CROWN.
Examinations of the materiality, technology, and state of preservation of the Imperial Crown in Vienna
An interdisciplinary research project of the Kunsthistorisches Museum Vienna

The Imperial Crown of the Holy Roman Empire in Vienna is one of the most valuable objects of the Imperial Treasury, both materially and non-materially. It has become inscribed into collective memory as one of the most important symbols of European history in the course of its around thousand-year-long existence.

There are still many open questions despite a nearly 250-year history of research. These concern the materials and the manufacturing technique just as much as the dating and early history of the crown, which is most recently once again being discussed with a great deal of controversy at the intersections between art history, archaeology, and historical scholarship. Against this background, the crown is for the first time being comprehensively investigated by an interdisciplinary research team of the Kunsthistorisches Museum in cooperation with international institutions and with the assistance of the latest technologies. The examinations should provide new findings on the history, materiality, technology, and state of preservation.

The only surviving crown of the Holy Roman Empire

For a long time linked erroneously with Charlemagne (r. 768–814), the Imperial Crown was used for the coronations of kings and emperors of the Holy Roman Empire until its end in 1806. Its concrete use may have spared it destruction, but also resulted in much damage, repair, loss, and reworking.

These changes and their influence on the state of preservation of the crown, together with questions concerning the materials used and the manufacturing techniques applied, provide the focus for this research project. The examinations will be conducted jointly by a team of researchers from the fields of history and art history, conservation science, and science.

Technological, scientific, and historical examinations

Up to now, there have been no scientific determinations concerning either the gold alloys or all 172 stones on the crown. The gemmological analysis of the entire setting was initiated, as was a systematic visual documentation of all elements of form and decoration with the help of a state-of-the-art 3D digital microscope that makes the structure and technique of the goldsmith work visible in an entirely new way. In the course of this work, two never before described ancient gems on the crown were documented and photographed, while views of all interior sides of the crown were created, free of distortion, for the first time.

The scientific examinations primarily focus on the characterization of the metal alloys, the niello, the enamels, the precious stones, and pearls. These examinations are being prepared and realized in close coordination and cooperation with leading international experts, including at the Rathgen Research Laboratory in Berlin, the Bayerische Staatsbibliothek in Munich, and the Centre de recherche et de restauration des musées de France in Paris. This should assure comparability for the evaluation and interpretation of data, also with regard to measurements on comparison objects. The latter concerns other precious works of the goldsmithing art of the tenth and eleventh centuries, to which access has been provided for comparative measurements by institutions like the Essen Cathedral Treasury, the Bayerisches Nationalmuseum in Munich, and the Louvre in Paris.

Parallel with the technological examinations, pictorial and text sources are being compiled that should considerably expand our knowledge of the fate of the crown, particularly for the period after 1500. All inscriptions on the crown are also being examined jointly, as individual letter forms have most recently been put forward as arguments in favour of first dating the origin of the crown, up to now predominantly dated by art historical scholarship in the second half of the tenth century, to around 1150.

The results of all these examinations should not only provide new foundations for findings on the historically developing condition of the crown, but also for continuing research on the medieval art of goldsmithing in general.

Initial results of the examination of the stone setting

In preparation for scientific examinations of the stone setting, 3D digital microscope images of the stones and of characteristic inclusions were produced. Thanks to cooperation with Prof. Lutz Nasdala and his team from the Institute for Mineralogy and Crystallography of the University of Vienna and the company WITec GmbH (Ulm) in May 2022, all 172 stones on the circlet, the front cross, and the arch could be subsequently identified using a spectrometer system adapted to this purpose, which enables the recording of both Raman and photoluminescence spectra. According to this, 71 sapphires, 50 garnets, 20 emeralds,

13 amethysts, 4 chalcedonies, 3 spinels, and 11 different varieties of coloured glass are today found on the circlet, the front cross, and the arch.

One spectacular discovery for the research of precious stones concerns the large red spinel in the middle row of the front plate. The measurements here prove that the stone had been exposed to temperatures of nearly 1,000° C before it was set in the crown. Whether this involved heat treatment aimed at improving the colour of the stone, today completely common, is still an open question. This would suggest not only the first large spinel in a historical decorative object, but also the oldest spinel for which such a treatment has been proven to date. This and other findings, for example, concerning the variety of the garnet types used, provided by Prof. H. Albert Gilg, Chair of Engineering Geology at the Technical University of Munich, will be published in the context of an article soon to appear in the British Journal of Gemmology and be opened to discussion.

It was also possible in the course of this programme of examinations to document two ancient amethyst intagli as part of the stone setting in the photograph for the first time. Unusually, their representations are turned inwards and can therefore not be seen from an exterior viewpoint, which is why they have to date never been scientifically studied. They present a half-length maenad with a theatre mask and a harbour scene with ships. Processing is currently being conducted by Prof. Erika Zwierlein-Diehl from the University of Bonn, who has already published several times on the ancient gems and cameos of the Kunsthistorisches Museum. According to the present state of knowledge, the intaglio with the maenad is the earliest and loveliest example of a type known only from a few examples. It was created by a Greek master craftsman during the transition from the late Hellenistic style to the Augustan Classicism from the mid to the third quarter of the first century BCE. The intaglio with the harbour scene in the so-called miniature style originated at around the end of the first century BCE – first century CE. Among the twelve known harbour images on intagli, this representation is one of the most detailed of its kind.

Currently underway are preparations for additional examinations with the help of X-ray fluorescence analysis, a non-destructive method that should provide additional findings, for example, relating to the classification of diverse types of garnets or special inclusion phases that might provide indications of the provenance of individual stones. In the process, the focus is also on the numerous pearls on the crown, the specifics of which can be analysed and evaluated with the assistance of Stefanos Karampelas from the Laboratoire Français de Gemmologie in Paris, also a leading international expert in his field.

The website for the project

The research project is accompanied by the website projekt-reichskrone.at/en/. It offers an interested public comprehensive information on the history and symbolism of the Imperial Crown, explains the individual examination methods, and will be continually supplemented with new findings.

DATA AND FACTS OF THE RESEARCH PROJECT

Project name: CROWN. Examinations of the materiality, technology, and state of preservation of the Imperial Crown of the Holy Roman Empire in Vienna

Website: projekt-reichskrone.at/en/

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GLOSSARY

The Holy Roman Empire (of the German Nation)

The designation Holy Roman Empire is derived from the idea and the claim of medieval Western rulers to continue the tradition of the ancient Imperium Romanum. Following its beginnings under Charlemagne, who was crowned emperor by the pope in 800, the medieval 'Empire of the Romans' took on concrete form as of the tenth century. The designation as 'Holy Roman Empire' established itself in the twelfth and thirteenth centuries. The addition 'of the German Nation' only appeared after the late fifteenth century.

This empire, whose sovereign was elected by a group of princes, was composed of numerous more or less autonomous territories. At its most expansive, it encompassed large parts of Central Europe as well as Burgundy and territories in Italy. It ended under the political pressure of Napoleon: Emperor Francis II declared the dissolution of the empire on 6 August 1806.

The Imperial Regalia

The Imperial Regalia are the only surviving royal treasure of the European Middle Ages. They consist of insignia and vestments from the most varied periods between the eighth and sixteenth centuries. The Imperial Crown is part of these holdings. In 1796, the entire treasure

was removed to safety from Nuremberg in the face of the advance of French revolutionary troops and subsequently to Vienna, to the court of the reigning emperor. It also remained there after the end of the empire as part of the Imperial Treasury.

The form of the ensemble, which lent legitimacy and authority to the king or emperor, became comprehensible as of the eleventh century. This was complemented in the fourteenth century by veneration as relics of Charlemagne, which had an additional identity-establishing effect and ensured the preservation and use of the insignia and vestments for coronation festivities until the end of the empire.

The locations for safekeeping changed frequently in the Middle Ages. The greatest part of the treasure was only deposited permanently in Nuremberg in 1424. From there, the relevant elements were brought to coronations in Aachen or Frankfurt am Main (mainly here after 1562).

The Imperial Crown

Various crowns that made clear the rank and position of the respective imperial sovereign existed in the Early and High Middle Ages. However, it was this insignia, which was long erroneously believed to be the crown of Charlemagne, that became the symbol of power per se in the empire over the course of time.

Much about this crown is extraordinary or even unique: the octagonal form, the arch with the specific naming of an emperor, the décor with its complex statement, and the long history. Considered beyond dispute over many decades were the findings of the Viennese art historian Hermann Fillitz (1924–2022), who dated the circlet to the Ottonian era (prior to 980 CE), to which the front cross and arch were added in the eleventh century. However, the field of archaeology has recently been arguing in favour of the origination of the entire crown during the reign of the Salian Conrad II (r. 1024–1039), historians in turn in favour of first dating it under the Hohenstaufen Conrad III (r. 1138–1152). However, none of these approaches has met with complete acceptance to date.

PRESS PHOTOS

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Imperial Crown
Western Germany(?), second half of tenth century(?) with later additions. Gold, enamel, gemstones, glass stones, pearls, iron
Kunsthistorisches Museum Vienna, Secular Treasury
© KHM-Museumsverband

Set-up for taking images
with the 3D-digital microscope
© KHM-Museumsverband

Set-up for taking images
from the inside of the front plate
with the 3D-digital microscope
© KHM-Museumsverband

Imperial Crown
Western Germany(?), second half of tenth century(?) with later
additions. Gold, enamel, gemstones, glass stones, pearls, iron
Kunsthistorisches Museum Vienna, Secular Treasury
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Imperial Crown
Detail: the enamel plate featuring a depiction
of King Hezekiah and the Prophet Isaiah
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Imperial Crown
Detail: left side-plate
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Imperial Crown
Detail: inside of the broken side-plate,
repaired with a bow-shaped piece of gold plate
© KHM-Museumsverband

**High-resolution image assembled
from several microscopic images**
from the enamel plate featuring a depiction
of King Solomon (detail)
© KHM-Museumsverband
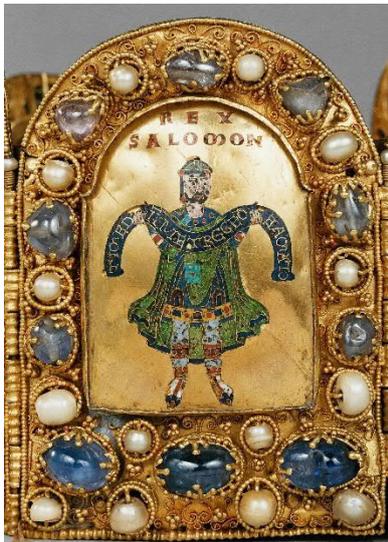
Imperial Crown
Detail: enamel plate depicting King Solomon
© KHM-Museumsverband

Decorative element detail on the circlet
3D-digital microscope image, using mirrors
with motorized rotation, 20x magnification
© KHM-Museumsverband

**Intaglio depicting a half-length maenad
with a theatre mask** (50–25 BCE)
on the back plate of the circlet
© KHM-Museumsverband

Sapphire of exceptional quality on the left side-plate
3D-digital microscope scan, 30x magnification
© KHM-Museumsverband

Large spinel in the centre on the front plate
3D-digital microscope scan, 30x magnification
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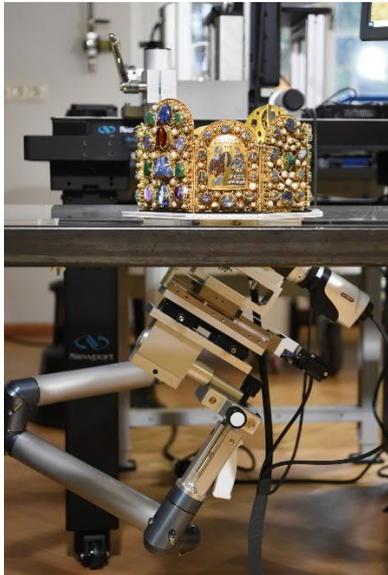
Set-up for taking images from the inside of the circlet
with the 3D-digital microscope, using a flex arm stand
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Teresa Lamers and Herbert Reitschuler **positioning the circlet**
while taking photographs with the 3D-digital microscope
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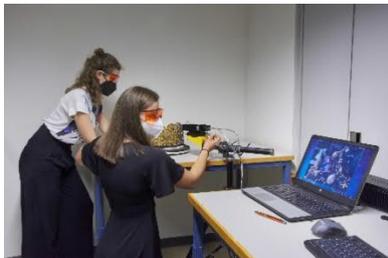
Teresa Lamers and Annalena Erlacher
preparing a Raman measurement
while analysing the gemstones
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Imperial crown, imperial orb and imperial sword as important parts
of the so-called **imperial regalia**, which have been used continuously
for coronations of the sovereign of the Holy Roman Empire (of the
German Nation) since the fifteenth century
Kunsthistorisches Museum Wien, Secular Treasury
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