



A copy of *Chaoyuan Tu* ("the painting of the heavenly court"), the best-known mural in the Yongle Palace in Yuncheng, Shanxi province, built in the Yuan Dynasty (1271-1368). It features about 300 Taoist figures, depicting a scene of congregation. The vibrant colors of the piece are sharpened by technology. PROVIDED TO CHINA DAILY

# AI shows true colors of iconic artwork

Ancient masterpiece restored for a modern-day audience, report **Wang Qian** and **Zhu Xingxin** in Yuncheng, Shanxi.

Technology, such as artificial intelligence and deep learning, is reshaping the preservation and restoration of cultural heritage, bringing masterpieces back to their former glory and enabling people to appreciate their beauty beyond time and space.

At the UNESCO headquarters in Paris late last month, *Fragments of Civilization — Exhibition on the Mural Art of the Yongle Palace* displayed one of the latest examples of reviving cultural heritage in the digital era.

*Chaoyuan Tu*, or the painting of the heavenly court, was the highlight of the exhibition. Using AI technology, experts have brought the mural close to its authentic colors that were used about 800 years ago, making the original features of the mural a present-day reality that can be admired by visitors from around the world.

"In modern times, the restoration of cultural relics is no longer about individual conservators working manually with tools," Xi Jiulong, director of the Yongle Palace mural preservation research institution, said at the exhibition opening in Paris.

"Technological advances are enabling the preservation of cultural heritage. Computing power will ultimately help us reverse time."

Divided into five sections — mural art, digital restoration, color exploration, replicas of costumes on the murals and related cultural creative products — the exhibition, which closed late last month, displayed a hand-painted replica of *Chaoyuan Tu* from the 1980s and an AI-restored version to offer a comparison on how technology has breathed new life into the viewing of ancient murals.

Karalyn Monteil, head of Programmes and Stakeholders Outreach for the Diversity of Cultural Expressions in UNESCO's culture sector, encourages related parties to protect and promote culture in the digital environment, especially in the face of climate change.

Cheng Kun from the Beijing Culture Pieces Development Co, the



**Clockwise from top left:** Cheng Kun (left), head of the Beijing Culture Pieces Development Co, displaying a calligraphy piece with Wang Ying, deputy representative to UNESCO for China, at an exhibition on the Yongle Palace in Paris last month. Part of the original mural that depicts the Jade Emperor. PHOTOS PROVIDED TO CHINA DAILY Cheng with a visitor at the Yongle Palace last week. ZHU XINGXIN / CHINA DAILY

company behind the exhibition, says that "technology makes it possible to re-create the authentic beauty of the *Chaoyuan Tu*. Through this exhibition, the Yongle Palace murals, with their unique artistic language, give the world a glimpse into the splendid Chinese culture."

Located in Ruicheng county in Yuncheng, Shanxi province, the mural is the best-known at the Yongle ("eternal joy") Palace, built in the Yuan Dynasty (1271-1368). Known for its approximately 1,005-square-meter frescoes, the Taoist temple complex commemorating Lyu Dongbin, one of the Baxian, the Eight Immortals of Taoism, comprises four wooden structures built along a line running from south to north.

Measuring 97 meters long and 4.4 meters high, *Chaoyuan Tu* features

about 300 Taoist figures depicting a scene of congregation, which tells a story about Taoist etiquette.

In the mural, the eight main deity figures are as tall as 3 meters. The characters are arranged in four layers from front to back, with various poses including sitting, standing, bending, and facing forward or sideways, in an orderly manner.

"*Chaoyuan Tu* is considered the crown jewel among existing Yuan Dynasty mural art," Xi says. "The strokes and lines of these murals remain awe-inspiring, but sadly their colors have decayed over time. We don't have a chance to see these murals in their original, vivid colors."

But this situation was remedied when the Beijing Culture Pieces Development Co and US chip design company Advanced Micro Devices



planned to cooperate on an AI restoration program for cultural heritage in 2019.

As a Yuncheng native, Cheng, 33, has been fascinated by the exquisite murals in Yongle Palace and, seeing the colors fading, she knew it was time to make her childhood dream come true. Cheng also stresses that human input will always be paramount in art.

Jovi Chi, senior marketing director at AMD, says as a tech company, it is their responsibility to preserve and pass down cultural heritage.

In November 2023, the Yongle Palace and AMD joint digital studio was established.

For Fan Aizhu, a mural restorer and inheritor at the palace, the studio helps break the barriers humans cannot cross.

processes the data related to the mural but also analyzes the discoloration, color fades, damage, cracks and stains that the mural has endured over the last eight centuries.

"AI is like a student and our data annotations are akin to lessons for AI. If we feed accurate information to it, AI can quickly become an expert on mural paintings. This requires that we provide as much accurate data as possible to lead us closer to the original, true colors," Xu says.

For traditional mural conservators, AI has shortened the long and dedicated duplicating period from months to hours.

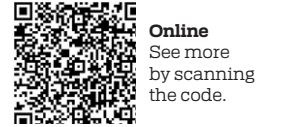
"Mural restoration and conservation is traditionally done through copying and reproduction. It takes at least 10 years to train a professional mural restorer. Consider the restoration of a main deity as an example — it would take at least a few months working day and night. This can be a cruel test of endurance and patience," Xi says.

Last month, an exhibition to showcase the latest digital restoration results was launched at Yongle Palace, unveiling a virtual docent named Yu Yao whose image is that of a jade maiden beside the Queen Mother of the West, or Xiwangmu, a powerful goddess in Chinese mythology. She can answer questions and interact with visitors.

Xi is happy to see how digital technologies allow the public to access historical knowledge and engage with narratives that were once confined to textbooks and museums and help transform the preservation of cultural heritage.

"We always talk about cultural confidence. How do we build it? We must be able to see the real masterpieces. Advances in technology enable that," he adds.

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By **WANG QIAN** and **ZHU XINGXIN** in Gaoping, Shanxi

For 78-year-old Wang Gaiying, Tiefs Temple is not only a hidden architectural gem in Gaoping, Shanxi province, but also her home for the past 58 years. Its 24 vividly detailed statues of deities inspired *Black Myth: Wukong*, a hit video game based on the classic Chinese novel *Journey to the West*.

With the main hall built in 1168, the temple was renovated and expanded during the Ming and Qing dynasties (1368-1911). It gets its name from the iron Buddha it once housed.

Thanks to the game's popularity, the once-dilapidated temple was restored and opened to the public on Aug 24, according to a notice released by the local cultural heritage protection bureau.

"Many people come to admire it every day," says Wang, who lives in the temple's western meditation room.

"I'm proud of my work and happy to see the younger generation appreciating these artifacts."

As more people visit, Wang's dedication to preserving the temple has gone viral and hit national headlines, giving a lot of publicity to these caretakers of the country's cultural heritage.

Known as a treasure of ancient Chinese architecture, Shanxi is home to 28,027 ancient buildings, according to the data from the third national cultural relics census. Among them, 531 are registered as national-level key sites. Behind this number are numerous guardians, such as Wang, who have safeguarded the buildings, sculptures and murals.

What makes Wang stand out is that her family has been guarding the temple for four generations — cleaning it, keeping people from entering and preventing theft. Since getting married at 20, Wang began assisting her mother-in-law who became the guardian of the temple in the 1950s. When she passed away in 1988, Wang took over the responsibility.

"Our family has had a close con-



Buddhist sculptures in the Tiefs Temple in Gaoping, Shanxi province, which opened to the public in August. ZHU XINGXIN / CHINA DAILY

nection to the temple for generations. It is my home and guarding it is my responsibility," Wang says.

With the passing years, it has been a challenge for her to preserve the

temple. After discussions with her daughter Meng Xuezheng and her son-in-law, Wang Wendong, the couple moved from their nearby home to the temple to help Wang Gaiying.

"My mother always chatted with my grandmother about stories regarding temple guarding," Meng says. "These stories have been ingrained in my heart since childhood. The temple is our root, our home, a legacy of steadfastness and faith passed down through generations. I am determined to protect it."

Just as Meng vowed, her daughter took on the role of part-time tour guide at the temple after graduating from college, joining her grandmother and mother in safeguarding it.

In 1986, the local cultural preservation authorities undertook an emergency restoration program at the temple. In 2004, the provincial government designated it as one of the province's fourth batch of key cultural heritage preservation sites. In 2017, the Gaoping authorities initiated extensive restoration work at the temple. Two years later, the State Council officially recognized it as part of the eighth batch of national key protected cultural relic units.

Shen Fei, Party secretary from the Gaoping cultural and tourism bureau, knows that preserving the temple is far from enough.

As the notice at the opening of Tiefs Temple said, the structure is a heritage protection unit with unpaired sculptures. While these sites offer a unique and enriching experience, visitors are urged to prioritize cultural preservation and cautioned not to cause any damage.

"Currently, we don't have the capacity to restore the temple and there are no future plans for renovation. What we can do is keep it as it is through the protection of Wang Gaiying's family, who are guarding it," Shen says.

In some temples that are not open to the public in the quiet mountains and countryside of Shanxi, more than 3,000 grassroots protectors like Wang Gaiying care for these ancient buildings. The locals call them temple keepers, who watch over the structures day and night.

Like unsung heroes, they have been preserving the past and ensuring that the cultural treasures of Shanxi are protected for future generations.