
RESEARCH ARTICLE

From Fenben to Digital Dunhuang Material Pool: Innovations in Art Production through Transformation of Producing Media

Ruiqi Ren

The Chinese University of Hong Kong, Hong Kong 999077, China

Corresponding Author: Ruiqi Ren, **E-mail:** 15510938353@163.com

ABSTRACT

Fenben was an indispensable medium for the ancient Dunhuang artisans before painting the wall. While Digital Dunhuang-Material Pool, which relies on 3D laser scanning, digital storage, and blockchain, is a new medium for art production in the advanced technological context. Combining desk research and case studies, using Fenben and the Digital Dunhuang-Material Pool as examples, this research focuses on the medium's origin, content, form, and application to practical art production, analyzing the prescriptive nature of the different mediums and their corresponding shaping of art production patterns. In conclusion, the research argues that the Digital Dunhuang-Material Pool echoes Fenben in an inter-temporal way while transforming the "readable" world of the Buddha on the wall into the "writable" cultural object on the blockchain, thus providing a compliant medium for cultural enthusiasts to create secondary artworks around Dunhuang, which is a vivid practice in the democratization of art production through the development of contemporary media.

KEYWORDS

Media; Art Production; Fenben; Digital Dunhuang-Material Pool; Textual Poaching.

ARTICLE INFORMATION

ACCEPTED: 20 April 2023

PUBLISHED: 28 April 2023

DOI: 10.32996/ljahs.2023.3.2.5

1. Introduction

Different media has distinct characteristics and limitations, and the selection of medium can directly impact art production pattern. For example, traditional painters need to produce their works on a material carrier with the help of paint and brushes. At the same time, digital artists can create visual effects and forms in computer software by adjusting parameters and overlaying layers in a way that was unimaginable to previous artists. The role of Fenben in the production of Dunhuang murals has been written about by domestic and international Dunhuang scholars such as Ma De, Sha Wu Tian and Sarah E. Fraser. Based on existing studies, this paper aims to compare Fenben with the latest digitization of Dunhuang cave art, the Digital Dunhuang-Material Pool, to analyze what the new pattern of art production is opened up for contemporary culture enthusiasts by the novel medium of art production emerged in the new technological context.

2. Fenben and the Painstaking Effort of Ancient Dunhuang Artisans

2.1 Fenben: The Medium of "Chuangyi Moxie (传移模写)"

The glorious Dunhuang murals result from the ancient Dunhuang artisans' collaborative labour. According to Shi Weixiang, in the creation of Dunhuang cave art, as the Buddhist scriptures do not explicitly state the pictorial rules of the Buddha's world, the production of paintings and sculptures is not restricted by the Buddhist scriptures so that the artisans can exercise his subjective initiative to create the pure world of the scriptures (Ma, 2018). In constructing a pictorial representation of the Buddha's world, the artisan must rely on imagination to visualise Buddhist texts' metaphors, meanings and stories. However, the excavation of the Dunhuang Fenben reflects how programmatic religious art disciplined the artisan's creativity.

As a medium of ancient Chinese painting, "Fenben" refers to drafts in the preparatory stages of painting (Hu, 2022a). Fenbens were used differently by different artisans, mainly for pattern-making (Su, 2017). Many Fenbens are also included in the precious sketches preserved in the cave of the hidden scriptures in Dunhuang.

Where did the Dunhuang manuscripts come from? In his study of Dunhuang manuscripts, Yang Hong argues that chalk may have come from two types of "ChuanYiMoXie": One is based on the Fenbens left behind by their predecessors, which artisans handed down; the other is a selection of classic frescoes that had already been produced by their predecessors, against which they were handed down (Yang, 1981). Yang Hong's term "ChuanYiMoXie" is an ancient Chinese traditional painting technique which refers to the process of transferring patterns and lines from the original work to another canvas or paper by copying them. This technique aims to learn and master the artistic characteristics of the original work. Thus, by transferring and modelling existing graphical expressions, Dunhuang Fenben becomes a medium of "inheritance" rather than "creation".



Figure 1. Comparison of the Fenben and Finished Versions of the Tien Wang Figure Excavated from the Cave of the Hidden Scriptures in Dunhuang

Source: Photo Credit: Collection. Yang Shiao. *How were the Dunhuang murals completed? This book reveals the process of creating Buddhist art in the Middle Ages* (Yang, 2018).

As for the content of the Fenben, Dunhuang art is part of what Wu Hung has called the "ritual art" (Hung & Yan, 2005) of a religious character, with its strict religious rituals, which makes the content of the images recorded in the Dunhuang Fenben restricted to the subject matter of the established texts. In Buddhist art, for example, the "BianXiang", biographies and motifs serve as definitive forms. In terms of the artistic style embodied in the Fenben, it is historically documented that the "creation" of Buddhist artistic styles formed a phased variation from Cao Zhongda, Zhang Singh, Wu Daotzu, and Zhou Fang, and that "to this day, the carving and painting houses list their models as Cao, Zhang, Wu, and Zhou. This is unchanging throughout the ages" (Zhang, 1963). Jiang Boqin has analysed in depth the alignment presentation of various styles in Dunhuang cave art as a "counterpoint" (Jiang, 1996), which also indicates that Dunhuang Fenben was a medium for "following" styles rather than "creating" styles.

Hence, as a preparatory medium for the Dunhuang artisans' fresco production, FenBen were not a vehicle for the artisans to record their artistic inspiration, whether in terms of source, content, or style, but more of a transfer medium for solidifying the rituals of religious imagery.

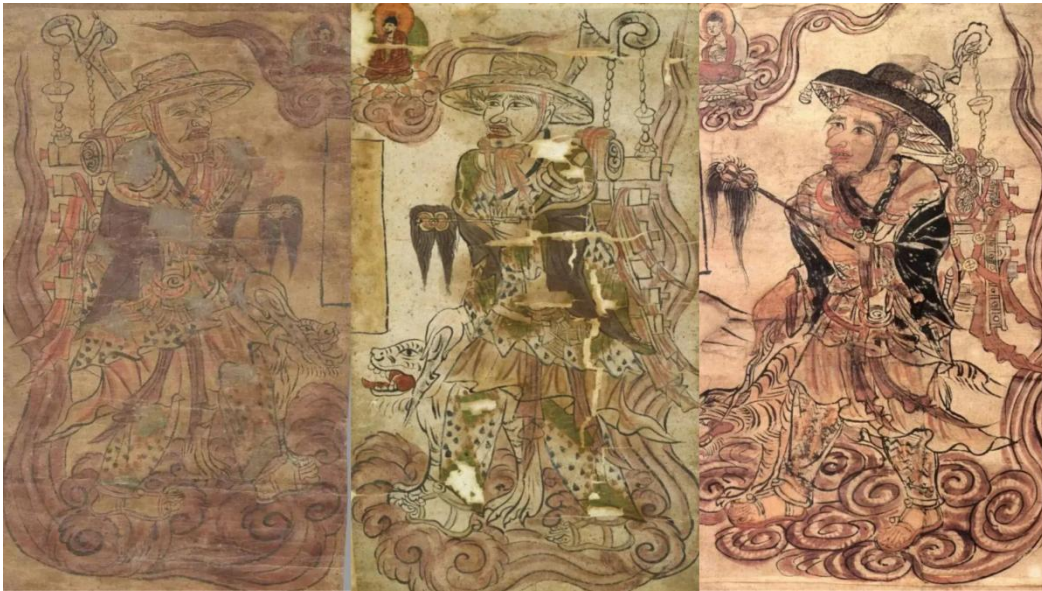


Figure 2. Walking Monks from Different Periods Excavated from the Cave of the Hidden Scriptures in Dunhuang
Source: Photo Credit: Douban. GanMaoDeHeMa. Various tiger paintings from the cave of the hidden scriptures in Dunhuang of the Walking Monks (Cold Hippopotamus, 2022).

2.2 The Painstaking Effort: Reproducing a Readable Buddhist World

The study found that the use of Dunhuang Fenben as a medium for transferring moulds reflects the fact that the artisans followed a “craftsmanship” rather than a “creativity” mindset in the preparation phase of art production. When it comes to the mural painting stage, the Fenben application is a technical process that is both laborious and artistic.

In the process of painting the murals, Fenben acted as a “basis or blueprint for copying and re-creation” (Guo, 2014), and there were two broad ways of applying it to the walls. One was to use a needle to make small, evenly spaced holes along the traces of the modelling lines on the chalk, making the sketch into a pierced Fenben, which the artisan would then lay in sequence on the wall, slapping it with red foundation powder to create a myriad of red spots on the wall, which were then linked into lines to form the outline. Following the traces of the powder dots, the artisan can control the size of the portrait, reproduce similar figures and then colour the whole (Guo, 2014). Around the outline of the dotted line, the artisan could improvise to create more detail and expand the size slightly when painting. For example, the images of the Thousand Buddhas in the frescoes of Cave 146 are essentially the same in their own pose, with only slight differences in handprints and colouring.

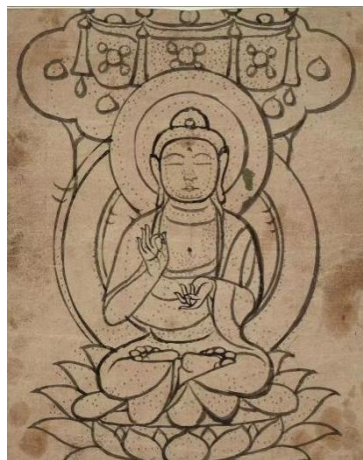


Figure 3. Pierced Fenben

Source: Photo Credit: Douban. Shiguang Xiezhenguan [the Cave of the Hidden Scriptures in Dunhuang] (Douban, n.d.).



Figure 4. Partial Drawing of the Thousand Buddhas in Cave 146 in Dunhuang

Source: Photo Credit: Institute of Humanities and Social Sciences, Peking University. Sarah E. Fraser: Fenben-Historical, Thematic and Stylistic Issues (Hu, 2022b).

The other way of using Fenben requires the artisan to familiarise himself with the Fenben over many years, repeatedly moulding it and using it as a basis and reference for further painting or repair. Once the brushwork was mastered, the overall plan for applying Fenben was arranged. The starting lines were drawn according to the wall's size and the image's priority, in conformity with the needs of the benefactor and the specific Buddhist texts to be expressed (Sha, 2007). For example, in the Jingbian painting "Laoduchadousheng Bian", the many figures, halls and towers, ponds and bridges, flowers and trees, exotic treasures and all kinds of magic tools are particularly complex and contain a continuous storyline, which is not divided, but must be clearly prioritised and coherent, thus requiring a sophisticated and rigorous overall design and wall drafting. Ma De points out that the caves were decorated to flatter the deities. When the decorative form reached its perfection, the form and process solidified, becoming a repetitive task with strict specifications (Ma, 2018). The "Laoducha Dousheng Bian" theme has appeared in fifteen different versions in the Dunhuang caves over the last hundred years, each with its characteristics. However, the general layout is largely the same, with only detailed alterations, such as the figures' clothing and the tabernacle's ornaments (Yang, 1981).



Figure 5. The Laoducha Dousheng Bian on the west wall of Cave 196 in Dunhuang

Source: Photo credit: Institute of Humanities and Social Sciences, Peking University. Sarah E. Fraser: Fenben-Historical, Thematic and Stylistic Issues (Hu, 2022b).

Due to the constraints of the religious nature of painting and the needs of the patrons, in order to ensure a consistent and stable "readability" of the Buddhist world on the walls and to complete the pictorial reproduction of Buddhist texts, the artisans, regardless of the method of applying Fenben, were not free to use Fenben as they wished. Even if they had the skill to play within the framework, it was a painstaking effort of "dancing with shackles".

3. Material Pool and the Culture Enthusiasts' Constellation on the Blockchain

3.1 Material Pool: A Platform for Digital Reproduction

Through the collective work of artisans, the Dunhuang cave art reflects the transmission and evolution of art over a thousand years during the ancient Middle Ages. It is the crystallisation of a thousand years of convergence between the multi-ethnic cultures of

ancient China and the cultures of Europe and Asia. Over time, however, natural and human-induced damage to the cave art has resulted in the implementation of restorative conservation measures that have fallen behind the rate of secondary damage to the heritage. To enhance and promote the conservation and dissemination of cultural heritage, in the 1990s, the Director of Dunhuang Academy, Fan Jinshi, proposed the idea of digitising cave art to use computer technology and digital imaging to achieve the permanent preservation and sustainable use of Dunhuang's cave relics.

From the launch of the ultra-high-definition 8K digital dome film "Dream Palace of Buddha" in 2014 to the completion of the "Digital Dunhuang" repository in 2016 with over 50,000 digitised archival negatives, over 300TB of digitised data on cultural relics and a dpi accuracy of 300, the Dunhuang Academy, in collaboration with domestic and international research institutes and technology companies, has accumulated a wealth of valuable experience in exploring the practical path of digitally capturing, processing, storing and reconstructing cave images.

On December 8, 2022, building on existing image processing technologies, Dunhuang Academy partnered with Tencent Technologies to create the Digital Dunhuang-Material Pool (<http://ip.e-dunhuang.com>), supported by digital technologies such as blockchain and encryption. With this, 6 cave sites, 448 walls and more than 6,500 high-definition digital reproduction images of murals, sutra scrolls and sculptures in Dunhuang (data as of March 16, 2023) are available to the world through Material Pool.

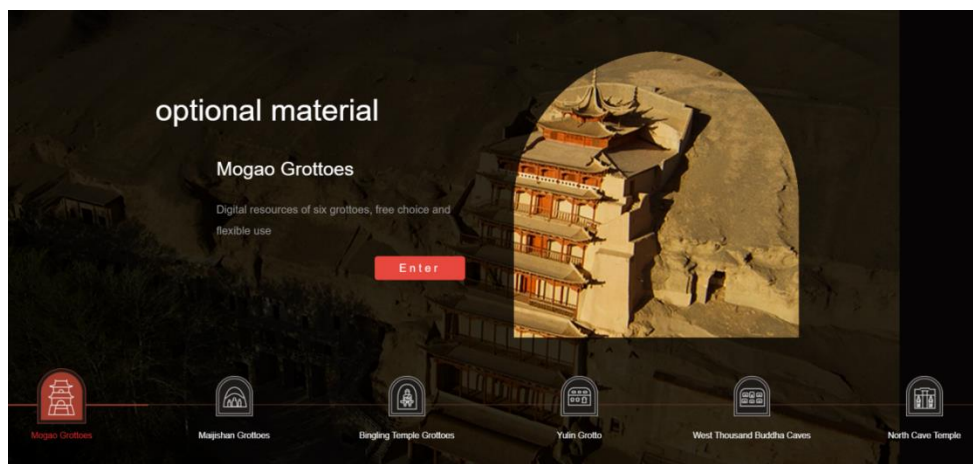


Figure 6. Home Page of the Digital Dunhuang-Material Pool Website
Source: Photo credit: Dunhuang Academy. Digital Dunhuang (<https://ip.e-dunhuang.com/>).

The website's indexing of the resources suggests that the creation of Material Pool can be seen as a retrospective reinterpretation of how Dunhuang cave art was produced. The classification pattern of the most numerous mural images in the Material Pool visually reflects this de-contextualisation process: digital scanning of the spatially defined physical caves results in visual wall materials; declassification of the systematic wall stories results in modular mural themes; and extraction of the mural themes in their finished state results in line elements in their manuscript state.



Fig 7. A portion of the "Mural Elements" Page on the Digital Dunhuang-Material Pool Website
Source: Photo credit: Dunhuang Academy. Digital Dunhuang (Digital Dunhuang, n.d.).

In the deconstructive digital reproduction of Dunhuang's murals, the Material Pool arrives at the smallest image unit of art production, the "line element", which echoes the cross-technological context of Dunhuang Fenben. As the world's first blockchain-based platform for the open sharing and co-creation of digital cultural heritage, the Material Pool provides a new medium of art

production for cultural enthusiasts to personalise their creations using programmed “Fenben” by digitally reproducing and categorising the immovable and indivisible tangible cultural heritage for licensing.

3.2 Textual Poaching: Creating Writable Constellation on the Blockchain

As the Dunhuang Document states, “Craftsmen should not learn ingenuity, for ingenuity is what others make of it. The body is a natural slave, the wife is the official maid” (Zhang, 1990). Ancient Dunhuang artisans, generally affiliated with the government and monasteries, were enslaved people in their own right and were subject to the fixed expressions of Buddhist texts in their art production, a form of “regular servitude”. As time has changed, the platform users who use the Material Pool to create their works have moved from an immediate and local painstaking effort to a ready-made “textual poaching” compared to the ancient artisans who copied from Fenben.

In the Material Pool, platform users are no longer confronted with stereotypical religious imagery but with cultural objects that can be written upon. Users can create secondary artworks efficiently by accessing the Material Pool's digital images. This media-empowered “text poaching” mode of art production is an invention of the use of Dunhuang wall painting resources beyond the framework of religious narratives. At the same time, secondary works can be re-uploaded, following professional certification by the Dunhuang Academy, and be registered as part of the Material Pool. In this way, contemporary culture enthusiasts can use the Material Pool as a medium for participatory art production, registering their individual works across time and space in the millennia of cave art, and thus joining ancient Dunhuang artisans in creating a generative, “constellation-style” digital life for Dunhuang cave art in a new media context.

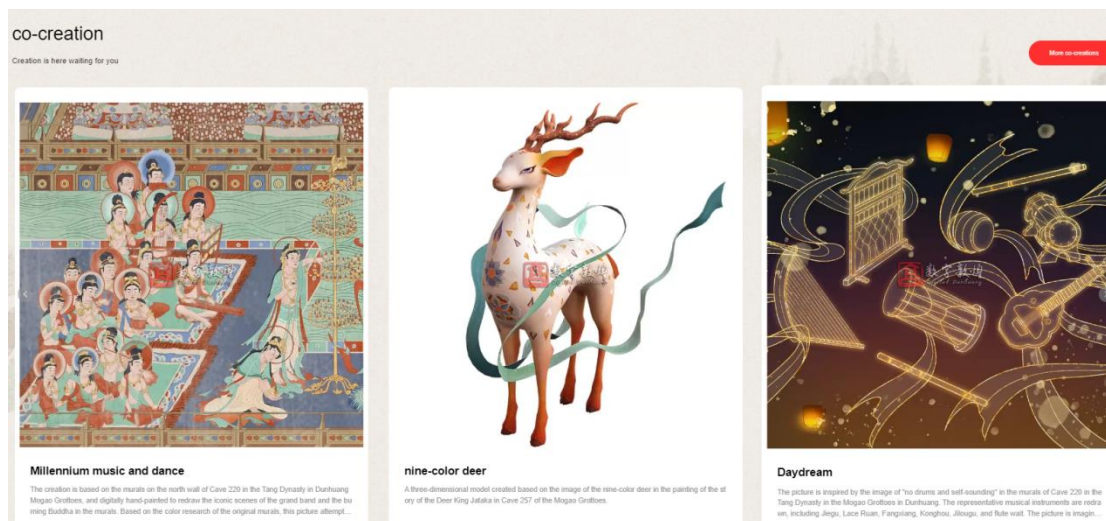


Figure 8. Part of the “Co-creation” Page on the Digital Dunhuang-Material Pool Website
Source: Photo credit: Dunhuang Academy (Digital Dunhuang, n.d.).

At the same time, Material Pool, established under the guidance of the State Administration of Cultural Heritage's “Internet + Chinese Civilization” Action Plan, is not intended to override any art production controls and create an anarchic environment for art production at will, but rather to develop effective management mechanisms for users' media use and art production practices, relying on a variety of digital technologies.

On the object side of the material, the Material Pool has pioneered a system for classifying and authorising digital resources of cultural relics, using Tencent blockchain technology to confirm and protect the rights of each digital image material of cultural relics so that the proof of originality of the digital material of cultural relics and related evidence information such as authorisation, payment and download can be stored on the chain in accordance with the rules. On the object side of the material, the material library has pioneered a system for classifying and authorising digital resources of cultural relics, using Tencent blockchain technology to confirm and protect the rights of each digital image material of cultural relics so that the proof of originality of the digital material of cultural relics and related evidence information such as authorisation, payment and download can be stored on the chain in time. The authorised use of each case of material can be verified.

Accordingly, on the user side, before users can use the Material Pool for creation, they need to register and authenticate with their real names, select the required material specifications for downloading according to their usage, and then complete an electronic contract to pay the usage fee. The entire process relies on product technologies such as Tencent Cloud's Wise-Eye face verification

authentication, electronic signatures and cloud intelligent content security auditing to safeguard the signing transaction and track and supervise possible material misuse, abuse and financial speculation (Dunhuang Academy, 2022).

By simultaneously empowering and regulating, Digital Dunhuang·Material Pool ensures the democratisation of artistic production and the compliance of cultural enthusiasts with “text poaching”, thus guaranteeing the sustainability and health of the ecology of digital cultural heritage resources re-creation.

4. Conclusion

As a preparatory medium for art production, the Dunhuang Fenben was created by hand, while the digital reproduction of electronic devices created the Digital Dunhuang·Material Pool. A “ritual art” mentality guided the ancient Dunhuang artisans to create the world of Buddhism through the medium of Fenben. At the same time, the creation of the Digital Dunhuang·Material Pool is a new medium of art production inviting contemporary cultural enthusiasts to use their imagination and creativity to produce diverse and differentiated art outside of Buddhist art. With technology and policy support, the Material Pool provides a platform for revitalizing the valuable cultural heritage left behind by ancient artisans.

Currently, only a limited number of co-creations have been uploaded to the library. In the future, how Dunhuang art will grow in “writable” digital life and how the breadth and depth of democratization of art production will expand will require a top-down collaborative effort between government departments, institutions and the people. As the digitization of Dunhuang art involves data from multiple organizations and institutions, the government can further guide the digitization process through policy guidelines, lead all sectors to participate in the digitization process, establish a comprehensive data sharing and security mechanism, and achieve a deeper integration of academia, technology and heritage. Also, Dunhuang Academy should strike a balance between heritage preservation and social benefits while empowering cultural heritage conservation with digital technology. It should work with the media to popularise and promote the digitization of Dunhuang art and raise awareness of digital Dunhuang among the public at home and abroad while actively applying the results of digitization to education, exhibitions, tourism and other fields to develop the Dunhuang cultural industry chain and enhance the market value of Dunhuang culture. The general public should also transform their traditional identity as appreciators and consumers when confronted with the digital objects of cultural heritage, and take the initiative to understand the rules of using new media, learn new art production techniques, and participate in the millennial legacy of Dunhuang art with concrete and innovative art production practices.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

Publisher’s Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers.

References

- [1] Cold Hippopotamus. (2022, January 29). *Various ways of painting tigers in the pictures of traveling monks in the Dunhuang Tibetan Sutra Cave*. Douban. <https://www.douban.com/note/824859952/?i=9303133Fk-7Yq8>
- [2] Digital Dunhuang. (n.d.). *Mural elements*. <https://ip.e-dunhuang.com/processing.html>
- [3] Douban. (n.d.). *Time photo gallery*. <https://site.douban.com/108346/>
- [4] Dunhuang Academy. (2022, December 8). *Introduction to the "Digital Dunhuang·Material Pool"*. https://www.bilibili.com/video/av818500238/?vd_source=90b559d92300373af54c4de5c083d671
- [5] Guo, P. (2014). A study of Zhang Daqian's Dunhuang copies and fresco fenbens. *Sichuan Drama*, (8), 63-65.
- [6] Hu, S. X. (2022a). Dunhuang Fenben and painting practices. *Art Panorama*, (6), 19-23.
- [7] Hu, S. X. (2022b, May 6). *Fenben: History, theme and style issues*. Weixin. https://mp.weixin.qq.com/s/rMkN943CX9j_W2XIFw4ZLA
- [8] Hung, W., & Yan, Z. (2005). *Art in Ritual: An essay on the history of ancient Chinese art by Wu Hung*. SDX Joint Publishing Company.
- [9] Jiang, B. Q. (1996). *Dunhuang art, religion and ritual civilization*. China Social Sciences Press.
- [10] Ma, D. (2018). *A study of ancient artisans at Dunhuang*. Cultural Relics Publishing House.
- [11] Sha, W. (2007). *Studies on Dunhuang manuscripts*. Central Compilation & Translation Press.
- [12] Su, J. C. (2017). The application of Fenben in traditional Chinese religious painting. *Fine Arts*, (3), 119-123. <https://doi.org/10.13864/j.cnki.cn11-1311/j.002609>
- [13] Yang, H. (1981). Intentional artisanship in misery: An introduction to the whiteprint sketches in the Dunhuang scrolls. *Fine Arts*, (10), 46-49+41. <https://doi.org/10.13864/j.cnki.cn11-1311/j.1981.10.014>
- [14] Yang, X. (2018, March 20). *How were the Dunhuang murals completed? This book reveals to you the creative process of Buddhist art in the Middle Ages*. Weixin. https://mp.weixin.qq.com/s/vlkcM1FvctoU1k_LK-R1zA
- [15] Zhang, Y. Q. (1990). Wang Fanzhi's poems. *Dunhuang Studies*, (2), 80-87.
- [16] Zhang, Y. Y. (1963). *The famous paintings of the past generations*. People's Fine Arts Publishing House.