Thermography for the conservation of historical artifacts: the case of the Chinese Buddha in an underground environment

By Testo

Thermography is the ideal choice for protecting historical treasures. With the use of this technique, we are able to identify imperfections that can damage our artifacts, such as water infiltration or mold, invisible to the naked eye. This technology is increasingly widespread as a preventive maintenance method for cultural and artistic heritage throughout the world.

Thermography is not a measurement of temperature, but is based on the principles of thermodynamics: each body is characterized by its own thermal emission depending on its surface temperature, which is in turn conditioned by the thermal conductivity and specific heat of each material. In fact, each material has a different capacity to transmit or retain heat.
Thermography allows us to investigate and identify internal problems that are not visible to the naked eye and is very useful in various applications for the protection of artistic and cultural heritage.

Some examples:

- large surfaces can be mapped to search for cavities, voids or infill
- the presence of water infiltration by capillarity can be observed
- over-plastered mosaics can be studied and maps of the adhesion of the tiles can be obtained
- detachments and cracks in frescoes can be detected

The potential of thermography is truly enormous even for medium and small-sized artifacts, such as archaeological finds, bronzes, paintings, ancient books and parchments.

THE APPLICATION CONTEXT

The Chinese nation, with a history of over 5,000 years of uninterrupted civilization, has created an extremely rich cultural heritage. Cultural relics are non-renewable historical resources and are the "flagship" of China. Relics are a precious material cultural heritage, not only a historical and tourist resource, but also represent Chinese artistic culture and are the basis of modern science and technology.
Cultural relics embody the national sentiment, cohesion and consensus of the Chinese people in particular: they generate profound and majestic power, can be called the "roots" and

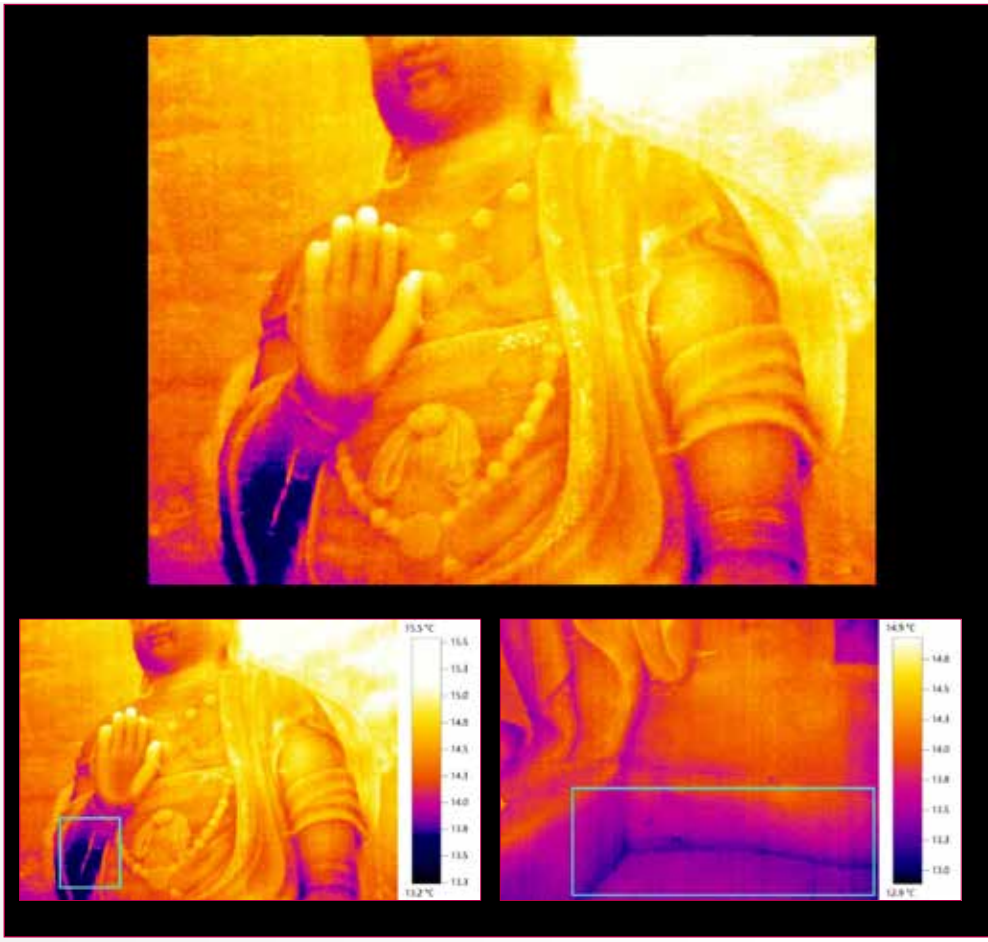
"sources" of the nation and the country, a very important concept for traditional Chinese culture!
Premier Li Keqiang stressed at the 12th National People's Congress in 2016 that by protecting historical relics, we promote the development of cultural enterprises, to pass on traditional Chinese culture, and also modernization, not only to create abundant material wealth, but also to provide excellent spiritual products to the people through culture, thus to win the respect of the world with civilization and moral strength.

THE CHALLENGE

Testo has received many requests for cultural heritage management around the world, hoping to provide solutions for the protection of historical relics, so that the precious relics get more attention and maintenance. Especially in some caves or in environments where the temperature and humidity are not stable, taking measurements on such cultural artefacts is very challenging. However, once all the measurements have been taken, the thermal imaging camera used for the measurements will certainly become "famous in history" together with the artefacts analysed.

THE SOLUTION

Testo 890 is a thermal imaging camera with high thermal sensitivity and high resolution. Furthermore, the possibility of using different lenses allows collecting images of both details at a great distance and large surfaces when the spaces are narrow. As can be seen in the collected images, testo 890 has proven to be particularly suitable for this type of application, highlighting some problems of the Buddha statue. Through the thermal imaging camera we can observe with precision that under the left arm of the Buddha statue there are evident cracks, highlighted with the lighter colours and caused by the heating of the material by air convection inside the cracks themselves. It can also be observed that these cracks are invisible to the naked eye, making thermographic inspection particularly useful in this case.
The area at the base of the statue raises suspicions of excessive humidity, highlighted by the cooling caused by the evaporation of the water. This could identify an area with mold on the surface in contact with the floor. Here, further investigations are necessary.



Abstract
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Keywords
Thermography; diagnostics; conservation; heritage; technologies

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CHNT 29

Conference on Cultural Heritage and New Technologies

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Call for Papers: April 15 to June 30

Notification: from July 14

Early Bird Tickets: until October 06

CHNT29: November 04 - 06

The association **CHNT-ICOMOS** Austria was founded in early 2021 to organise the annual Conference on Cultural Heritage and New Technologies. It is a sister association of the Austrian National Committee of the International Council on Monuments and Sites (ICOMOS). The association has around 20 members who contribute to the continuous development of the conference and participate intensively in the preparations.

The City of Vienna (Department 7 - Cultural Affairs) is the association's cooperation partner and is hosting the event, which is funded by the Federal Ministry of Culture, Arts, Civil Service and Sports.

CHNT provides a platform for exchanging views on the Cultural Heritage protection agenda and enables discussions among colleagues from a wide range of disciplines. During the conference the latest approaches to the research, management and monitoring of world heritage sites, cultural assets and archaeological monuments will be presented. The focus is primarily on interdisciplinary cooperation between experts with a strong interest in the application of new technologies in the field of cultural heritage.

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Presenters and session chairs who participated in CHNT 29 have the possibility to publish their cont-ributions in the proceedings of the conference.

The call is open from April 15 to June 22, 2024!

„We believe that technology can make a difference and help to protect, research and valorize Cultural Heritage in a sustainable way and to thereby preserve it for the next generation."

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Giovanni Battista Moroni, Il cavaliere in rosa, 1560, Olio su tela, Palazzo Moroni – Bergamo