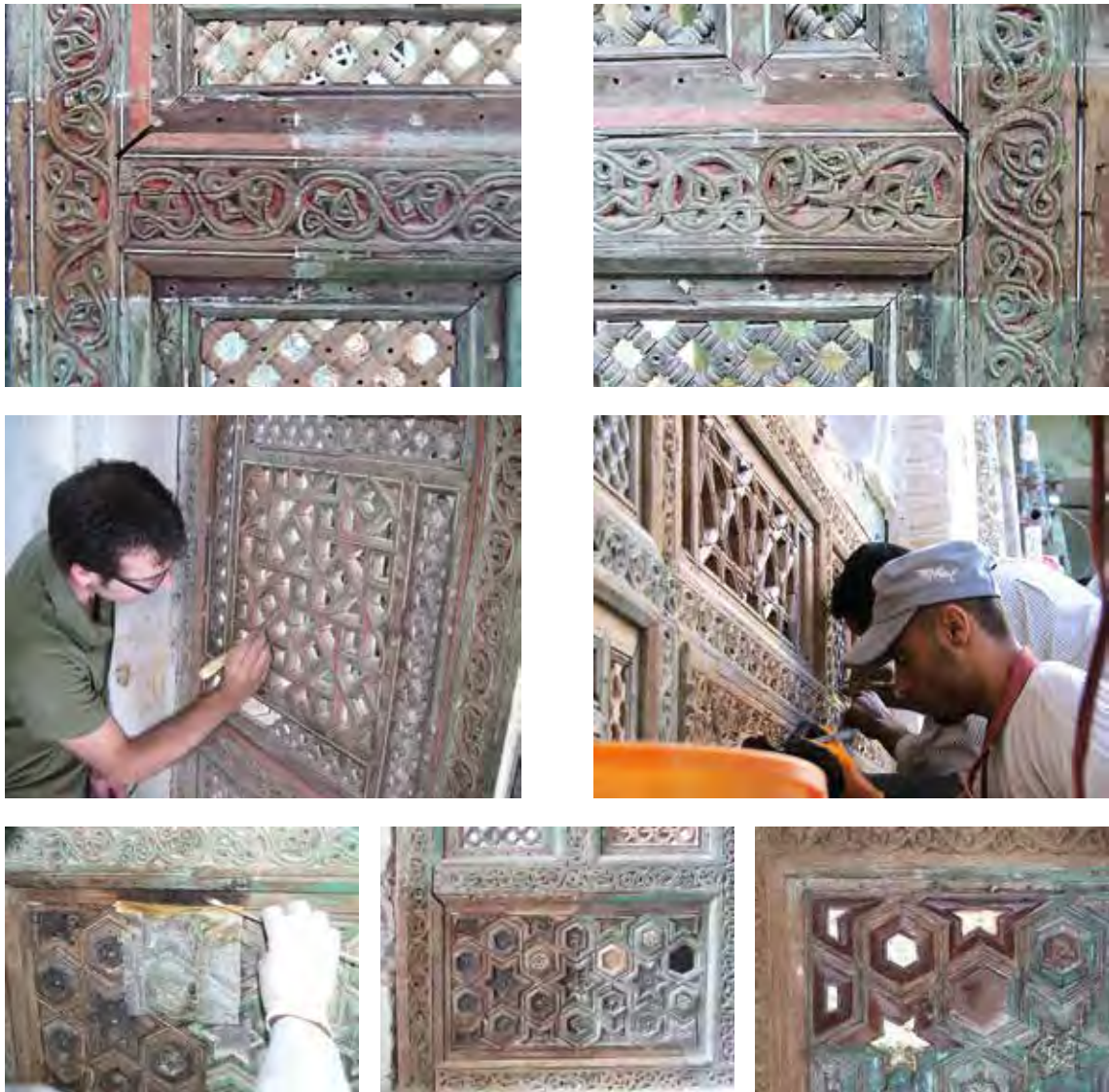
On the basis of the scientific findings, tests for cleaning were undertaken, in the hope of eliminating the many heavy coats of green paint. We proceeded in a selective manner to check the degree of removal of the coats of paint and reach a level that historically respected the surface with its precious carved framing and friezes.

The methods used, which gave satisfactory results, were not all the same.

Large sections of the panels, where the wood species had to be restored to its natural bare state and cleaned of the patina of time, required the use of scalpels, sometimes with the aid of water, ethanol and acetone, and finishing with padding. For the carved and painted frames, in order to preserve the traces of original color, we developed a solution of water-ethanol-acetone-ammonia in adequate proportions.

The procedure involved applying Japanese paper on the surface of the overpainting to be removed, then applying the special mixture with a brush and repeating the application in order to soften the green color enough for the Japanese paper to absorb it. After completing removal of the green color absorbed by the paper fibers the surface was padded with the same solvent solution.

On the basis of the of results obtained in the test, a group of young Yemeni operators undertook the delicate cleaning operation, which required six months of work.

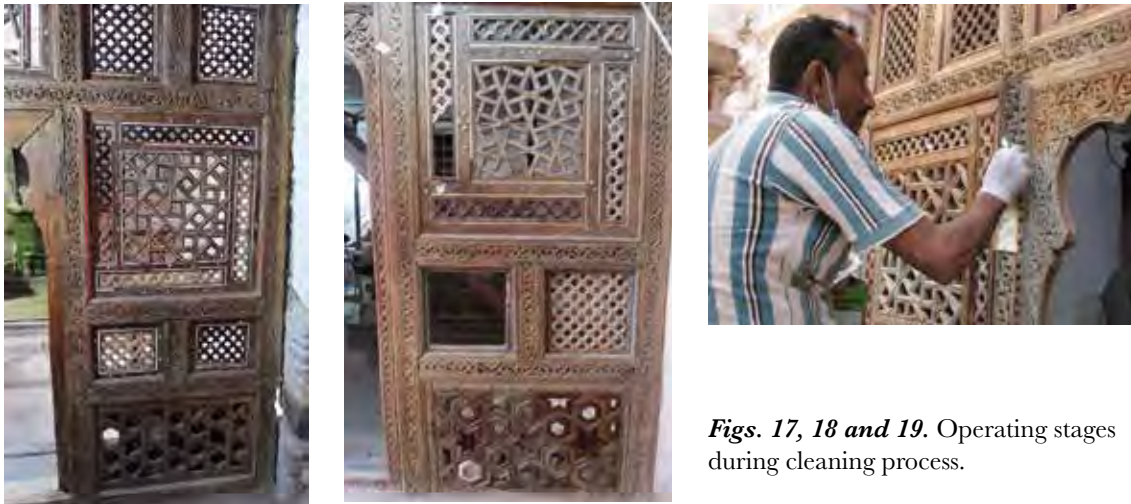


Figs. from 10 to 16. Test of cleaning and stages of operations.

While one group undertook the cleaning process, another group of Yemeni operators deliberated an executive program on the basis of the initial project, to decide the structural repair of the *mashrabiyyahs* that exhibited particular problems. Loose posthumous additions were discovered, gaps caused by the removal or deterioration of wooden parts, structural parts that had deteriorated to the point, in some cases, of static instability.

Initially, it was decided to remove the loose elements that consolidate some of the lateral uprights and some of the crosspieces that had obvious problems of stability caused by the erosion of xylophagous insects.

The structural consolidation of these beams was resolved in a variety of ways. To restore those damaged by termites in the cenotaph of al-Malik al-Ashraf Ismā'īl, eroded

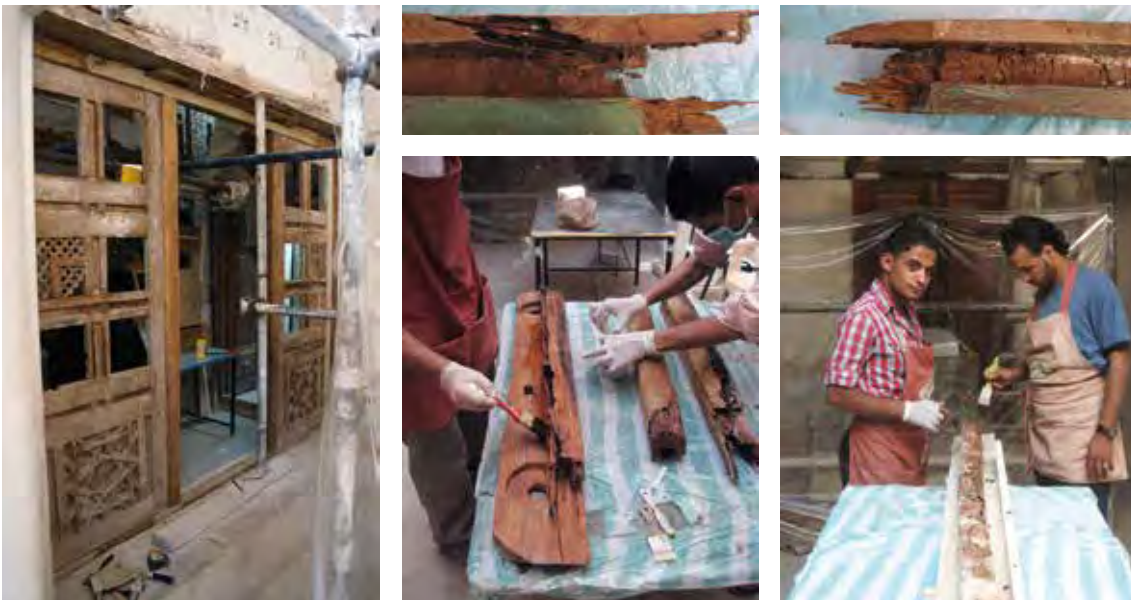


Figs. 17, 18 and 19. Operating stages during cleaning process.

internally by numerous tunnels, we proceeded, after ensuring that the insects had been exterminated and applying adequate termite-prevention treatment, to inject an epoxy resin-based compound, such as Araldite. Surface fissures and holes were plugged with appropriately pigmented epoxy resin.

For the structural reinforcement of the load-bearing beam of the south cenotaph, which was in a condition of extreme erosion caused by termites and also badly rotted from the stagnation of water from previous seepage, it was necessary to dismantle the entire *mashrabiyyah*. Since it would not have been possible to work on-site due to the structural instability of the artefact, it was completely removed and taken to the workshop.

The first job was to treat it to eliminate the termites.



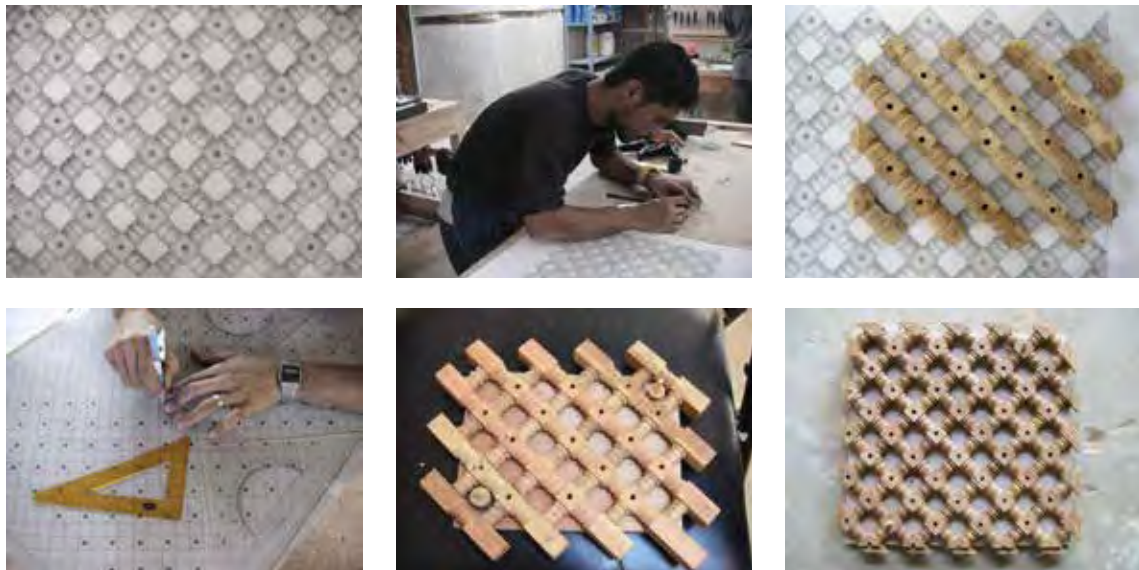
Figs. 20 to 24. Situation and operating steps for consolidation of a load-bearing beam.

The damaged load-bearing beam was treated separately. Local consolidation was then done, using syringe and brush, with acrylic resin (Paraloid B72 at 2.5 % in acetone). After re-establishing the cohesion of the wood fibers, the cracks and tunnels were filled with a paste applied using a putty-knife. Long strips of wood were used to reinforce the structure in place of the missing parts. Finally, the reassembled screen was returned to its proper place.

A delicate issue that arose during the earliest stages of the project, concerned the way in which the missing parts of the *mashrabiyyahs* would be restored. In the specific case, they concerned missing oblique spool-grids of the windows, but also empty spaces due to the absence of the vertical molded columns and frames of the panels. Even the absence of several of the door panels, once richly decorated with perforated geometrical designs, required deep reflection to make a coherent philological choice.

With the Works Directorate, we decided for reconstruction in order to give a unified impression of the whole. The decision did not only focus on the issue of re-establishing the esthetic unity of the design, but also on an ideal restoration of the particular conditions of light filtering through the grids and perforated patterns of the screens in the funeral hall. We had to consider the modulated play of light and shadow as well, as it penetrates softly suffused in the interior space, in order to re-establish the holy aura of the cenotaph.

In accordance with this choice and in consideration of the congruent proportion of surviving parts, the missing elements had to be reconstructed with wood species, materials, geometries and technical procedures having the same characteristics as the originals. In order to achieve this, we developed technical drawings in scale 1:1 and, on the basis of this preliminary study, to construct a first prototype in order to understand the construction dynamics, examining the intact gratings in function and replicating the original structure faithfully. This work required extreme precision, with special procedures and stages.



Figs. 25 to 30. Stages of study and construction of two prototypes for two windows of different sizes.

A first stage consisted of having the carpentry workshop produce a series of spools on the lathe. A second stage required cutting fitted cubes and small perforated spools. Bit by bit as the pieces were produced, they were assembled on the bench and checked on the basis of the design configuration. A later stage was carried out on the *mashrabiyyahs* to determine how to handle the final reassembly, piece by piece, inserting wooden pegs along the way to restore the windows.



Figs. 31 to 35. Operating stages in the construction of spool windows.



Fig. 36. Prototype of window prior to restoration.



Fig. 37. Intermediate state of assembly of the reconstructed parts.



Fig. 38. Prototype of completed window.

The positive outcomes of the constructive method and installation of the first prototype of window grating made it possible to open a specific operating sector for the restoration of all the other missing windows.

The two sole surviving doors were also taken to the workshop to be reinforced with toggles and tessellations. For the circumstance, a study of the geometric design of the

missing central windows was necessary, in order to ensure their faithful reconstruction. This work required special resource to find the exact original geometry, since we only disposed of an incomplete design. Restoration of the first two panels of the original doors of the *mashrabiyyah* on the south side of the cenotaph hall erected for al-Malik al-Nāṣir Aḥmad, provided the foundations for reconstruction of the missing doors.



Figs. 39, 40 and 41. Views for the proposed reconstruction of the decorative designs of a door.



Figs. 42, 43 and 44. Stages in the work of reconstruction of the ornate geometric design of the doors.

One particular solution was implemented to resolve the delicate interruptions or breaks relative to the panels at the base of the *mashrabiyyahs*. These panels, found only in the cenotaph halls of the Sultan and his son, were worked with inlays of different wood species, such as *humar*, ebony for the borders, holding elements in ivory in pentagonal and star shapes, in turn etched and artistically inlaid.

It was decided to repair the missing wood frames with ebony so as to also strengthen the structural unity of the panel. We felt it appropriate to also restore the pentagonal and stellar decorations ivory, in a simplified mode, without inlays, where they were missing, in order to restore the chromatic balance and overall uniform effect.

This choice required careful preliminary study. After a series of tests, the best method

was decided. A set of rectangular dies was created, measuring 20 x 15 cm, with a margin around the perimeter 3 mm thick, in which to spread a resin mixture to obtain a compact, flat slab. The mixture used was a bi-component epoxy resin (SV640) specific for wood. A mixture of ochre yellow, red and black was added to the resin, in adequate proportions to arrive at a tint similar to that of ivory. The sheets thus obtained were then cut into the shapes agreed for insertion into the gaps on the panels.



Figs. 45, 46 and 47. Stages in the work of reconstruction of the hexagonal and star-shaped inserts.

In conclusion, the development of the works of restoration on the *mashrabiyyahs* of the funeral halls in the courtyard created the conditions to teach and test with the Yemeni team all the types of repairs that could later be applied, with the appropriate adaptations, on the other wooden artefacts at al-Ashrafiyyah Mosque and Madrasah.



Figs. 47a, 47b and 47c. Decorated wooden doors.

Wooden doors at the entrance to al-Ashrafiyyah Mosque and Madrasah: access from the west entryway

The four façades that enclose and border the architectural complex of al-Ashrafiyyah Mosque and Madrasah were designed, originally, with four entrances. These consisted of portals with richly carved, sculptured and decorated wooden doors.

The north façade on a level with the Prayer Hall does not have doors, as its inner wall faces Mecca, with the *mihrāb* at the center and the windows on either side. However, just below the vertical axis of the *mihrāb* on the lower floor, which gives access from the street to the subterranean rooms, there is a simple, rather plain wooden door, installed during the restoration works in 1981, in place of the missing, probably decorated original.

On the south side, the interior of the magnificent Royal Porch architecturally built with stone blocks, alternating red and green bands, with the intrados of the vault painted in mural decorations, originally must have held a splendidly elaborate door. In the past, perhaps in the 19th century, this was replaced with two modest wooden doors with simple, geometrical designs etched in them.

Two other entryways, also with architectural porch in the form of an atrium and heavy wooden doors, are located on east and west façades. The original wooden door on the east side was also replaced during the restoration in 1981.

Of the four original wooden doors, therefore, only the west door, now the main entrance, remains to bear precious historical witness to the artistic taste in vogue in Yemen between the 14th and the 16th century. This doorway was the subject of a major conservative restoration by the Yemeni operators of the *Wood Restorer Team*.

State of conservation of the west wood doorway

The architecture of the west entryway is formed by a small battlemented building, intended as an atrium, topped with a small dome. On the inside, the wooden door is bordered on all four sides by imposing jambs, inserted in the structure of the masonry. The jambs are densely decorated with meticulous carvings.

The portal, consisting of panels of *tunub* wood, has two coffered door panels divided into sixteen coffers with the blocks carved and decorated in stylized vine patterns. In the bottom section, half the height of the right door panel contains a small doorway for a secondary or service access when the two main door panels remain closed.

The dating 894 h. and the name of the artist Ḥājī ‘Abd Allāh are etched at the center of the lintel over the door (see figures 56, 57 and 58) and refer to 1473 CE, about seventy years after al-Ashrafiyyah Mosque and Madrasah was built.



Figs. 48, 49a, 49b and 50.

Conditions of the wooden doorway prior to restoration, showing some details.

The doorway was in a very bad state of conservation. In addition to the natural wear of time and neglect, over the centuries it had been the subject of works of maintenance of the moldings and fissures, as well as of the unstable anchorages. These works, in some parts, consisted of the insertion of wooden elements, fastened with nails, replacing lost or broken parts. In some places iron strips were nailed on haphazardly with the intent of repairing fissured or unstable boards.

The hinge of the right door panel, consisting of a large vertical board pivoting at the point where it rests on the floor, was replaced at the base with an iron angle that supports and moves the entire structure of the massive door. The small doorway located in the right door panel for secondary access is particularly deteriorated and unstable, with hinges that had already been replaced but had loosened, and various inserts of different wood species.

In the front-facing aspect of the doorway, the vertical and horizontal boards framing the coffers were originally molded with geometrical carvings. In time these eroded and wore down, so that the plasticity of the skillfully sculpted designs was no longer legible. The panels themselves, with refined indentations and vegetable designs, show the same erosive phenomena. More in general, the entire doorway and undergone various cursory applications of oily paint in the past. A base coat of yellow paint is still identifiable, in contact with the wood, and another over it in green. These paints are badly worn, for the most part, on the lower sections of the doors.

Even the sculptured wooden jambs surrounding the doorway had been covered over, first by a whitewash of lime and later by a greenish paint, then again by whitewash, which has worn off in places.



Fig. 51. Conditions of the carved lintel prior to restoration.

Despite these repeated coats of paint, the three-dimensional carving is still recognizable, with the shapes of tiny buildings, miniature replicas of the perimetral battlements of al-Ashrafiyyah Mosque and Madrasah. However, the lower section is eroded or worn down almost entirely and has lost its clarity and plastic value.

Restoration works

The works for conservative restoration of the portal were coordinated by a restoration expert from the IVBC and carried out by two Yemeni operators who had already acquired valid practical experience on the *mashrabiyyahs* in the preceding months.

The entire process was carried out in two different stages. A first stage of esthetic restoration relative to recovery of the plastic values, by cleaning and coating with a final protective treatment. A second stage of a more structural character consisted of the removal of non-original additions, restoration of the hinges of the secondary service entry, the repair and replacement of those wood elements essential for the function of the structure.

First section: works of conservative restoration

In the first section, the initial operation focused on a detailed study of the state of conservation with a descriptive technical report, photographic documentation and preparation of a plan of action.

On the basis of the general view of the doorway a graphic drawing in scale 1:25 was done to document graphically both the state of conservation and the works as the different stages proceeded to completion.

The preliminary stage of inspections focused on prudent tests of cleaning of the precious decorated coffers, the framing of the doors and the jambs. The situation required diversified stratigraphic tests with the aim of ascertaining any presence of original color under the paintings that had covered them over in the past, extended to the entire surface.



Figs. 52 and 53. First tests of cleaning methods.

The outcomes of the tests confirmed that only the carved panels with refined indentations and vegetable designs of the door had been painted originally. Several surviving traces were found in the apertures and indentations of the moldings. The painting done at the time was designed on a gypsum base, a material very sensitive to moisture. Probably, when the surface of the door was painted over in the past, the decorations were already probably almost entirely lost.

For the jambs, the tests of cleaning ascertained that there were no traces left of any original pigmentation.

For removal of the repainting, a method was developed that could be applied selectively stratum by stratum with a view to saving any minimum surviving trace of original color.

The method, on each separate block, required three different passages, each technically different from the previous, on small areas at a time. A first passage was dry, done mechanically with scalpels, to remove the film of the thick coat of oil-based paint, yellow in some places, green in others. A second passage with the same method used to clean the *mashrabiyyahs*, i.e. the mixture of solvents with interposition of Japanese paper and removal by padding to remove the second coat of green paint. A third passage, with scalpels and tufts of cotton, served for a final finish.



Figs. 54 to 60. Stages in the work of cleaning the doorway.

Second Section: technical-structural repair work

The second stage of work on the doorway concerned works of a structural type.

Primarily, the works were centered on the small service entry in the right door panel, which was particularly worn and precarious. All the loose parts were removed, such as strips of iron and frames added on the front in replacement of the originals, which had been lost. The hinges were detached from the back and reinforced, then straightened and repositioned correctly.



Figs. 61, 62 and 63. Stages in repairing the static conditions of the small service door in the right door panel.

Wooden pegs were inserted on the outer panels and others in support of the base, where the continuous passage of people has worn away some parts.

A few vertical and horizontal beams, originally molded with geometrical carvings and having the function of framing the coffer panels were missing. With the Works Directorate it was decided to reconstruct only those missing in the lower portions, for the dual function of reinforcing the original parts and restoring the plastic-formal values. In respect of the principle of recognizability, the added parts had been simply modeled in their external shape, but not in the carvings.





Figs. 64 to 69. Stages in reconstruction of the crosspieces and insertion of pegs.

Coherence with this choice was also maintained in the fixing of some of the coffer blocks in the bottom section.

On conclusion of the works, a specific protective treatment for wood was applied on the entire doorway.



Fig. 70. The doorway after restoration.

Main access doorway to the Prayer Hall

In the inner courtyard of the architectural complex, a narrow corridor between the monumental funeral pavilions leads to the Prayer Hall through an internal entrance in front of the *miḥrāb*.

This access contains a splendid wood portal with two door panels, original with the construction of al-Ashrafiyyah Mosque and Madrasah, dating from the end of the 14th century.

Since it was not possible to work on it in place, we dismantled the two door panels and took them to the workshop.

State of conservation

The Prayer Hall door in *tunub* wood had two panels decorated with fine carving. Each panel was divided into three sections vertically with two square blocks at the top and bottom and one rectangular block in the middle. All these panels were densely carved with geometric designs.

In addition to these decorations, the door was embellished with brass bands containing decorations worked in relief, with shapes of rosettes. The borders of the carved wooden sections were studded with nails, also in brass and in relief, with hemispherical heads or in the shapes of rosettes.



Figs. 71 to 77. State of conservation of the doorway, showing some details.

In general, on careful inspection, the door was found to be in a very poor state of conservation.

The hinges on the sides of the two door panels pivoted badly in the hole of the wooden lintel at the top and bottom of the cavity, worn down on the floor, creating instability of the closing movement. On the front, the original lock on the center had been replaced and

the carved frame adjacent to it had consequently been pried loose. The rectangular panel of the right door panel had a large gap in it, caused by a breakage of the wood. The break was closed from the back by nailing a board across it. This door, like the west entrance door and the *mashrabiyyahs*, was painted with the unsightly green paint, the result of conservative maintenance done in the past. The paint had altered the original reddish-brown color of the *tunub* wood. The precious bands and decorations in brass were also covered over with green paint.

Restoration works

The first stage of the works provided for the cleaning a few small sectors to determine whether there were any traces of original tints under the thick coats of green paint.



Figs. 78, 79 and 80. Cleaning tests.

The assays did not reveal any colors that could be considered original. The type of artefact led us to believe that the only decoration contemplated were the carvings.

To remove the green paint the method used consisting of applying a gentle water-based paint remover that would not damage the surface of the wood. This was left for a few minutes to soften the green paint, so that it could then be removed mechanically with small putty knives. Removal of any residue was accomplished using cotton pads soaked in 3A solvent solution (water, acetone and ethanol) and scalpels.

The brass decorations were cleaned after the wood, as they required a different procedure. Our goal in cleaning these bands was, aside from removing the paint, to protect its



Figs. 81, 82 and 83. Steps in the cleaning of decorative elements in brass.

natural patina acquired over the centuries with the oxidation of the metal. For this reason, the method chosen called for the use of a solution of surfactants after interposing sheets of Japanese paper, then rubbing the surface with semi-dry cotton pads.

With the Works Directorate we agreed to remove the clumsy wooden lock and repair the breaks and gaps. On some wood inserts it was necessary to perform simplified etchings to provide a more organic linkage.

A protective treatment was then applied to the wood using a paintbrush.





Section 4

SCIENTIFIC INSIGHTS

Ch. 1 - The painted surface of al-Ashrafiyyah
Mosque and Madrasah of Ta'izz.
Scientific analysis



THE PAINTED SURFACE OF AL-ASHRAFIYYAH MOSQUE AND MADRASAH OF TA'IZZ. SCIENTIFIC ANALYSIS

ARIANNA GAMBIRASI

Since the definition of the restoration projects, the interventions conducted by Istituto Veneto per i Beni Culturali (IVBC) in Yemen have been supported by scientific investigations aimed at defining the executive techniques, identifying the constituent materials and determining the state of conservation of the polychrome wooden ceiling of al-Ashrafiyyah Mosque and Madrasah of Ta'izz.

The analytical techniques used by the laboratory of the IVBC for the study of the samples are listed below:

- **Stereomicroscopic observation** of the samples as they are, in order to allow a preliminary macroscopic description of their morphological characteristics.
- **Preparation and study of the pictorial fragments set up in cross section:** the sample is incorporated in polyester resin, orienting it in such a way as to obtain a section perpendicular to the external surface; subsequently it is observed under a microscope in reflected visible light and ultraviolet radiation, in order to identify the succession and composition of the layers and the possible presence of organic fluorescent material. The description of the layers is performed starting from the innermost one (NorMal 14/83).
- **Micro-chemical tests** on cross sections and powders for the identification of pigments and binders (proteins, oils, etc.). (Dimos, part I, module 3, 1978).
- **FT-IR spectrophotometric analysis** with infrared spectrophotometer in Fourier transform; this method serves for identification, based on the reading of the absorption spectra of infrared radiation, of any natural and synthetic organic compounds and inorganic compounds referable to constituent and decaying materials.

- **Ion chromatography:** the sample is immersed in a known volume of distilled water in order to extract any soluble salts contained in it; subsequently the concentration of the ionic species is measured by separating the anions in an ion exchange chromatographic column. The sample solutions are prepared according to NorMaL 13/83.
- **Petrographic study on thin section:** petrographic analysis by observation of thin sections with a polarizing optical microscope in transmitted light, aimed at identifying the mineralogical components of the material and its textural characteristics (NorMaL 10/82, 12/83, 14/83, 23/86, 27/88). (These investigations were carried out by dr. Davide Melica at the Diagnostic Laboratory for Restoration of Copertino (LE).
- **Raman microscopy:** non-destructive and non-invasive investigation technique that makes it possible to identify the molecular and crystallographic nature of the species present in both macroscopic and microscopic samples. It can be applied in situ and in the laboratory, but also without sampling. If there are samples, these can be kept intact for other tests. The sample is irradiated by a laser beam, which causes light diffusion containing the molecular information mentioned. The combination of a spectrometer with a microscope serves for the analysis of powder samples with granules of even a few micrometers.
- **X-ray diffractometry** for the crystallographic characterization of samples. (These investigations were carried out by prof. Baraldi at the laboratories of the Chemistry Department of the University of Modena Reggio Emilia).
- **SEM scanning electron microscope coupled to EDS spectroscopy** for the qualitative characterization of solid substances through elemental analysis, with the possibility of detecting the presence of trace elements. The samples were analyzed following a gold metallization procedure.

As it is not possible to report in detail on all the results collected, only the most significant information regarding the executive techniques and the constituent materials that emerged during the various survey campaigns will be presented below. The historical and artistic information that gradually correlates the analytical results were obtained from what was reported by Prof. Bensi in the scientific report that show the overall picture of the results obtained in al-Ashrafiyyah Mosque and Madrasah of Ta'izz.

For a complete reading of all the data collected during the various survey campaigns, please refer to the related scientific reports.

Materials and techniques identified in the mural paintings of al-Ashrafiyyah Mosque and Madrasah in Ta‘izz

Mortars, binders and preparatory layers

The analysis carried out on fragments of paint film and on the supporting plaster of the painted surfaces of al-Ashrafiyyah Mosque and Madrasah made it possible to determine that the materials and executive techniques used to produce the painted decorations in the lateral domes differ from those used in the central dome.

For the lateral domes, the painted decorations were produced using a support of plaster mixed with an aggregate with a basis of volcanic rock fragments (90%) and carbonate granules (10%) (Figs. 1-2). In the stratigraphy of the plaster it is not possible to distinguish a sequence of layers (such as *rinzaſſo*, *arriccio*, etc.), probably because of the particular technique used to produce the plaster, known as *qadāḍ*, which calls for application of plaster “fresh on fresh” combined with constant pounding of the surface to ensure penetration of each succeeding layer in the others. The samples tested were found to be extremely strong and compact and were thus in an excellent state of conservation.



Fig. 1. Sampling point of the fragment of plaster T1 taken from lateral dome 1d - south side, under the concrete band - al-Ashrafiyyah.

PRELIMINARY MACROSCOPIC DESCRIPTION OF SAMPLE		
1	Type	Fragment of plaster
2	Dimensional aspect	Rough
3	Structural aspect	Uniform
4	Overall coloring	Whitish with gray inert material
5	Cohesion	High

PETROGRAPHIC STUDY ON THIN CROSS-SECTION			
MICROSCOPIC DESCRIPTION OF CLASTS			
1	Composition % (approximate values)	Clasts have an essentially silicate composition; in order of decreasing abundance the following are observed:	
		Mineralogical type	%
		Fragments of intrusive volcanic rock consisting of single crystals of feldspars or crystalline aggregates of feldspars and quartz; the feldspars are often altered in kaolin or sericite	75
		Fragments of effusive volcanic rock with felted texture consisting of feldspars and opaque minerals	15
		Carbonate granules (calcareous)	12
		Opaque minerals	traces
2	Granulometry (approximate values)	Variable from coarsely silty to very coarsely sandy (0.05-2 mm) but mainly moderately to coarsely sandy (0.4-0,8 mm)	
3	Assortment	High	
4	Sphericity and Roundness	The clasts present angular outlines and moderate or low sphericity	
5	Orientation	Random	
6	Distribution	Heterogeneous	
7	Inert/binder ratio	1.5:1 in volume	
8	Porosity		
8.1	Percentage of spaces	Low (<15% in volume)	
8.2	Type of spaces	Pores	
8.3	Origin of porosity	Primary	
MICROSCOPIC DESCRIPTION OF BINDING MATRIX			
1	Composition	Calcium carbonate derived from the use of aerial or weakly hydraulic lime	
2	Structure	Lumpy	
3	Texture	Colloform-micritic	
STATE OF CONSERVATION OF PLASTER			
The mixture is extremely tenacious and compact and is thus in an excellent state of conservation. No products of deterioration were found in it.			

Tab. 1. Report relative to the petrographic analysis carried out on sample T1.



Fig. 2. Microphotograph under polarized transmitted light of sample T1, N+, 20X, mounted in a thin section.

In most of the samples analyzed above the supporting plaster, it was possible to observe a thin stratum that exhibited some fluorescence when the sample, viewed in glossy stratigraphic cross section, was observed under ultraviolet light. The tests carried out on a this layer using a micro-FTIR spectrophotometer reveals the presence of a proteic material identifiable as animal glue, calcium oxalate and calcite. We can therefore interpret this stratum as a sort of preparation/primer applied on the supporting plaster before the painting, the latter done using whitewash as binder.

In some samples, underneath the paint layer, it is possible to observe a thin layer of black pigment of vegetable origin identifiable with the preparatory drawing (Fig. 49).

The supporting plaster of the central dome was found to consist of gypsum, coated with organic material, presumably of proteic origin, applied also in this case with a preparatory/primer function, on which we can see the paint layers applied *a secco* using a protein binder (probably the same used for the preparation/primer). The plaster have moderate tenacity and low cohesion, in accordance with the characteristics of their composition.

The presence of preparatory layers showing fluorescence in the presence of ultraviolet light was observed underneath the paint coatings with Azurite base. In this case, in which the micro-FTIR analysis revealed the presence of lipoproteic materials and oxalates, one can suppose that this was a preparatory layer for the blue paint layers applied to obtain darker and/or more luminous blues, as can be seen in European mural painting (Figs. 26-27).

Since the tests carried out for characterization of the supporting plaster revealed the presence of calcium oxalate in the gypsum plaster and in some samples of stuccowork, it is thought that protein binders – presumably based on animal glue – were added to the plasters and stuccos, as had been seen also in the gypsum plaster of Islamic buildings in Granada. The presence of organic substances in the gypsum mixtures would explain the light pinkish colour noted in some case, in the absence of any pigments. The paint layers contain proteic materials and traces of lipids as in the paintings of Quşayr

‘Amrā in Jordan. However, it is not possible to exclude that the proteic substances derive from later restoration works on the decoration.

All the fragments of paint layers tested contain a superficial layer consisting of atmospheric particulate and products of combustion, in some cases calcite, gypsum and oxalate were also identified, referable to products of neoformation.

Stuccoworks

During the various diagnostic campaigns carried out, petrographic analyses were also made on fragments of stucco that had been made with a mixture of gypsum, in prevalence, and anhydrite (Figs. 3-4).

The stuccoworks, like the plaster of the main dome, were prepared using a mortar containing partially hydrated gypsum and water-soluble anhydrite, obtained by cooking bi-hydrated lime over low heat (*gesso da presa*). When mixed with water, the sulfates are re-hydrated, becoming adhesive and hardening. As Prof. Bensi observed in his report, the presence of anhydrite could depend on the fact that part of the initial anhydrite was not hydrated during the setting process, or perhaps there was a process, still ongoing, of loss of water by the gypsum, a phenomenon that can occur to an appreciable degree if the temperature of the artefact exceeds 42°C, a condition that was certainly possible on the walls of the dome of al-Ashrafiyyah Mosque. Similar phenomena have been observed in gypsum plasters in religious buildings in Egypt.

A mixture of gypsum and anhydrite, but with a high percentage of the latter, was found in the preparation of the decorations of the dome at the mosque of al-Aqṣā in Jerusalem.



Fig. 3. Sampling point of the fragment of stuccowork T17 taken from lateral dome 1f - north side, from the window grid - al-Ashrafiyyah.

PRELIMINARY MACROSCOPIC DESCRIPTION OF SAMPLE		
1	Type	Fragment of stucco
2	Dimensional aspect	Fine
3	Structural aspect	Uniform
4	Overall color	Whitish
5	Cohesion	Moderate

PETROGRAPHIC STUDY ON THIN CROSS-SECTION

MICROSCOPIC DESCRIPTION OF CLASTS		
1	Composition % (approx. values)	The clasts have a silicate composition and are represented by sporadic crystal of quartz and feldspar
2	Granulometry (approx. values)	Variable from coarsely silty to finely sandy (0.05-0.1 mm)
3	Assortment	Very low
4	Sphericity and roundness	The borders are generally angular and sphericity is average
5	Orientation	
6	Distribution	
7	Inert/binders ratio	<1:5 in volume
8	Porosity	
8.1	Percentage of spaces	High (30% in volume)
8.2	Types of spaces	Subcircular pores
8.3	origin of porosity	Primary
MICROSCOPIC DESCRIPTION OF BINDING MATRIX		
1	Composition	Gypsum
2	Structure	Uniform
3	Texture	Microscopic
STATE OF CONSERVATION OF MORTAR		
The mixture has fair tenacity and compactness in accordance with the compositive features.		

Tab. 2. Report relative to the petrographic analysis carried out on sample T17.

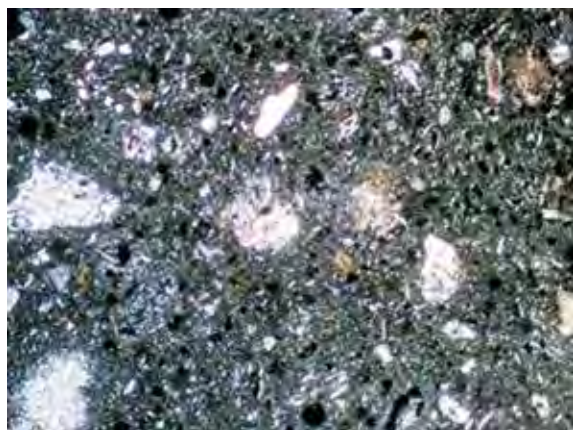


Fig. 4. Microphotograph under polarized transmitted light, N+, 50x, of sample T17 mounted in a thin cross section.

White surface coatings

Part of the surfaces of the mosque were coated in whitewash and the petrographic analyses carried out on this type of sample revealed that this consisted of the application of several layers of lime, weakly pigmented with ochre which gave it a yellow-brownish colour (Figs. 5-6). No inert materials were found in the layers.



Fig. 5. Sampling point of fragment of surface whitewash T10 taken from lateral dome 1d - east side - al-Ashrafiyyah.

PRELIMINARY MACROSCOPIC DESCRIPTION OF SAMPLE		
1	Type	Fragment consisting of several coats of whitewash
2	Dimensional aspect	Very fine
3	Structural aspect	Uniform
4	Overall color	Whitish
5	Cohesion	Low

Tab. 3. Report relative to the petrographic analysis carried out on sample T10.

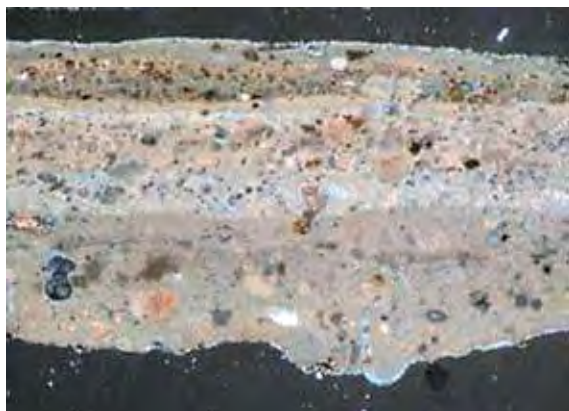


Fig. 6. Microphotograph under polarized transmitted light, N+, 50x, of sample T10 mounted in a thin section.

Materials of deterioration

Tests were also carried out on samples taken from zones that showed evident signs of deterioration: concretions and incrustations on the surface, efflorescences, flaking of the plaster and paint layers. The ionic chromatography analysis, performed to identify and quantify the soluble salts, detected mainly sulfates and nitrates, in some cases moderate concentrations of phosphates ions were also found. Oxalates were also identified, probably having formed in response to the mineralization of organic substances used in preparatory/primer coats for decorative applications and as binders.

Pigments

The following are descriptions of the pigments identified in the paint layers at different times during the studies. With regard to their origin and the historical information relative to their use, we refer also to what has already been reported with regard to the pigments used at al-Jāmi' al-Kabīr mosque in Şan'ā'.

Reds

The red pigments identified during the various diagnostic campaigns are Red Earth (Fe_2O_3) (Figs. 7-14), and mercury sulfide (HgS) for which it was not possible to determine whether it was a natural product (Cinnabar) or an artificial one (Vermillion). We will therefore refer to it as Cinnabar/Vermillion (Figs. 15-18). In the samples tested, the Cinnabar/Vermillion was identified in association with small quantities of Minium (Pb_3O_4) (Fig. 19).

As Prof. Bensi has already reported, Cinnabar/Vermillion and Minium were often mixed together in European painting as well, although in theory a reaction was possible between the sulfides of the Cinnabar and the Lead of the Minium with the formation of Lead sulfides of a brown color. However, with Cinnabar or Vermillion in absence of free sulfuric acid these problems did not generally arise, and are not seen in the samples from al-Ashrafiyyah Mosque and Madrasah. The Cinnabar/Vermillion pigment also seems to

be free of the darkening that sometimes affects it, especially in mural painting, due to its transformation into blackish Meta-cinnabarite. For the Cinnabar/Vermillion in the samples taken from the main dome, this phenomenon probably did not occur thanks to the presence of a supporting plaster made from gypsum and not from lime.



Fig. 7. Stereomicroscope image of the front of paint sample T4 where the red colour of the paint and the presence of surface deposits are observed.



Fig. 8. Stereomicroscope image of the back of mural paint sample T4 where the plaster support made from lime is observed.

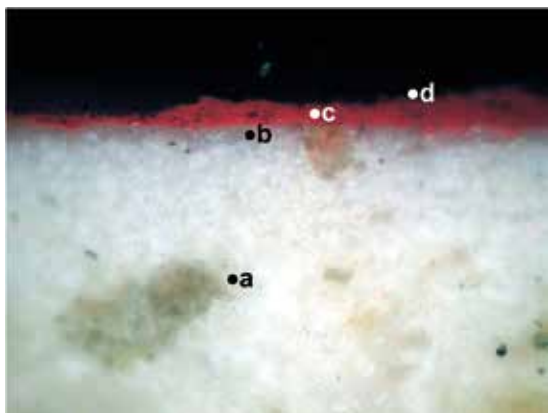


Fig. 9. Image at the optical microscope of the cross section of paint sample T4 viewed in reflected visible light showing the red layer (c) containing the pigment Red Earth.

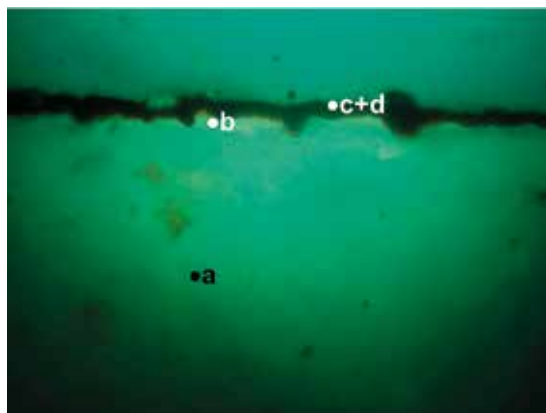


Fig. 10. Image at the optical microscope of the cross section of paint sample T4 viewed in ultraviolet radiation where it is possible to observe the fluorescence of the layer (b) due to the use of proteinic material (probably animal glue), applied on the supporting plaster as primer before applying the paint.

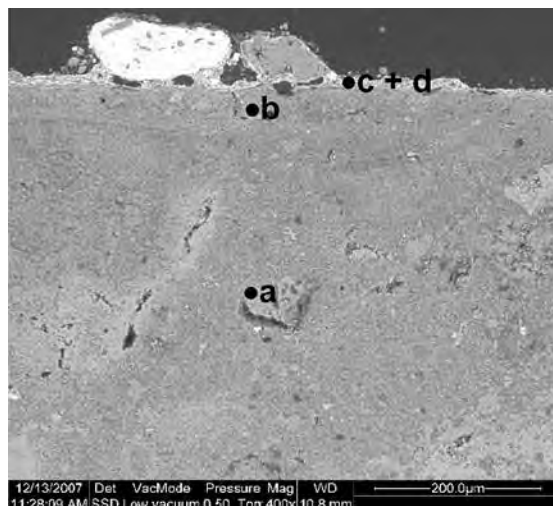


Fig. 11. ESEM image of paint sample T4 cross section.

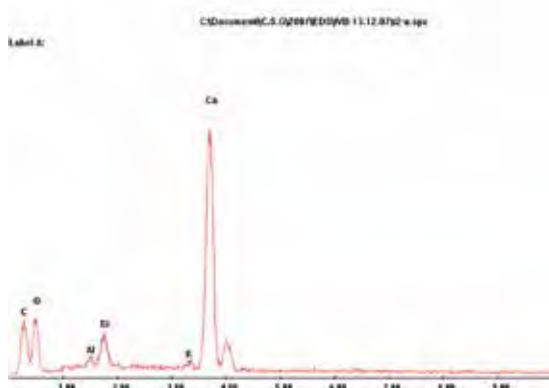


Fig. 12. EDS spectrum acquired on paint sample T4, from an area of the layer (a) in which the characteristic elements of calcium carbonate (CaCO_3), formed by the carbonation of the lime used as binder for support of the plaster are detected.

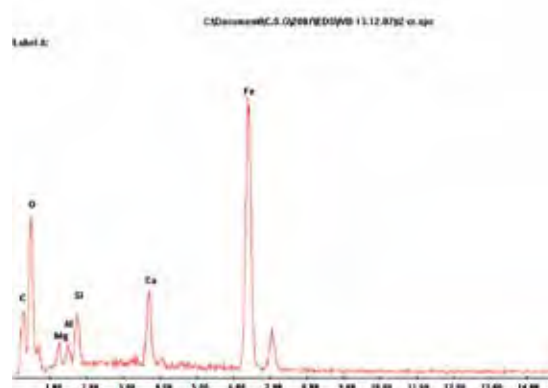


Fig. 13. EDS spectrum acquired on paint sample T4, from a red grain of layer (c) in which the characteristic elements of Red Earth (Fe_2O_3) are detected.



Fig. 14. Sampling point of the microfragment of mural painting CC3 with red paint taken from the central dome - al-Ashrafiya.

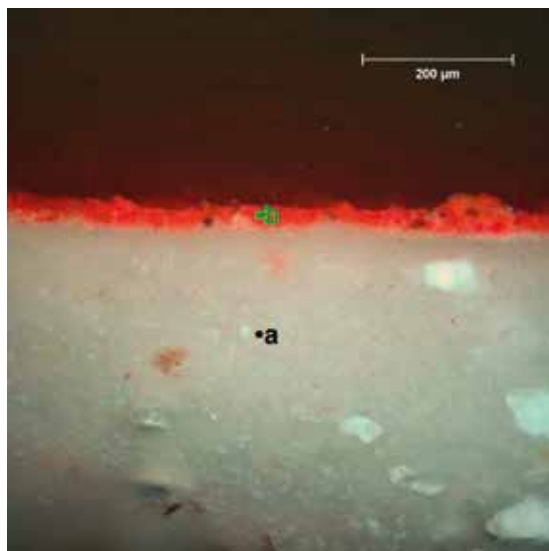


Fig. 15. Image at the optical microscope of the cross section of paint sample CC3 viewed in reflected visible light showing the red layer (b) containing Cinnabar/Vermillion and a little Minium pigment.

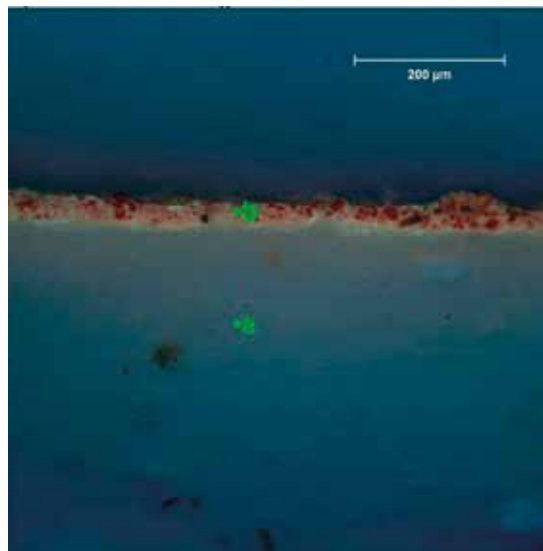


Fig. 16. Image at the optical microscope of the cross section of paint sample CC3 viewed in ultraviolet radiation showing the fluorescence of the layer (b) that indicate the use of an organic binder (probably animal glue).

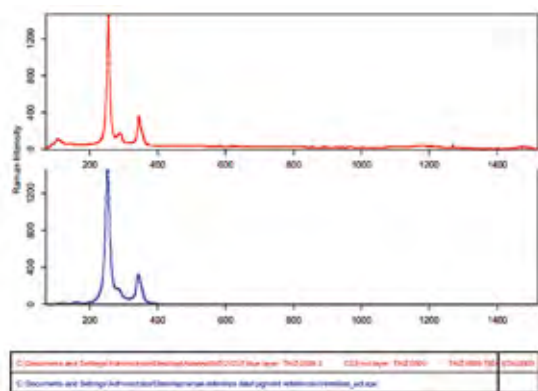


Fig. 17. Raman spectrum acquired from layer (b) of sample CC3 in which the characteristic peaks of Cinnabar/Vermillion pigment are observed as evidenced by comparison with the reference spectrum.

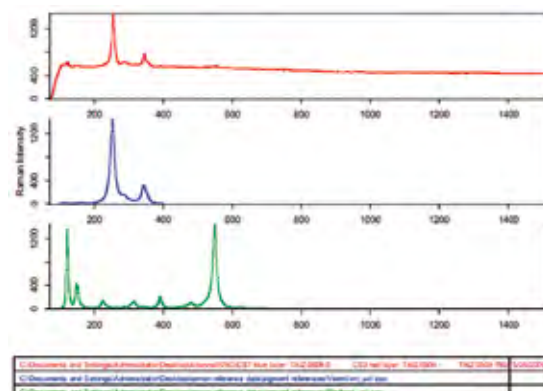


Fig. 18. Raman spectrum acquired from layer (b) of sample CC3 in which the peaks attributable to Minium pigment are observed in addition to the characteristic peaks of Cinnabar/Vermillion.

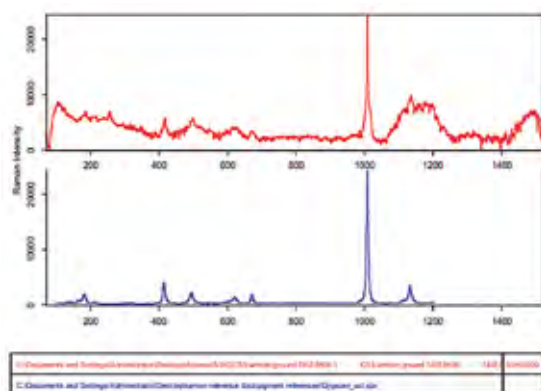


Fig. 19. Raman spectrum acquired from layer (a) of sample CC3, corresponding to the supporting plaster, in which the characteristic peaks of gypsum are observed as evidenced by comparison with the reference spectrum.

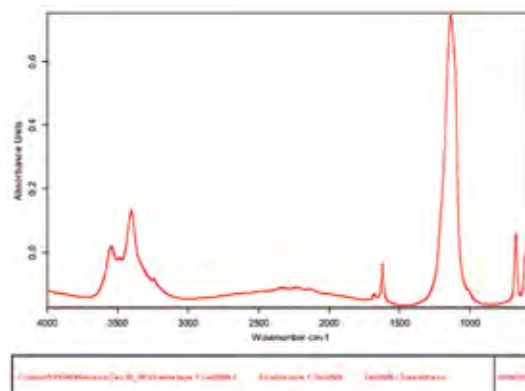


Fig. 20. Micro-FTIR spectrum acquired from layer (a) of sample CC3 in which the peaks characteristic of gypsum are observed.

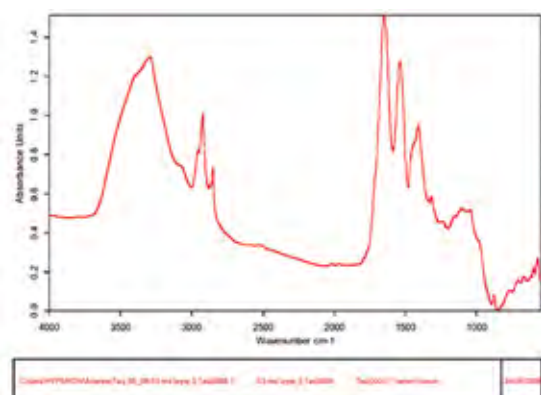


Fig. 21. Micro-FTIR spectrum acquired from layer (b) of sample CC3 in which the characteristic peaks of proteinic material, attributable to the use of animal glue as binder of the paint layer, are observed.

Blues

The analysis performed on fragments of blue paint layers identified Azurite, basic copper carbonate ($2\text{CuCO}_3\text{Cu}(\text{OH})_2$), as the pigment used to produce the blue color on both the lateral and the central dome (Figs. 23-36). The material exists in two forms, natural and artificial, with the same chemical formula. The samples analyzed during the different diagnostic campaigns found in all the blue paint samples, grains of various dimensions with irregular borders, indicating the use of natural Azurite (the artificial compound has smaller, more rounded grains). Deposits of Azurite exist in various part of the Middle East, in Sinai and Iran.

In the samples tested, the Azurite is associated with basic copper chloride, of a green color, Atacamite or Paratacamite ($\text{Cu}_2\text{Cl}(\text{OH})_3$), materials with the same chemical formula but different crystalline structure (Fig. 30).

As suggested by Prof. Bensi, Atacamite/Paratacamite could be formed by transfor-

mation of the Azurite due to reaction with atmospheric chlorides. Ta'izz is not far from the sea and could be reached by marine aerosols rich in chlorides, or they could have formed as a result of earlier attempts to clean the decorations with chlorinated products.

There are many cases among European mural paintings of transformation of Azurite into Atacamite/Paratacamite, although the reason for the change has not always been identified accurately.

Alternatively, it is possible that Atacamite/Paratacamite were present with the Azurite from the outset, but this seems less likely since surely at the time of decoration execution the paint must have been blue or at least the presence of the compound did not alter the blue color that at the time of sampling appeared green.

In a sample taken from the main dome with blue coloring different from that of other zones, phosphorus was found in addition to copper salts. Only further study will make it possible to clarify the origin of the phosphorus. For the moment we can only suggest a few possibilities:

- a. use of a substance obtained from the calcification of animal bones containing carbonates and phosphates of calcium, such as Bone White or Bone Black;
- b. the blue pigment of this paint is a copper phosphate of which there are two types used in painting: pseudo-Malachite, a basic phosphate of hydrated copper which is extracted only in Europe, and Turquoise, basic phosphate of copper and aluminum hydrate, also extracted in Sinai and Iran. The turquoise is a semiprecious stone often used in the Middle East, to which magical and symbolic values were attributed;
- c. the phosphates are a contamination by water seeping from outside (bird excrements contain phosphates). A quantity of 11.67% of soluble phosphates was found in the lateral domes, however only in the blue paint of this type phosphorus was detected. The phosphorus do not appear in any other paint samples.



Fig. 22. Sampling point of the microfragment of mural painting T22a with blue/green paint taken from lateral dome 1e, southwest side, al-Ashrafiyyah.



Fig. 23. Stereomicroscope image of the front of paint sample T22a where the blue/green colour of the paint and the presence of surface deposits are observed.



Fig. 24. Stereomicroscope image of the back of paint sample T22a where the white supporting plaster is observed.

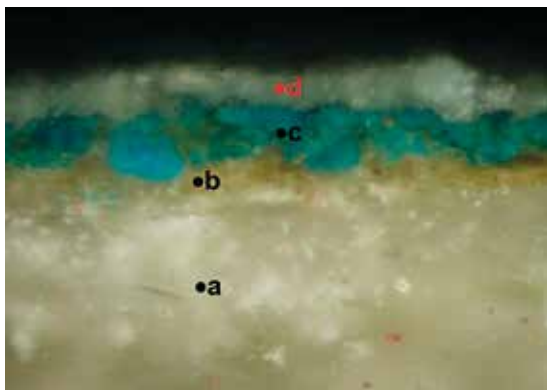


Fig. 25. Image at the optical microscope of the cross section of the paint sample T22a viewed in reflected visible light showing the blue paint layer (c) containing Azurite. Beneath the paint layer a yellowish layer (b), corresponding to a preparatory/primer coat is observed. The white surface layer (d) was found to be made of gypsum.

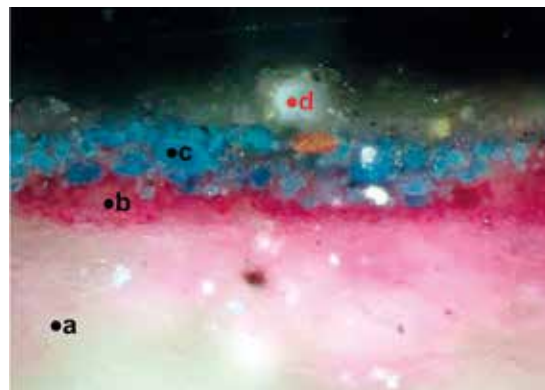


Fig. 26. Image at the optical microscope of the cross section of the paint sample T22a viewed in reflected visible light, after test with fuchsin. The micro-chemical test carried out on the sample made it possible to identify the proteinic nature of the layer (b) and the binder used for application of the paint layer. The proteinic material was found to have penetrated partially into layer (a) as well.

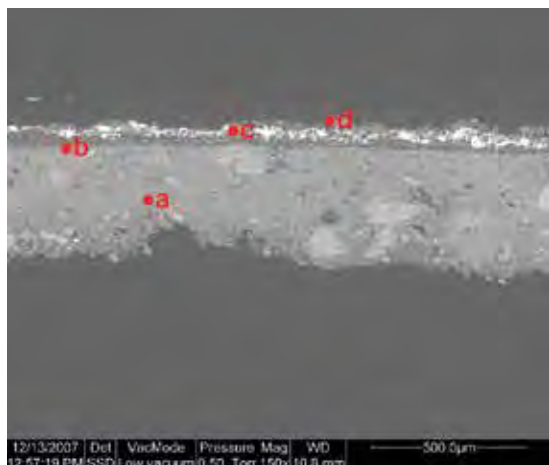


Fig. 27. ESEM image of paint sample T22a cross section.

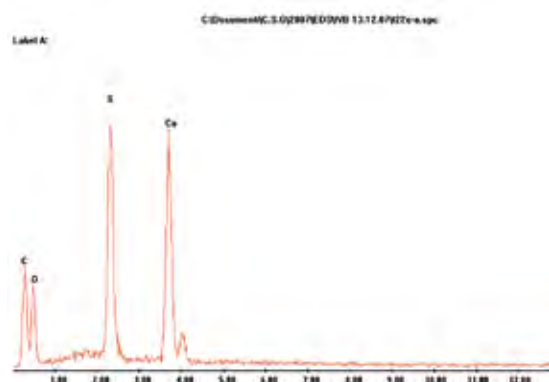


Fig. 28. EDS spectrum acquired on sample T22a, from an area of layer (a) in which Calcium (Ca) and Sulfur (S) elements were found, indicating the presence of gypsum.

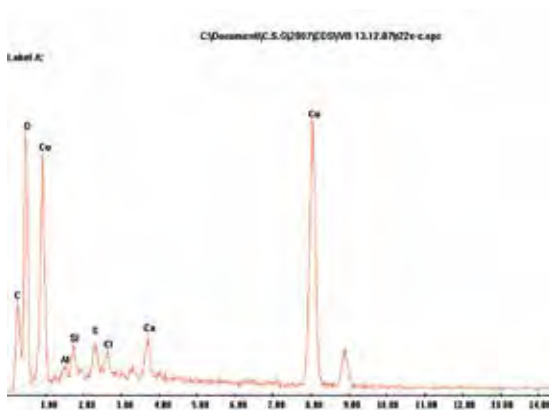


Fig. 29. EDS spectrum acquired on sample T22a, from a blue grain of layer (c) in which elements attributable to Azurite pigment [$2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$] were found. A small quantity of chlorine was also detected.

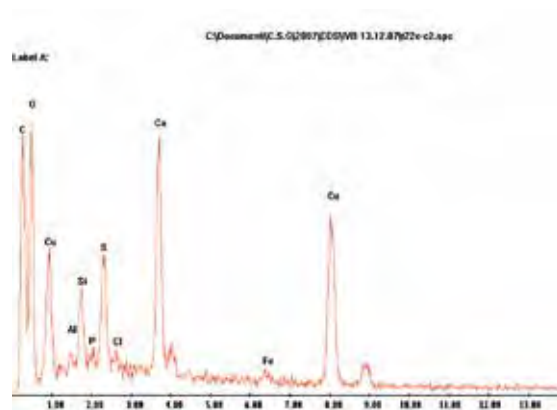


Fig. 30. EDS spectrum acquired on sample T22a, from an area of layer (c) in which elements attributable to Azurite pigment [$2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$] were found.



Fig. 31. Sampling point of the fragment of mural painting CC4 with blue/green paint layer taken from the central dome - al-Ashrafiyyah.

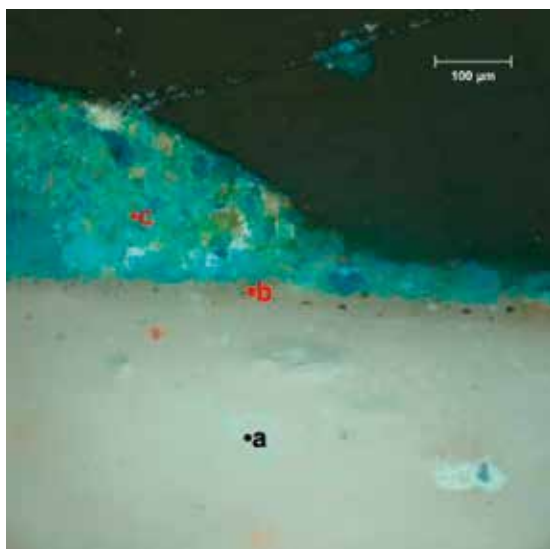


Fig. 32. Image at the optical microscope of the cross section of the paint sample CC4 viewed in reflected visible light showing the layer (a) corresponding to the supporting plaster made of gypsum and anhydrite, the whitish layer (b) containing black grains identifiable as Carbon Black, presumably referring to the preparatory drawing, and the blue layer (c) containing Azurite with traces of Atacamite applied using an organic binder presumably of proteinic nature.

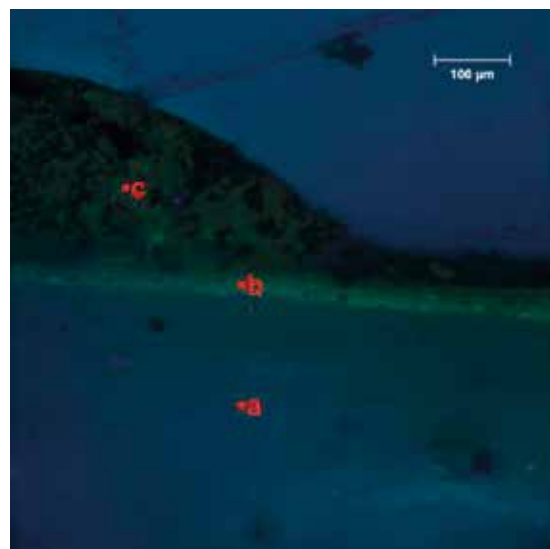


Fig. 33. Image at the optical microscope of the cross section of the paint sample CC4 viewed in ultraviolet radiation showing the fluorescence of the layer (b) that indicate the presence of organic material.

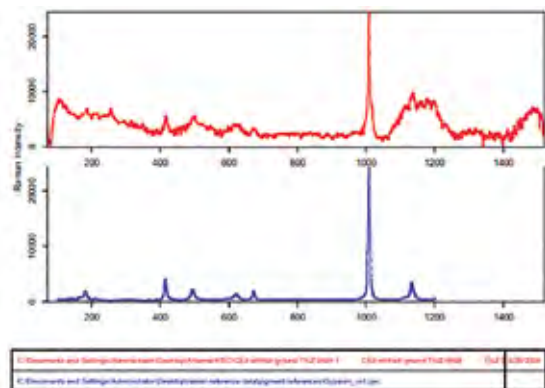


Fig. 34. Raman spectrum acquired on sample CC4 from the white layer (a) corresponding to the supporting plaster, in which the characteristic peaks of gypsum are observed, as evidenced by comparison with the reference spectrum.

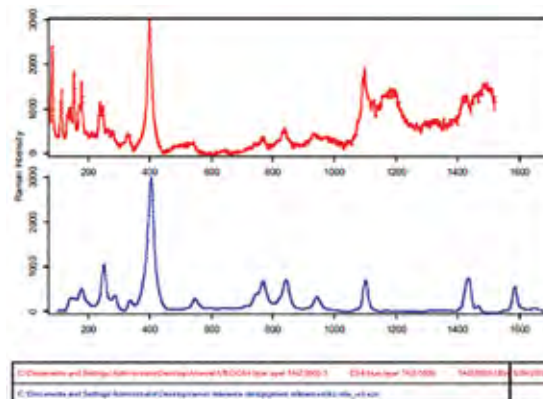


Fig. 35. Raman spectrum acquired from the blue paint layer (c) of sample CC4 in which the characteristic peaks of Azurite are observed as evidenced by comparison with the reference spectrum.

Yellows

For the realization of the yellow paints in the lateral dome, Yellow Ochre was used (Figs. 37-43), while in the main dome in the yellow/gold paints (in particular in the Qur'anic inscriptions that were apparently gilded) the pigment Orpiment has been identified in a gypsum binder (Fig. 44).

Orpiment (As_2S_3), although highly poisonous, was a widely used pigment in the Muslim world, and has also been found in the al-Jāmi' al-Kabīr of Ṣan'ā'. In Europe, it was used for imitation of gold and its color (from which it takes its name "or-piment", pigment similar to gold).



Fig. 36. Sampling point of the microfragment of mural painting T3 with yellow paint taken from lateral dome 1d - south side - al-Ashrafiyah.



Fig. 37. Stereomicroscope image of the front of paint sample T3 where the yellow colour of the paint and the presence of surface deposits are observed.



Fig. 38. Stereomicroscope image of the back of paint sample T3 where the lime-based plaster is observed.

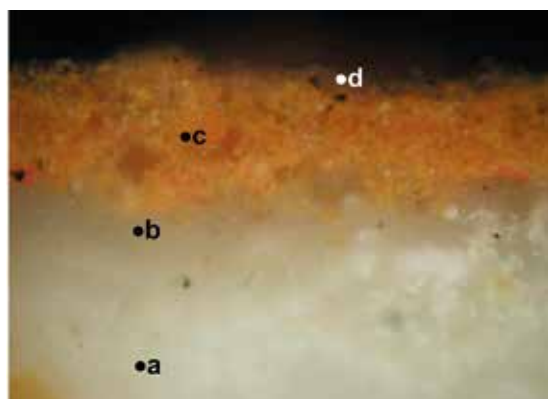


Fig. 39. Image at the optical microscope of the cross section of paint sample T3 viewed in reflected visible light showing the yellow paint layer (c) containing Yellow Ochre applied using lime as a binder.

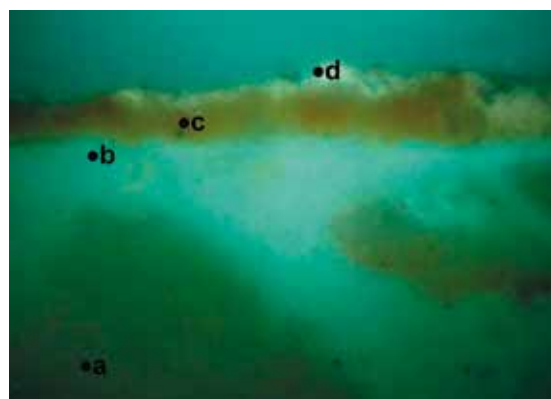


Fig. 40. Image at the optical microscope of the cross section of paint sample T3 viewed in ultraviolet radiation showing the properties of fluorescence of the layer (d) corresponding to a surface coating.

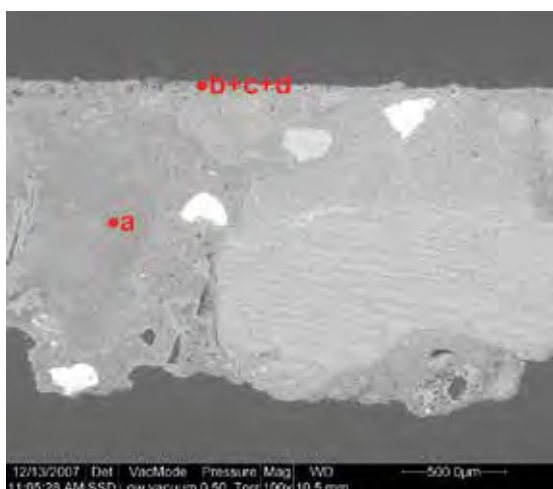


Fig. 41. ESEM image of sample T3 cross-section.

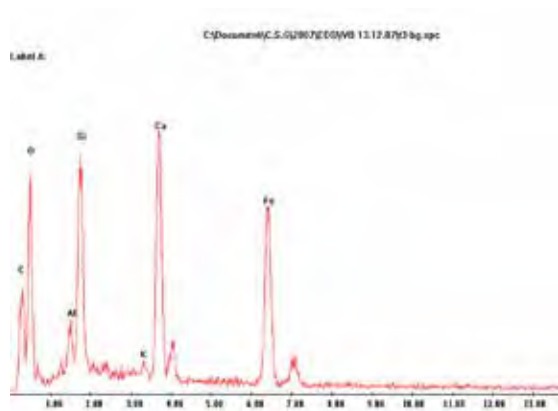


Fig. 42. EDS spectrum acquired on sample T3, from a yellow grain of layer (c) showing elements characteristics of Yellow Ochre.

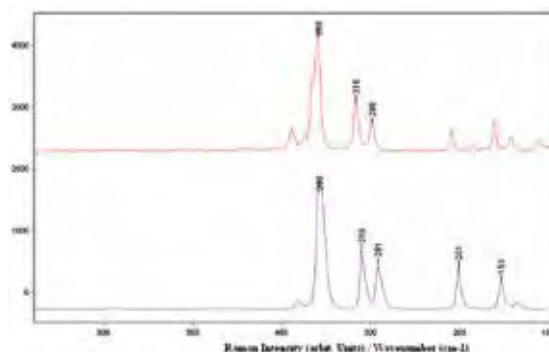


Fig. 43. Raman spectrum acquired on the yellow/gold paint sample CC5, taken from the main dome of the al-Ashrafiyyah, in which peaks attributable to Orpiment are detected, as evidenced by comparison with the reference spectrum.

Greens

The green paint of fragments taken from the lateral domes was producing using Green Earth pigment (Figs. 44-50).



Fig. 44. Sampling point of microfragment of mural painting T7 with green paint taken from dome 1d - east side - al-Ashrafiyyah.



Fig. 45. Stereomicroscope image of the front of paint sample T7 where the green colour of the paint and the presence of surface deposits are observed.



Fig. 46. Stereomicroscope image of the back of paint sample T7 where the supporting plaster made with lime and sand is observed.



Fig. 47. Image at the optical microscope of the cross section of paint sample T7 viewed in reflected visible light showing the green paint layer (c) containing Green Earth and small quantities of Ochre.

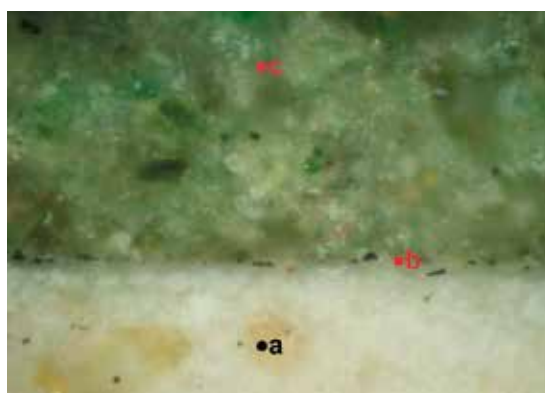


Fig. 48. Image at the optical microscope of the cross section of paint sample T7 viewed in reflected visible light at higher magnification. On the thin layer (b), grains of Carbon Black are observed, identifiable as traces of the preparatory drawing.

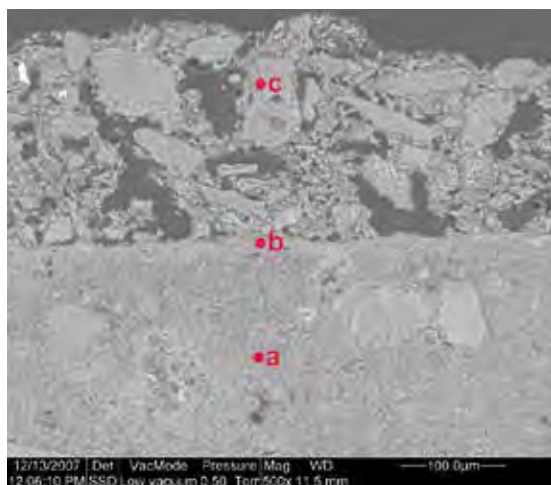


Fig. 49. ESEM image of sample T7 cross-section.

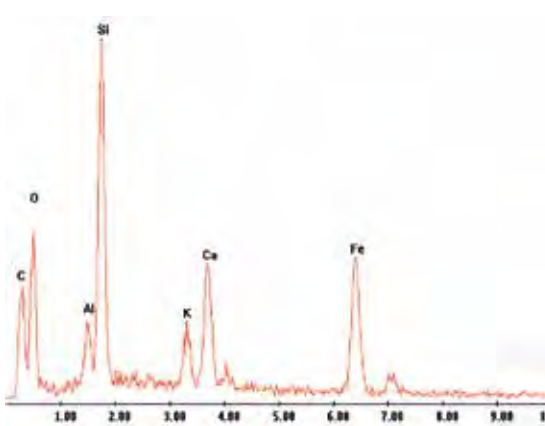


Fig. 50. EDS spectrum acquired on sample T7 from a green grain of layer (c) showing elements characteristics of Green Earth.

Blacks

In the samples analyzed presenting painted black paint layers, the use of a pigment of vegetable origin identifiable as Carbon Black was detected (Figs. 51-54).



Fig. 51. Sampling point of the micro fragment of mural painting T6 with black paint taken from one of the lateral domes – al-Ashrafiyyah.

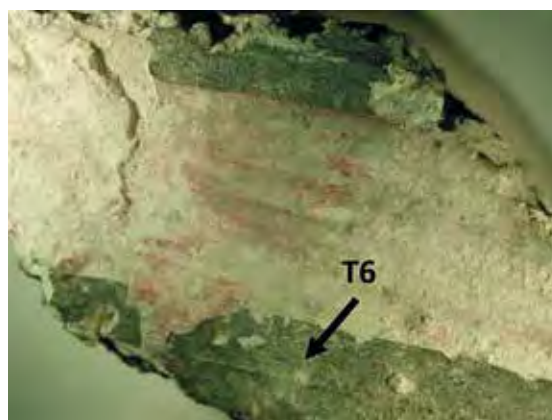


Fig. 52. Stereomicroscope image of the fragment of mural painting from which sample T6 was taken and subsequently mounted in a cross section.

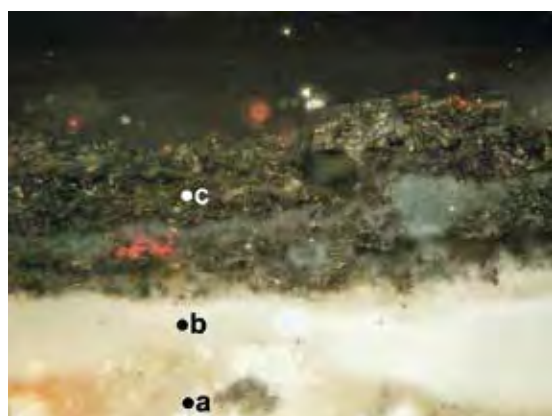


Fig. 53. Image at the optical microscope of the cross section of the paint sample T6 viewed in reflected visible light showing the black paint layer (c) containing Carbon Black applied in succeeding layers, wet on wet.

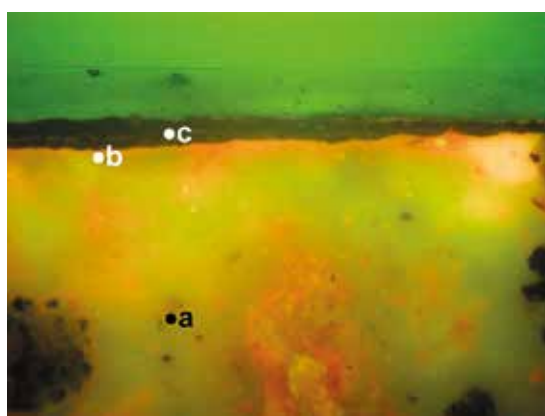


Fig. 54. Image at the optical microscope of the cross section of the paint sample T6 viewed in ultraviolet light after test with fuchsin. The micro-chemical test made it possible to identify the proteinic nature of layer (b).

Whites

The applications of white paint on the lateral domes were found to consist of calcium carbonate, presumably formed following carbonation of whitewash.

In the main dome, the layers of white paint were produced using Calcium Sulfates (gypsum partially hydrated and water-soluble anhydrite). Kaolin was also detected and, as it is a highly resistant material, it was suitable for mural painting (Figs. 55-61).



Fig. 55. Sampling point of the microfragment of mural painting T6 with white paint taken from lateral dome 1d - south side - al-Ashrafiyyah.



Fig. 56. Stereomicroscope image of the front of paint sample T6 where the white colour of the paint and the presence of surface deposits are observed.



Fig. 57. Stereomicroscope image of the back of paint sample T6 where the supporting plaster made with lime and sand is observed.

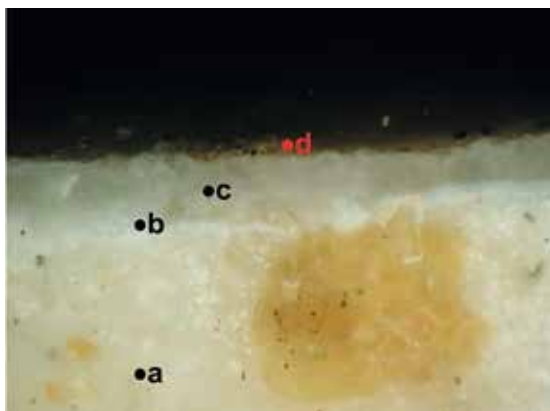


Fig. 58. Image at the optical microscope of the cross section of the paint sample T6 viewed in reflected visible light showing the paint white layer (c) made of calcium carbonate.

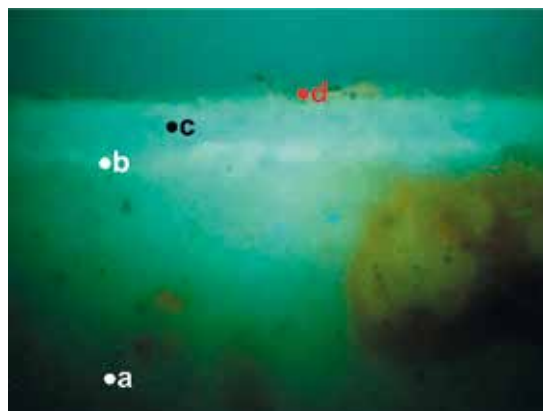


Fig. 59. Image at the optical microscope of the cross section of the paint sample T6 viewed in ultraviolet radiation showing the fluorescence of the layer (b).

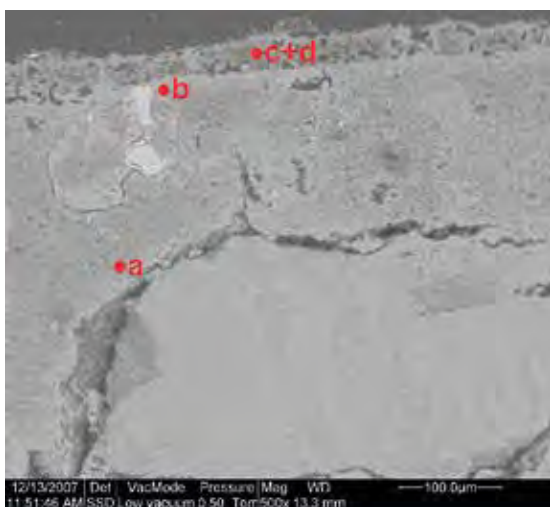


Fig. 60. ESEM image of the paint sample T6 cross-section.

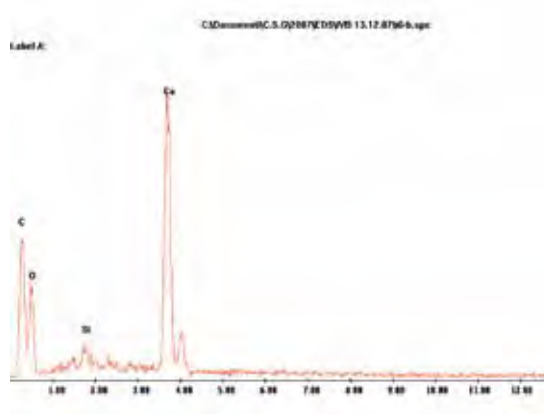


Fig. 61. EDS spectrum acquired on paint sample T6 from an area of layer (c) in which the characteristic elements of calcium carbonate are detected.

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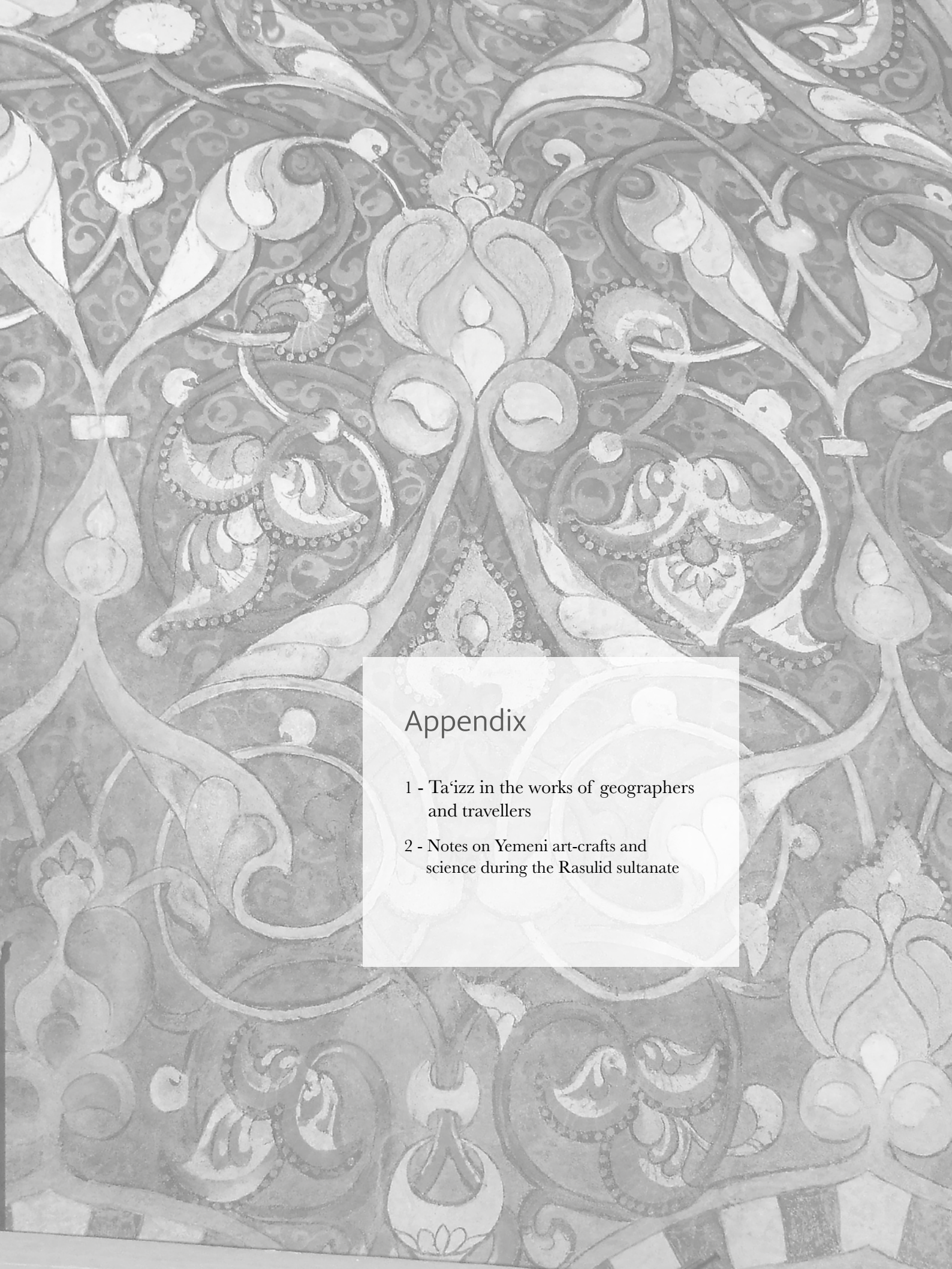
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Appendix

- 1 - Ta'izz in the works of geographers and travellers
- 2 - Notes on Yemeni art-crafts and science during the Rasulid sultanate



TA'IZZ IN THE WORKS OF GEOGRAPHERS AND TRAVELLERS

GIOVANNI CANOVA

1. Arab geographers and travellers

Very little is known about Ta'izz before it became an important center of religious architecture and culture under the Rasulid dynasty (7th-9th /13th-15th century CE). "Lisān al-Yaman" al-Hamdānī (mid-4th/10th century CE), a Yemeni authority on South Arabia antiquities, genealogy and geography, repeatedly mentions Jabal Ṣabir¹ in the territory inhabited by the Ḥawāshib, but not the settlement of Ta'izz located on its slopes. Before the urban development that took place in the reign of the Rasulid sovereigns, the nearby city of Janad, whose mosque, according to tradition, had been founded by one of the Prophet's Companions, Mu'ādh ibn Jabal, was much more important.

Ibn al-Mujāwir, originally from Nīsābūr, describes in *Tārīkh al-Mustabṣir* his voyage on the Arabic peninsula, through Hijaz, Yemen and Oman. The work was probably written in the years 624-627/1226-1230 CE, "just as Ayyubid rule over much of the Yemen was coming to an end and just before their successors, the Rasulids, assumed power."² He describes the fortress of Ta'izz located between the town and Jabal Ṣabir, as "solid and strong, [made of] gypsum and stone, with gates and solid walls and inhabited. There is no fortress in the whole of the Yemen more auspicious than this, because it is the seat of rule and the fortress of rulers." He draws a circular map of the area, writing at the center *Ḥiṣn Ta'izz 'alā jabal* ("The fortress of Ta'izz on a mountain"), while the city is shown on the left slope.³

1 Al-Hamdānī, *Ṣifāh*, 117, 195; Von Maltzan 1873: 350-352.

2 Rex Smith, *A Traveller... Ibn al-Mujāwir's Tārīkh al-Mustabṣir*, 3: 169. The itinerary of his voyage is shown in Map 1: Ibn al-Mujāwir's World.

3 Rex Smith, *A Traveller...*: 169, 171. The note at the top reads "al-Maghribah, connecting with Jabal Ṣabir"; at the bottom "a town on the slope of the mountain of Ta'izz"; to the left "Ta'izz", and to the right "slope of a mountain". Cf. Ibn al-Muğāwir, *Descriptio Arabiae Meridionalis*, ed. O. Löfgren, ii, 156 and Tab. vi.

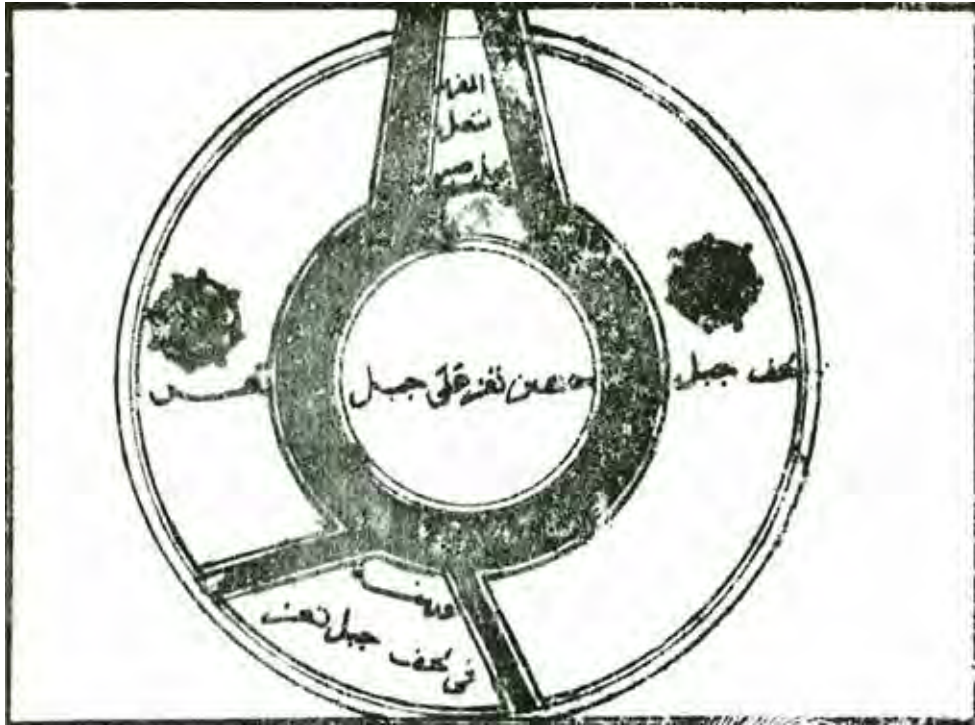


Fig. 1. Ibn al-Mujāwir, Map of Ta'izz.

Geographers only mention the fortress (*qal'ah* or *ḥiṣn*). Yāqūt (d. 626/1229 CE) describes it as one of the most important citadels of Yemen. Referring to Jabal Ṣabir, he writes that it dominates over the fortress of Ta'izz and many fortified villages. 'Udaynah is one of the three districts of Ta'izz; the others are al-Maghribiyyah, to the west, and al-Sharqiyyah, to the east. The celebrated lexicographer and historian of the ancient Yemenite world, Nashwān ibn Sa'īd al-Ḥimyarī, came from this region; he allegedly conquered many fortresses.⁴

Abū al-Fidā' (d. 732/1331 CE) determines the geographical position of Ta'izz in *Taqwīm al-buldān*, and describes the city as the residence of the Yemeni sovereigns. It consists of a fortress on the mountains that dominate the coastline (al-Tahā'im) and the region of Zabīd. Above Ta'izz, there is a place of amusement (*muntazah*) called Sahlah, where the king had made the waters from the surrounding mountains flow. Many very beautiful buildings were located there, in a garden.⁵

The great traveler, Ibn Baṭṭūṭah (d. ca. 770 h./1368-9) traveled for thirty years in the Islamic world. Departing from Tangiers in 725 h./1325, he visited Mecca several times

4 Yāqūt, *Muḥam al-buldān*, i: 34 (Ta'izz); iii: 392 (Ṣabir); iv: 90 ('Udaynah).

5 Abū al-Fidā', *Taqwīm al-buldān*, 90-91; *Géographie*, ii: 121 (Taaz). According to Qāḍī Ismā'il al-Akwa', the vocalization reported by Abū al-Fidā', Ti'izz, reflects the pronunciation of the people of Ṣan'ā' or Dhamār, but not that of the inhabitants of the place and that reported in the sources (al-Akwa' 1988: 60 note 4).

and went as far as India and central Africa. He visited Ta'izz on his way from Jiblah. He leaves interesting notes: a description of the city, of the sultan and an audience at court.

(...) We proceeded to the city of Ta'izz, the capital of the king of al-Yaman. It is one of the finest and largest of the cities of al-Yaman. Its people are overbearing, insolent and rude, as is generally the case in towns where kings have their seats. It is composed of three quarters (*maḥallāt*); one of them is the residence of the sultan, his mamlūks and courtiers, and the officers of his government, and is called by the name that I do not remember; the second is inhabited by the amīrs and troops and is called 'Udaina; the third is inhabited by the common people and contains the principal bazaar, and it is called al-Maḥālib.(...) *Account of the Sultan of al-Yaman*. He is the sultan [al-Malik] al-Mujāhid Nūr al-Dīn 'Alī, son of the sultan al-Mu'ayyad Hizabr al-Dīn Dā'ūd, son of the sultan al-Muẓaffar Yūsuf b. 'Alī b. Rasūl. His ancestor became widely known by the appellation of *Rasūl* ['envoy'] because one of the 'Abbasid caliphs sent him to al-Yemen to be governor there, and later on his sons gained the royal power for themselves. He has an elaborate ceremonial in his sitting [for public audience] and his riding out.

(...) We saluted him, and he bade us welcome and we stayed in his house as guests for three nights. On the fourth day, which was a Thursday, the day on which the sultan sits in audience for the general people, the *qāḍī* presented me to him and I saluted him. The method of saluting him is that one touches the ground with his index-finger, then raises it to the head and says 'May God prolong thy majesty' (*adāma Allāh 'izzaka*). I did as the *qāḍī* had done; the *qāḍī* took his seat to the king's right, and on his command, I sat in front of him. He then questioned me about my country, about our Mster, the Commander of Faithful [*sayyid al-muslimīn*] the prince of liberality, Abū Sa'īd (God be pleased with him), and about the king of Egypt, the king of al-'Irāq, and the king of the Lurs, and I answered all the questions that he asked concerning them. His vizier was in his presence, and the king commanded him to treat me honourably and arrange for my lodging.

The ceremonial at the [public] session of this king is as follows. He takes his seat on a platform carpeted and decorated with silken fabrics; to right and left of him are the men-at-arms (*ahl al-silāḥ*), those nearest him holding swords and shields, and next to them the bowmen, in front of them to the right and left are the chamberlain and the officers of government and the private secretary. (...) When the sultan takes his seat they cry with one voice Bismillāh ('In the name of God') and when he rises they do the same.

(...) The food is then brought, and it is of two sorts, the food of the commons and the food of the high officers. The superior food is partaken of by the sultan, the grand *qāḍī*, the principal sharīfs and jurists and the guests.

After I had remained for some days as the guest of the sultan of al-Yaman, during which he treated me generously and provided me with a horse, I took leave to continue my journey to the city of Ṣan'a'.⁶

6 Ibn Baṭṭūṭa, *Rihlah*, ii: 171-176. *The travels...*, trans. Gibb, ii: 369-371.



Fig. 2. World map from al-Istakhri, *Kūtāb al-Masālik wa-l-mamālik* (Book of Routes and Realms). South at the top; Arabia (*Diyār al-ʿarab*) at the center of the circle. Mid-15th century. Istanbul, Topkapı Saray Museum (after Pinto 2016, Fig. 4.9).

2. Taʿizz in the reports of European travellers

Ludovico de Varthema left from Venice around 1500 for a long and adventurous voyage in the Far East. He stayed at length in Yemen, where he was imprisoned on the charge of being a Christian. De Varthema mentions Taʿizz in the chapter “De Taesa et de Zibit et Damar città grandissima de Arabia Felice”, making a rather exaggerated comparison to Roman monuments. He also mentions the cultivation of roses and the rose water made from them.

Da poi el vedere di Sana me posi in camino et andai ad un'altra città chiamata Taesa, la quale è distante da Sana prefata III giornate et è posta pure in montagna. Questa città è bellissima et abundata de ogni gentilezza et sopra tutto de quantità grandissima de acqua rosata, la quale quivi se stila. La fama di questa tal città è che sia antiquissima, dove sta un tempio facto como sancta Maria Rotonda di Roma, et molti altri palazzi antiquissimi. Qui sonno grandissimi mercanti. Vesteno queste gente come le sopradicte. El colore loro sonno olivastri.⁷

⁷ L. de Varthema, 1928: 153. “From there, I went on to visit Sana (Ṣanʿā) and after that to another city called Taesa (Taʿizz), about three days distant from Sana and, like it, in the mountains. This city is beautiful and abounds in every good thing, above all an enormous quantity of rose water, for which it is famous. The fame of this city is also that it is very ancient, with a temple built much like Santa Maria Rotonda in Rome, and many other fine ancient palaces. A great many merchants come from this town. The people dress as I described already and their skin is the color of olives.” Facing page 24, map of the itinerary that, departing from Egypt passes through Syria, the Arab coast of the Red Sea, Yemen and Oman, Persia, India, returning by circumnavigating Africa.

The Danish traveller Carsten Niebuhr (d. 1815) visited Ta'izz in June 1763 and described it in his report of the voyage.⁸ The city is located at the feet of the fertile Mount Saber, a name which recalls the name of a plant: aloe. It is surrounded by brick walls, which extend all the way to the fortress, al-Qāhirah, which dominates it. The city is entered through two gates, guarded by two towers. Niebuhr reports information about the founder, al-Malik al-Ashraf Ismā'īl, considered a saint. According to the tradition, he had been king of this land. His mortal remains are buried in a mosque that bears his name [al-Madrasah al-Ashrafiyyah], but no one is allowed near his tomb. Once this saint performed a miracle that put the 'dolah', the governor of Ta'izz, in a bad light for his greed. Near the mosque is a garden which belongs to the son of al-Malik al-Ashraf Ismā'īl, Yaḥyā; it was watered by an extraordinary hydraulic system that, in its time, had been considered a marvel, but was now in ruins.⁹

His long stay in Ta'izz – Niebuhr was prevented several times from departing for Ṣan'ā' –, enabled him to learn a great deal about the city. In the original edition printed in Copenhagen (1774) he has included a map of Ta'izz and a table with a panoramic view of the city, surmounted by al-Qāhirah fortress, the ruins of 'Udaynah and, in the background, the mountainous range of Jabal Ṣabir. Both the map and the panorama indicate with the number 7 the “Scherifie”, corresponding to al-Madrasah al-Ashrafiyyah;



Fig. 3. Map of Ta'izz (Niebuhr, *Reisebeschreibung*, Tab. lxvi).

⁸ Niebuhr, *Reisebeschreibung*, 1774, i: 377-390.

⁹ *Reisebeschreibung*, i: 379-380. The text quoted in the English translation (*Travels through Arabia*, i: 335-336) is abridged with respect to the German edition. A brief mention of Ta'izz is also found in his description of Arabia. Niebuhr writes that Jabal Ṣabir is so fertile that the Arabs think all the plants in the world grow there (*Description*: 210).

with number 6 the “Cathedral Mosqué zu Táås”, sometimes attributed to al-Malik Ismā‘īl (confused with al-Muẓaffariyyah).¹⁰



Fig. 4. Panorama of Ta'izz (Niebuhr, *Reisebeschreibung*, Tab. lxvii).

Paul Émil Botta traveled in Yemen to collect botanical samples for the Museum d'Histoire Naturelle of Paris. After debarking at Ḥudaydah in 1836, he proposed to visit places that had not been described by Niebuhr, gathering information about the natural environment, the villages and their inhabitants. He climbed the Jabal Ṣabir, the highest of the mountains surrounding Ta'izz, whose peaks dominate the rolling terrain on which the city is built. On these mountains, there are many villages whose inhabitants have developed cultivations of grain, durrah, qat and coffee on the terraced land. Ta'izz was once a flourishing city, but now was almost completely ruined by civil wars and banditry. Several aqueducts carry water from Jabal Ṣabir to the fields around the city, abandoned because the farmers “were sure they would not be allowed to harvest the fruits of their labor”.

We can still see two great mosques in the city that, for their imposing size and aspect, but not for the incomplete work and perfection of the architecture, can be compared to the mosques of Cairo. One may worry that if there is not a powerful government to rule by force and monitor the wellbeing and safety of the inhabitants, these remains of ancient prosperity will be lost forever, abandoned as they are to the destructive action

10 Niebuhr, *Reisebeschreibung*, i: 378; tables lxvi (map) and lxvii (Panorama). The other numbers indicate, respectively: 1. Bāb Shaykh Mūsā; 2. al-Bāb al-Kabīr; 3. Palace of Sīdī Aḥmad; 5. Palace of Sīdī ‘Abd Allāh; (...) 8. Qubbah Ḥusayn; 9. Qaṣr Mosque; 10. Sūq, or market street; 11, great mosque outside the city; 12. Muṣallā, the square where the ‘dolāh’ prays on holidays; 13. road for Ṣan‘ā; 14. road for Mokha.

of time. This has already happened for many of the monuments described by Niebuhr, among others those that, in his time, were outside the city. Now they are nothing but piles of rubble.¹¹

Heinrich Freiherr von Maltzan describes the area of Ta'izz, detailing the geographical conditions, the social conditions of the inhabitants, of ancient Ḥimyar origin, the political divisions and the many villages, but devotes only a few lines to the city and to the Jāmi' al-Muḏaffar, which would contain seventy tombs in ruins.¹²

Renzo Manzoni (d. 1918) visited Ta'izz in 1878, during the second of his three voyages in Yemen. The city appeared to him to be a complete mass of ruins. Only five mosques and a dozen house “that the Arabs still call palaces” remain as evidence of the importance the city had in the past. And this despite the fact that its name, Ta'izz, meant “construction in an inaccessible place”. Manzoni reported much information from Niebuhr. He describes the five city gates and its mosques. He devotes a long passage to describing al-Madrasah al-Ashrafiyyah, on the basis of information he obtained locally.



Fig. 5. Manzoni's teacher of Arabic language.

11 Botta 1841: 79-83. The author describes the serene atmosphere of the imam's home, where leaves of qat are offered in Yemen as in other Asian countries hosts offer coffee. "I love the sight of these green bunches, with their pleasant aroma that invite one to take pleasure in what everyone is saying. The incense that they take care to burn contributes in time to the drunken feeling and the hours pass more swiftly and more enjoyably than in our societies, where one is obliged to talk even if one has nothing to say" (83-84).

12 Von Maltzan 1873: 398-403.

Moschea Es-Scerifia, che fu fondata dall'Imàno Ismâ'îl Esc'-Sceriff èben Abbàs èben Àli èben Dàud èben Resùl Ghadàni: ha due sumâa [minareti], è rettangolare, con due ordini di colonne, e tre cupoloni tutti a ornati e a colori. Nel lato Sud stanno le tombe in marmo del fondatore, di suo figlio Àli, e di due schiavi. Dentro uno steccato di legno traforato trovansi tre tombe, pure in marmo, che contengono i corpi delle sette mogli del fondatore. In faccia alla tomba di questi ve n'ha un'altra, di mattoni e calce, contornata da legni scolpiti, nella quale riposa un altro suo schiavo.

In questa moschea trovasi pure una camera a uso biblioteca, nella quale stanno affastellati libri, codici arabi antichissimi, la maggior parte rovinati; pochi completi. Qui trovai e comperai per 25 talleri: *Kettâb el-Hisàn fi tarikh Têz lâ Ali Othmàn* (libro di Hisàn colla storia di Têz sino a Ali Othmàn) e *Kettâb Kurret-el-Eiùn fi tarikh el-Yèmen lâ el-Meimun* (libro di Kùrret el Eiùn colla storia dello Yèmen sino al Meimun). In questi libri si raccontano le origini delle moschee, delle case o palazzi, dei samsàre dal *Gibèl el-Assir*, paese che trovasi al Nord dello Yèmen, sino alla città di Aden.

È da loro che presi tutte le notizie riguardanti la storia dello Yèmen, che quanto prima narrerò brevemente. La moschea Esc'-Sciarefia è sempre chiusa, e bisogna pregare il Faqì custode, che venga ad aprirla e faccia da cicerone al viaggiatore.¹³

Manzoni does not forget to include a list of various objects purchased at Ta'izz in the two existing shops, owned by Greeks. These even include some alcoholic beverages like: Bain Bruel cognac, Chappaz bitters from Marseilles, Pale-Ale beer.

Hermann Burchardt (d. 1909) learned Arabic and Turkish before going to live in Damascus in 1893. From here, he made many trips to Mesopotamia, Iran, Central Asia. He visited Yemen three times, in 1900-1901, 1907, 1909, bringing a camera with him. He visited Ta'izz on his second and third trips, and met his death there, killed by bandits. The report of his trip was made by his secretary, companion and teacher of Arabic, Muḥammad al-Jarādī. The text in Arabic was published by Eugen Mittwoch, with a facing translation in German. Al-Jarādī writes that 'al-Khawājah' took pictures (*rasm*) of the Great Mosque of Ta'izz called Jāmi' al-Muẓaffar, of the domes and of the city, viewed from all four sides. Burchardt made an excursion on Mount Ṣabir up to the fortress built by Ṭughtakīn ibn Ayyūb, where he 'gasped' (*tanaffasa*) before the splendid panoramic view of

13 Manzoni 1884: 313-314. "Al-Sharifiyyah [al-Ashrafiyyah] mosque, which was founded by the Imam Ismā'îl al-Sharîf ibn 'Abbās ibn 'Alî ibn Dā'ūd ibn Rasûl al-Ghassānî: has two *ṣawma'* [minarets], it is rectangular, with two orders of columns and three domes, all decorated and in colors. On the south side are the tombs in marble of the founder, his son 'Alî, and two slaves. Behind a lacy wooden screen are three more tombs, also in marble, that contain the bodies of the founder's seven wives. Another tomb faces these, in brick and plasterwork, surrounded by carved woodwork, in which another of his slaves was laid to rest. In this mosque there is even a library, with bound books, ancient Arabic codices, many ruined, few complete. Here I found and purchased for 25 tallers: *al-Kitāb al-ḥusān fî tārīkh Ta'izz li-'Alî 'Uthmān* (?), 'Alî 'Uthmān al-Khazrajî?) on the history of Ta'izz, and *Kitāb Qurrat al-'uyūn fî tārīkh [bi-akhbār] al-Yaman al-maymūn* (*Qurrat al-'uyūn* with the history of Yemen [by Ibn al-Dayba']). In these books they tell of the origins of the mosques, houses or palaces, of the samsarah from *Gibāl el-Asir*, a country to the north of Yemen, all the way to the city of Aden. It was from them that I learned the history of Yemen, that I shall briefly narrate soon hereafter. Al-Sharifiyyah [al-Ashrafiyyah] mosque is never open and one has to beg the Faqî custodian to come and open it and act as a guide to the traveler."

city below him. The volume is accompanied by 28 tables of original photographs; among these, two that show al-Madrasah al-Ashrafiyyah.¹⁴



Fig. 6. Al-Madrasah al-Ashrafiyyah (after Burchardt, 1907?).



Fig. 7. Al-Madrasah al-Ashrafiyyah (after Burchardt, 1907?).

14 Mittwoch 1926: 26-28. Tables XVIII and XIX (this last contains the erroneous caption “el-Muzaffarīje Mosque”, probably because it was the mosque mentioned in the text.) Many photographic plates belonging to the Burchardt Fund are kept at the Museum für Völkerkunde in Berlin.

A French naturalist, A. Deflers, visited Yemen in 1887 for a “botanical excursion in the mountains of Arabia Felix”, publishing a catalogue of the plants collected. He stayed several days in Ta‘izz, gathering herbs on Mount Şabir. The city is built at an altitude of 1347 meters and is surrounded by walls with towers of 2-3 meters. It possesses five mosques “in Byzantine style”, with domes surmounted by the half-moon (*hilāl*). The most noteworthy is that of “el-Muzâfer”, in the foothills of Mount Şaber, founded by the imam whose name it bears. It is a rectangular construction with a façade showing a row of windows covered by gratings, and is finished in white plaster that makes it stand out against the dark volcanic rocks of the mountain. The mosque is surmounted by two minarets, three large domes and a dozen smaller domes. The façade is decorated with a row of arches supported by slender columns.¹⁵

A photograph published by Salvatore Aponte in 1934 presents an overview of Ta‘izz.



Fig. 8. Ta‘izz (after Aponte 1936, Fig. 5).

The author writes that

Outside its borders, Ta‘izz does not get talked about much, though it was once the capital of Yemen for over two centuries, under the dynasty of the Beni Ghassan who in 1237 conquered Mecca. Of that ancient splendor it still preserves evidence in its lovely mosques – one of which has a tall and graceful minaret that leans like the tower of Pisa – and in the fortifications erected on the heights that crown it. But no vain pride remains in its inhabitants. Fine folk, they live enclosed in their happy valley and refuse to worry at all about what is going on in the vast world .(...)

¹⁵ Deflers 1889: 88-90. The author seems to confuse al-Muzaffariyyah with al-Madrasah al-Ashrafiyyah.

It is even less easy to see the powerful Emir who rules southern Yemen. Usually, he does not live in the city, but has built his residence on the heights of Dār Nāṣir, which overlooks Ta'izz. It takes an hour and a half to go up there on muleback. But who could resist a meeting with such an illustrious personality? The Sayyid 'Alī al-Wazīr is the only real Emir left in Yemen (the others are mere troop commanders), and he belongs to one of the most noble family of Arabia, one of those who gave the Peninsula its leaders and sovereigns. (...) He lost an eye to smallpox, and with that eye the ability to ascend to the throne of the Zaydites.¹⁶

The city is surrounded and protected on the south side by walls. These continue along the slopes of Jabal Ṣabir, although they appear badly damaged by now. The fortress al-Qāhira dominates the city from the summit of the mountain.



Figs. 9 and 10. Ta'izz: The Muzaffariyyah with its leaning minaret (which collapsed in 1961). The emir 'Alī al-Wazīr surrounded by his officers and the city's executioner (After Aponte, Figs. 7, 8).

Hugh Scott organized an expedition to Yemen in 1937-1938 on behalf of the Natural History section of the British Museum. He published a detailed report of the trip, *In the High Yemen*, in which he devotes a brief description to the city of Ta'izz and includes a few photographs. Among them, one shows ash-Sharifiya (= al-Ashrafiyyah), which he describes as "one of the large mosques, in the Turkish style". Scott does not mention the decorations inside, probably because he was unable to gain access. According to the author, a Turkish influence in these mosques would be 'obvious'.

Ta'izz is the most beautiful city of the Yemen, and our headquarters for nearly three weeks, lies at 4,500 feet above sea-level, on the lowest spurs of the north slope of Jebel Sabir. The ancient walls, enclosing it in three sides, run at either end up the slopes of the mountain, which forms the natural rampart of the city on the south. The city has two large gates, not far apart, at either end of the eastern sector of the north wall. Both open on to the road from Mocha, which skirts that wall and continues north-wards to

¹⁶ Aponte 1936: 22-23.



Figs. 11 and 12. Ta'izz (after Scott, 1942).

San'a. (...) Many of the houses are great blocks three or four storeys in height, with much external ornament and traceried upon windows; houses such as, with local variations, are characteristic of all the cities of the Yemen highland.

At Ta'izz three large mosques, entirely covered with whitewash, stand out glistening against the surrounding buildings and the darker background of Jebel Sabir. (...) Turkish influence is plainly manifest in these mosques. Though some claim foundation by early rulers, all the principal ones, as they now appear, were built or rebuilt under the Turkish dominion in the 16th or early 17th century. Thus, the Jami' Masjid or Muzaffariya, the chief mosque, is said to have been founded late in the 13th century by the Rasulite Sultan Al Muzaffar, but rebuilt by the Turks. Ash Sharifiya [al-Madrasah al-Ashrafiyyah] was founded about a century later by another Rasulite Sultan, Isma'il ibn al-'Abbas, but seems to have been likewise rebuilt. It has a single large dome and several smaller domes. Its two minarets, like the single minaret of the Jami' Masjid, have series of recessed round-headed alcoves one above the other. (...) While Ash Sharafiya boasts two minarets, and the Jami' Masjid but one, the third large mosque, Al Makhdabiya, has no *suma'* (tower) at all. But it possesses some ten cupolas and a wealth of crenellated parapets. Six of the dazzling white domes are grouped over the roofed portion north (Mecca-wards) of its open courtyard. (...) The Jami' Masjid, centrally situated though in a rather low part of the city, was used for the official Friday midday service only.¹⁷

T.J. Abercrombie published in 1964 an extraordinary view of the Mountain Fortress of al-Qahirah above the morning mists of Ta'izz, and comments:

Sons of sheiks lived as hostage in this grim eyrie to ensure their fathers' loyalty to the Imams. Twin minarets cap the Al-Ashrafiyyah Mosque, a Ta'izz landmark. Farm villages dot the slopes of the 9,859-foot (3008 m) Jabal Sabir.

¹⁷ Scott 1947: 82-83; Photographs 41, 42, 44: "Ta'izz; one of the large mosques, in the Turkish style (= al-Ashrafiyyah)". He cites the works of Niebuhr and Manzoni.



Fig. 13. Ta'izz: al-Madrasah al-Ashrafiyyah with its two minarets, the Fortress al-Qāhirah and Mount Şabir (After Abercrombie 1964: 424-425.)

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سُبْحَانَ اللَّهِ عَزَّ وَجَلَّ

Appendix 2

NOTES ON YEMENI ART-CRAFTS AND SCIENCE DURING THE RASULID SULTANATE

MAURIZIO MERLO

In the mid-13th century, the Mamluk sultanate (1250–1507 CE) imposed its dominion, gradually replacing the preceding Ayyubid dynasty (1169–1250 CE). The Mamluk domination eventually extended over a wide region that included areas like Egypt, Palestine, Syria and part of the Arab peninsula, including the two important holy cities of Medina and Mecca.

In Yemen, a different dynasty of lesser political and military power managed to impose its independence and govern independently, this was the Rasulid dynasty (1228–1454 CE). The Rasulids, who possessed gifts of great statesmanship, were able to maintain their independence for a long period, establishing strong bonds of friendship and alliance with the nearby Mamluks. However, to the neighboring Mamluk reign, the Rasulids were in effect considered a subject sultanate that, by paying regular tribute with precious gifts, were able to maintain their independence.¹

Scholars like Rachel Ward or Doris Behrens-Abouseif,² who have had the opportunity to examine Yemenite and Egyptian historical sources and manuscripts, inform us that, of the many diplomatic gifts received in Cairo, those from Yemen were the most appreciated. Some of these were the subject of frequent and detailed reports describing the gifts that came from Yemen as precious objects of many kinds, mainly from different regions of India, but some that are explicitly described as having been produced in Yemen. The historical sources also report that more material was sent from Yemen to Cairo than vice versa. One could suppose that these “gifts” formed the duties due for the maintenance of independence, representing a portion of the profits earned thanks to its fortunate location, which made Yemen an important point of trade conjunction with the Indies.

Although the delivery of gifts from Egypt to Yemen was less frequent and the practice less well documented, we can suppose that, according to the customs of the time, the gifts were equally precious and of great value, reflecting the beauty of Mamluk art

¹ Carboni, S. (ed.), *Exhibition: The Five-Petaled Rosette: Mamluk Art for the Sultans of Yemen*.

² Behrens-Abouseif 2014; Ward 2016.

and craftsmanship in the period of its maximum splendor. The theory that many objects were ordered specifically for the occasion, as diplomatic gifts, is supported to some extent by the research of Rachel Ward.³ The scholar made a direct analysis of several objects and discovered that one of them had been reworked and/or altered specifically as a gift for the Rasulid sultan, adding his name and emblem (see Figs. 1 and 2). Venetia Porter also supports the idea that the Mamluk objects owned by the Rasulid sultans were mostly diplomatic gifts. However she is also suggesting other interesting theories, drawing some considerations from al-Khazrajī,⁴ her main source. She claims that these objects may have been the work of foreign artisans imported to Yemen by the Rasulid government, who created a local craftsmanship, rather than the product of direct purchases on order. The Rasulid dynasty made a practice of flanking its artisans with professionals from Syria and Egypt, both because the local craftsmen were insufficient in number and because the foreign artisans were considered more skilled and their products more refined.⁵



Figs. 1 and 2. Vase in brass, etched in silver and niello, bearing the name of the Rasulid Sultan al-Malik al-Mujāhid ‘Alī I. In the detail on the right we can see the symbol of the Rasulid dynasty, the rosette with five petals. Metropolitan Museum of Art, New York, Edward C. Moore Collection.

It is also possible that, with regard to the objects of court furnishing, the trend was to prefer the products of foreign artisans just because they were considered richer and more refined, worthy symbols of their rank. For this reason we also see braziers, candelabra and large trays in finely inlaid brass, decorated and enameled, or vases, pitchers and bottles in painted glass, hand decorated and gilded, which are all examples of the high Mamluk craftsmanship. This was probably the general trend between the 13th and 14th centuries for many other products, including furnishing and clothing textile objects, of which there is very little and only fragmentary evidence.⁶

3 Ward 2016.

4 El-Khazrejiyy, *The Pearl-strings: A History of the Resūliyy Dynasty of Yemen*, J.W. Redhouse, trans., M. ‘Asal, ed., 5 vols, Leiden: Brill, and London: Luzac: 1906-1918.

5 Porter 1987: 234-235.

6 Porter 1987: 238.

Ellen Kenney writes that

[...] for the various mechanisms by which these Rasūlid–Mamlūk objects may have been generated, four options have been proposed:

1) royal commissions, 2) diplomatic gifts, 3) market orders/purchases by special delegates and visiting embassies, 4) expatriate craftsmen from Mamlūk cities sent to or requested by Rasūlid patrons.

It should be pointed out, however, that the various mechanisms explaining the Rasūlid–Mamlūk material are not mutually exclusive. Especially if one disaggregates the corpus in question, it is more likely that different objects reflect different patronage mechanisms.⁷

In spite of the vastness and extreme division of the area, which also experienced European invasion during the Crusades, the Syrian and Egyptian craftsmanship continued and perfected itself with a polychrome decorative tradition that made use of a wide range of materials. The production of objects in metal grew with the improvement of etching and inlaying with gold, silver and copper that often, depending on custom, created an effect similar to painting on the metal, highlighting any emblems or heraldic symbols.

For glass, the gilding process was perfected and used also by the Byzantines, occasionally combined with decorations in enamel and various shapes. The artistic production of these objects reached its peak in Syria, but also in many parts of Egypt. The level of artistry was so great and so much admired that much of it was exported to Europe, serving in some cases to influence the workmanship of glass in important European capitals and important centers like Venice.



Figs. 3 and 4. Engraved brass tray made for the Rasulid Sultan al-Malik al-Mu'ayyad Dāwūd ibn Yūsuf. On the right we can see, above the fine figure of the horse, the rosette with five petals. Metropolitan Museum of Art, New York, Edward C. Moore Collection.

⁷ Kenney 2021: 38.



Figs. 5 and 6. Brazier in brass carved and inlaid, with silver and niello, dedicated to the Rasulid Sultan al-Malik al-Muẓaffar Yūsuf ibn ‘Umar. The presence of the rosette with five petals is a further confirmation of its pertinence to the Rasulid dynasty. Metropolitan Museum of Art, New York, Edward C. Moore Collection.



Fig. 7. Gilded glass bottle decorated with enamel, Museum für Islamische Kunst, Berlin. The rosette with five petals can be seen, symbol of the Rasulide dynasty. See also Daum (ed.), 1978: 27.

Patronage of the arts and the taste for beautiful things, the construction of palaces, mosques and *madrasahs* so richly decorated as never seen before in Yemen, derived from the high intellectual level that characterized many of the members of the Rasulid dynasty. It has been theorized that the Rasulid possessed treasures much more precious than the artistic products discussed here, as they had many contacts with the countries of the Far East as well.⁸ In addition to be collectors or patrons of the arts and literature, the Rasulid sultans were people of great culture and scholars, and some of them left evidence of their research.⁹

⁸ See Behrens-Abouseif 2014: 37–39; Kenney 2021: 44 and 46.

⁹ Finster 1988: 254–264.



Fig. 8. This jug with four handles in gilded glass, hand decorated, displays the rosette with five petals associated with the Rasulide dynasty. Smithsonian National Museum of Asian Art, Freer Gallery, Washington. See also Daum (ed.), 1978:19.

Daniel Martin Varisco, in his extensive research regarding al-Malik al-Muẓaffar¹⁰ (1229–1249 CE), the first of the Rasulid dynasty to govern in Yemen, describes the sultan as an enthusiastic scholar of religion and of the Arabic language. He was accustomed to inviting masters of great fame, even from far away. Among his works are treatises on the *ḥadīth* (brief narratives relative to sayings or facts about the Prophet, having juridical and religious value), on astrology, scripture and medicine. He ordered the construction of numerous mosques and *madrasahs*, including al-Muẓaffariyah Madrasah in Ta‘izz which, at the time, was considered the greatest school in the Middle East, and attracted many famous scholars.

There were other sultans who devoted their lives to the study of the sciences, but the most emblematic case is certainly that of al-Malik al-Ashraf ‘Umar ibn Yūsuf ibn ‘Umar ibn ‘Alī ibn Rasūl (1295–1296), third sultan of the Rasulid dynasty, for whom the al-Ashrafiyyah Mosque and Madrasah in Ta‘izz¹¹ is named, and where he was buried. Although his reign was brief, and lacking in particular historical and military significance, al-Malik al-Ashraf was a prolific scholar from an early age and left a personal contribution to science. He wrote treatises on several topics but was a particularly profound student of astronomy and astrology, and devoted most of his attention to those sectors.

Alongside his profound theoretical study, he liked to put his studies into practice with the construction of technical instrumentation he himself designed. Among the most significant objects developed by al-Malik al-Ashraf there is an astrolabe, currently displayed at the Metropolitan Museum of Art in New York (Figs. 9, 10). An inscription on this astrolabe bears the name ‘Umar ibn Yūsuf ibn ‘Umar ibn ‘Alī ibn Rasūl al-Muẓaffarī (Fig. 11).

¹⁰ Varisco 1993: 21.

¹¹ Ventrone Vassallo 1992: 131–148.

هذا الأسطرلاب عمل عمر بن يوسف بن عمر بن علي بن رسول المظفري مباشرة وإملاً سنة ٦٩٠

This astrolabe is the work of ‘Umar ibn Yūsuf ibn ‘Umar ibn ‘Alī ibn Rasūl al-Muẓaffarī by his own hand and (also) under his supervision in the year 690 Hijra (1291).¹²



Figs. 9, 10, 11. Front and back of the astrolabe. In the detail we can see the signature of the prince ‘Umar ibn Yūsuf ibn ‘Umar ibn ‘Alī ibn Rasūl al-Muẓaffarī. Metropolitan Museum of Art, New York, Edward C. Moore Collection.

The title al-Muẓaffarī refers to his father, al-Malik al-Muẓaffar Yūsuf, at whose death ‘Umar succeeded to the sultanate in 694/1295, taking the title of al-Malik al-Ashraf.

The object was made with particular skill and for its rather unusual characteristics is considered unique for its kind. What makes it even more interesting is the existence of a treatise written by al-Malik al-Ashraf himself, preserved in two manuscripts in Cairo and

¹² Trans. King 1985: 102.

Teheran,¹³ in which he describes in great detail, using tables and illustration, the production of the astrolabe and other instruments.

In this treatise, al-Malik al-Ashraf also was one of the first, in the medieval epoch, to describe the use of the magnetic compass, without claiming to have invented it, and it is the first time the compass was used to determine the direction of the *qiblah*.¹⁴ At the end of the treatise are two notes by two of the sultan's teachers who, after inspecting a number of astrolabes made by al-Malik al-Ashraf, testified to their excellence, granting him permission to make anything he wanted in this field.¹⁵

Al-Malik al-Ashraf was a great scholar and very versatile. He succeeded in collecting a great variety of data, both theoretical and technical, in his treatises, also citing information he had learned from earlier writings, and probably gathered foreign scholars around him who were equally well educated and versatile.

This patronage of the arts, religion and science made the Rasulid dynasty, between the end of the 13th and the beginning of the 14th century an important sultanate that, in spite of its relatively small size with respect to the Mamluk kingdom, was able to maintain its autonomy and leave a great deal of authoritative evidence of its importance and culture, which we are fortunate to have today.

13 See King 1985; Schmidl 2007.

14 Schmidl 2007.

15 *Ibid.*

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