

N RICH

National Research Institute of
Cultural Heritage

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National Research Institute of
Cultural Heritage



| COVER STORY |



While excavating the 8th century Unified Silla era building and corridor site, a tiny gold leaf artifact was discovered crumpled.

The gold leaf artifact has bird and flower patterns carved in lines at a thickness of 0.05 millimeters in width, which is finer than a human hair, becoming one of the most detailed metal craft relics discovered by far.

The pattern is very realistic and it is so detailed that it is almost impossible to recognize the pattern with the naked eye.

How did the people of Silla make such a mysterious artifact which would not be easy even for modern-day craftsmen to produce?

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Gold Leaf Metal Crafts From the Unified Silla
Period Excavated in Donggung Palace and
Wolji Pond

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Hopes to Broaden the Scope of Communication about Cultural Heritage with People around the World through NRICH



**Director General of National Research
Institute of Cultural Heritage**

KIM Yeonsoo

I am very pleased to announce the fifth issue of the NRICH English Newsletter. The NRICH newsletter was first published in 2020 to promote the latest research results and news on Korean cultural heritage at home and abroad.

The unprecedented COVID-19 pandemic made the world to experience a whole new lifestyle such as daily life covered by face masks and the contactless and contact-free culture. In spite of the pandemic, the NRICH has continued to make achievements as the country's leading cultural heritage investigation and research institute.

As of 2022, the NRICH is conducting 55 research projects covering the fields of archeology, art heritage, architectural heritage, natural heritage and conservation science. In the fifth issue of NRICH, I would like to introduce major achievements and popular topics among the ongoing researches by our institution.

This issue introduces the cases of the gold leaf artifacts found during an excavation in Gyeongju, the capital of the Silla Kingdom for 1,000 years, as well as digital datafication of Geumseokmun, or Korean epigraphs, columnar joints showing the geological diversity of the Korean Peninsula and heritage conservation technology exchanges with Thailand and Mongolia. I expect this issue will provide an opportunity to enhance understandings on cultural heritage researches in Korea and share our achievements.

The NRICH hopes to broaden the scope of communication regarding cultural heritage with people around the world through each issue. I would like to express my gratitude to all readers of the NRICH newsletter.

NRICH History

Cultural heritage that have formed naturally or artificially over many years are valuable heritage not only for the people of their country of origin but for all humankind due to their historic, artistic, and academic value, and their natural beauty in the case of landscapes. As such, it is every country's duty to survey and study them and to preserve them for future generations.

The National Research Institute of Cultural Heritage (NRICH) has been striving to reveal and spread the value of our culture and history through research for the past 50 years and has become the only research institute in Korea that is in charge of comprehensive research on cultural heritage. It is our responsibility to enhance the value of the country's culture through creating knowledge and promoting cultural heritage and we aim to become a world-class cultural heritage research institution.



1969. 11.
The National Research Institute of Cultural Heritage established (In Seoul)

1970's

- 1973**
Excavation of Cheonmachong Tomb (World Heritage)
- 1975**
Excavation of Hwangnam Grand Chong Tomb (World Heritage)
- 1976**
Excavation of Donggung Palace and Wolji Pond, Gyeongju (Anapji, Historic Site No. 18)
- 1973**
Started research in the field of artistic cultural heritage (*First target: Buddhist bells)
- 1975**
Started research on conservation science for cultural heritage

1980's

- 1980**
Excavation of Mireuksa Temple site, Iksan
- 1983**
Excavation of Hwangnyongsa Temple site, Gyeongju
- 1984**
Survey of all the Buddhist painting in Korean temples

1990's

- 1990**
Expanded excavation in ancient capitals (Gyeongju, Buyeo, etc.) through opening regional offices
- 1999**
Conducted repair and restoration on Iksan Mireuksa Temple stone pagoda

2000's

- 2004**
National Research Institute of Cultural Heritage relocated (to Daejeon)
- 2005**
Implemented cultural heritage restoration technology and materials research
- 2006**
Expanded research to natural heritage

2010's

- 2005~2019**
Established regional research offices and one conservation center
- 2017**
Implemented safety and disaster prevention of cultural heritage in light of climate change and potential disaster risks

NRICH Organization

Director General

9 Divisions

- Administrative Division
- Planning and Coordination Division
- Research Division of Archaeology
- Research Division of Artistic Heritage
- Research Division of Architectural Heritage
- Conservation Science Division
- Restoration Technology Division
- Natural Heritage Division
- Safety and Disaster Prevention Division

7 Regional Offices

- Gyeongju National Research Institute of Cultural Heritage
- Buyeo National Research Institute of Cultural Heritage
- Gaya National Research Institute of Cultural Heritage
- Naju National Research Institute of Cultural Heritage
- Jungwon National Research Institute of Cultural Heritage
- Ganghwa National Research Institute of Cultural Heritage
- Wanju National Research Institute of Cultural Heritage

1 Center

- Cultural Heritage Conservation Science Center



The Essence of Metal Crafts from the Unified Silla Period Found in Donggung Palace and Wolji Pond

Gyeongju National Research Institute of Cultural Heritage

KIM Gyeongyeol

The Donggung Palace and Wolji Pond in Gyeongju is a royal palace site consisting of a garden and a villa for crown prince, built in the 14th year (674) and the 19th year (679) of King Munmu's reign respectively. Namely the center of Silla's royal capital, it is an important site representing the rise and fall of Unified Silla.

Recently, a gold leaf engraved with blooming flowers and two birds design recovered from the east site made the headlines. The keyword for this object is minuteness. Could anything be more detailed than this? Hundreds of lines with a thickness around 0.04 to 0.05 millimeters are carved on the gold leaf, 3.6 centimeters wide and 1.17 centimeters long.

We will take a closer look at this gold leaf in four themes. First, its dramatic excavation circumstances; second, detailed carving; third, production technique and the carved pattern; fourth, the significance of the gold leaf in the history of Silla's metal crafts.



1. Dramatic Excavation Circumstances

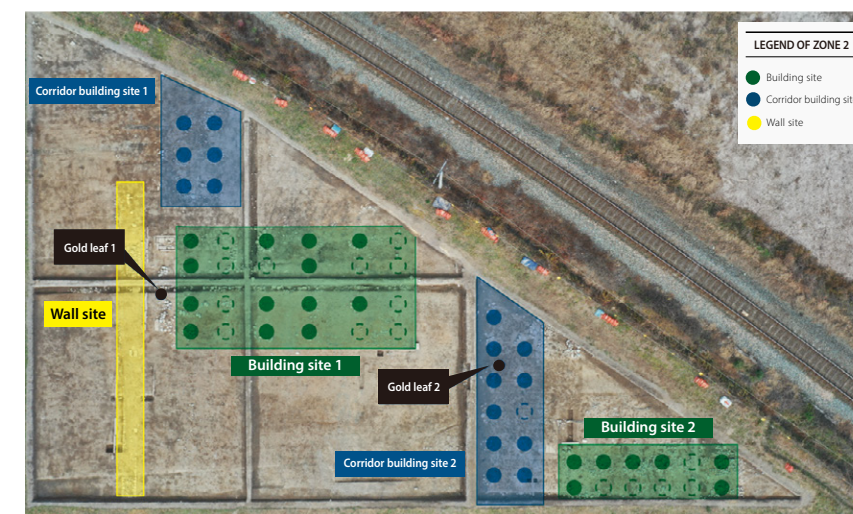
In late October, 2016, an excavation worker urgently called an investigator at the site. An artifact in the size of a red bean, mixed with dirt, glittered like gold, and it was documented for treatment. Ten days later, a similar object was found in another grid about 20 meters away.

This was how the gold leaf artifact was found and excavated. Two pieces of gold leaves, found in a miraculous excavation process, were joined with each other during conservation treatment and confirmed to be one object. At the same time, very detailed pattern was engraved on the gold leaf. The gold leaf is 3.6 centimeters wide, 1.17 centimeters long and 0.04 millimeters thick with a weight of 0.3 grams. The thickness of lines on the gold leaf was only 0.05 millimeters. Hundreds of the lines formed *ssangjomun*, or a pattern of a pair of birds facing flowers. Without the meticulous excavation process by the field workers and our researchers, the gold leaf may not be with us now.

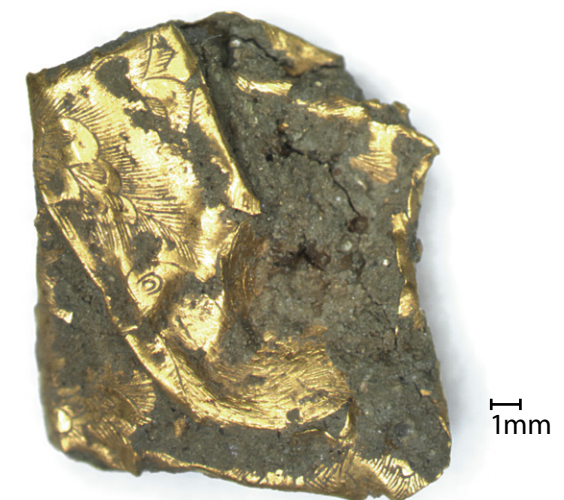
2. 0.05mm Lines Engraved on 0.04mm-thick Gold Leaf

The keyword for the gold leaf found in the site is delicateness. The average human hair is about 0.08 millimeters thick and carving a pattern with lines in a thickness of 0.05 millimeters, which is thinner than hair, is at the pinnacle of detailedness. Among the modern technologies that represent detail is semiconductor manufacturing. The fine process of semiconductor making is conducted in nanoscale and the modern semiconductor manufacturing technology could replicate the fine patterns on the gold leaf. However, the important point is that micro-scale detailed patterns were engraved on gold leaf during the Unified Silla period. Therefore, it can be said that, among the relics identified so far, the detail of the engraving is in the highest level ever. According to the analyses conducted up to now, it seems that the pattern was engraved with a very fine stylus or chisel by applying gold leaf to a certain object. However, there is a debate among experts over whether it was the

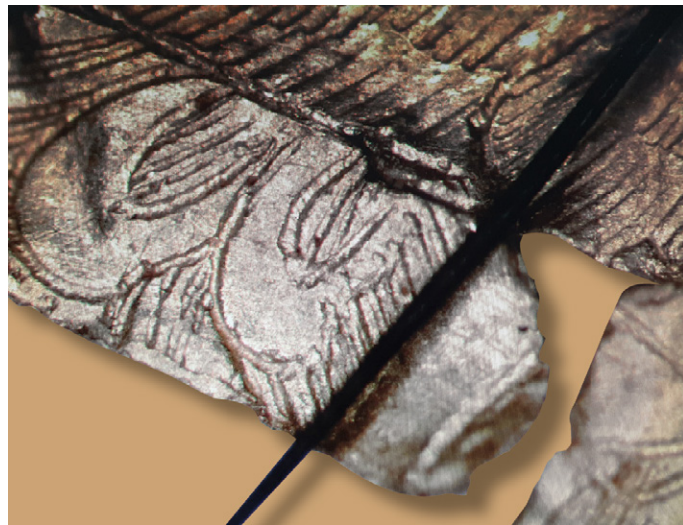
line is drawn or chiseled into. As seen in the electron microscope analysis results, there are traces of gold pushed inside the line (the shape of the bean pod) and it shows that the line was not punched in or drawn with a single stroke. Therefore, considering the convenience for engraving the pattern, it seems a little more likely that it was drawn.



① The plan of Zone 2 and the location of gold leaf



② The gold leaf parts excavated from the north side of Zone 2



③ Thickness comparison of the patterns engraved on the gold leaf and human hair

The patterns engraved on the gold leaf like this is almost impossible to recognize without a magnifying glass. If so, questions such as 'Did they engrave such elaborate patterns with a magnifying glass?' or 'Was this carved with the extraordinary sense of the unknown Silla craftsman?' arise.

It is presumed that the patterns were engraved using a magnifying glass, but unfortunately, the magnifying glass of this period has not been identified in Korea to date. Some estimate that the crystal lens found in the Bunhwangsa Temple site in Gyeongju as a magnifying glass, but considering the shape of the lens and its magnifications, it is unlikely that it was used as a magnifying glass. However, the fact that the crystal was processed in the form of a convex lens shows that the people of Silla understood the concept of condensing lens from the optical perspective and also likely to have known the concept of magnifying at the time. Therefore, although an actual magnifying glass has not been found archaeologically as of now, it is reasonable to assume that the magnifying glass or a similar tool was made and used to engrave patterns on the object. This is also supported by the patterns as there are some mistakes found, but the amount is very small compared to the total number of the lines and there are almost no overlaps of many lines of the pattern, thus it is considered that the magnifying glass was used to carve the patterns.

3. Production Technique and Flowers and Birds Engraved on Gold Leaf

A notable part of the gold leaf's production method is that the patterns were carved on a large gold leaf first, then only the necessary parts were cut and used. This is highly assumed because the cut off traces of the engraved patterns are found on the artifact as well as the edges are slightly curled due to its cutting. Therefore, it is estimated that the current shape, which is an indeterminate form close to a trapezoid, is a finished product. There is no hole to be found for the hanging purposes, so it seems that it was directly attached to an object; however, there are no traces of pigment nor foreign substances found on the back side of the object.

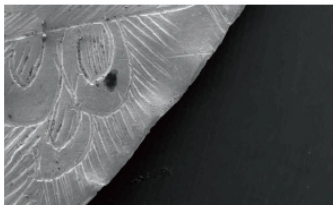
The type of bird engraved on the object appears to be a turtle dove. The slightly protruding forehead; the protruding cere from the forehead to the beak; the typical toe shape of a forest bird without webbing and toes developed from the first to the fourth one; the characteristic shapes of the body and tail feathers and the body to wing ratio are the reasons for considering it to be a turtle dove. Turtle doves often symbolize conjugal harmony because a male and female pair always travel together, but it is difficult to understand the exact meaning of the pattern at the moment as the symbolic meaning of a pattern continues to change according to the times and regions. Interestingly, it is very likely that the birds drawn on the gold leaf represent a male and a female. If you observe the bird drawn on the left and the bird on the right, you can see the differences. The shape of the neck feathers, the direction of the tail, and the direction in which the tail feathers are engraved are different. The bird on the right has more neck feathers than the left and the tail is downwards with the tail feathers pointing downwards. Since the pattern is so detailed, it is likely that these differences reflected some significance.



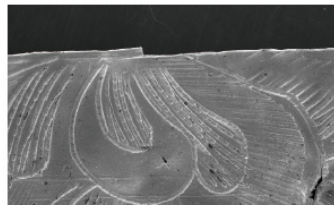
④ The cut off trace of the gold leaf after engraving the pattern



⑤ The trace of a mistake by the artisan



⑥ The edge of the gold leaf slightly curled due to cutting



⑦ Details of the engraved patterns

Normally the male and female doves are distinguished by pressing the head of the bird or slightly shaking the bird in order to confirm the female's tail going up and the male's tail going down for the purpose of mating. So, it is most likely that the bird on the left side is female and on the right side is male.

The flower carved on the gold leaf is known as *danhwa*, which literally refers to round flower. It is an imaginary flower design popular during the Unified Silla period and is also found in objects excavated from the Hwangnyongsa Temple site and the Garden Site in Guhwang-dong, Gyeongju.

The pattern carved on the gold leaf is a typical symmetrical ssangjomun (a pattern of a pair of birds). This pattern is easily found in roof tiles from the Unified Silla period. The shape of the pattern suggests that the gold leaf dates to the 8th century. Many researchers have suggested that the ssangjomun is originated from Sassanid Persia and introduced to the Korean Peninsula via China. However, the gold leaf from the site is depicted very realistically, while the patterns found in the Sassanid or China are rather formal. Therefore, we can presume that this is the indigenized Silla style.

4. Significance of the Gold Leaf in Metal Craft History

First, this gold leaf was made of ultra-high purity gold. The electron microscope analysis found that other elements are close to zero percent. It is close to the true meaning of pure gold. Nowadays, with the development of refining technology, it is not difficult to manufacture 99.99wt% of pure gold. However, the fact that technology for pure gold production continues to be developed even now indicates

that the technology is not so easy to achieve. Gold is a highly malleable and ductile metal due to the presence of many free electrons in its material properties. So it would not have been so difficult to pound and flatten pure gold wide and thin, but refining high purity gold would have been very difficult. There were very few gold objects made of pure gold during that time (This may be due to the hardness of gold metal was problematic for the practical use). For the reference, the average purity of gold crowns excavated from wooden chamber tombs with stone mound of Silla is around 80-89% (19.3k-21.1k).

Second, the ssangjomun pattern is described in a very realistic way. Ssangjomun designs recovered from the Korean Peninsula are often formal or added with imaginary elements. However, this object is very realistic. A relic with similar design is the silver Buddhist urn engraved with flower and bird design, presumed to be collected from the Hwangnyongsa Temple site in Gyeongju.

It seems that level of realistic expression can be evaluated not only in the field of metal crafts, but also in the field of fine art of Silla. Paintings and drawings from Silla period are rare and metal crafts in this level of realistic expression are hard to find as well. The use or function of the gold leaf is not clarified yet, because no similar object was ever excavated in Korea nor abroad. However, the general consensus is that this gold leaf is probably for the utopia or for gods rather than functioning as decoration. If it were to be a decoration, the patterns should have been visible.

This precious object is now on display at a special exhibition "The Blooming Flowers and Birds on 3 centimeter Gold Leaf" at Cheonjongo Special Exhibition Room of the Gyeongju National Research Institute of Cultural Heritage. The exhibition is closed on weekends and holidays, but is available at the official website of the Gyeongju National Research Institute of Cultural Heritage.



Backing Up Hidden History: Introduction to *Geumseokmun* and Building Digital Data

Research Division of Artistic Heritage

LEE Jongsuk

Definition of Geumseokmun

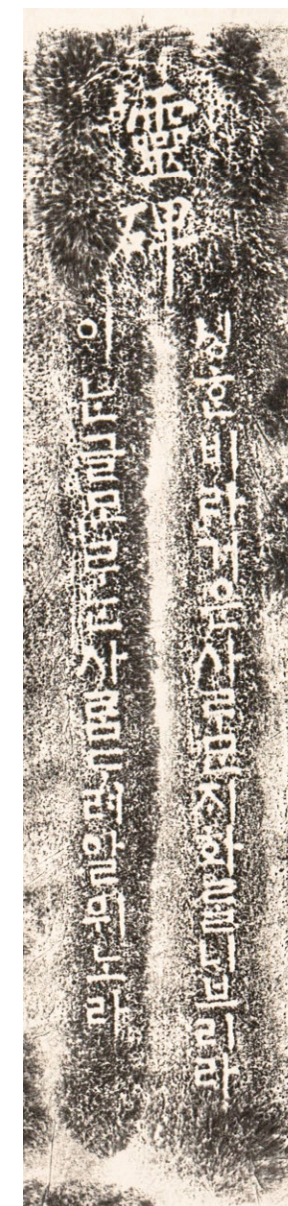
Geumseokmun refers to the inscription on metal and the inscription on stone. In a larger context, geumseokmun includes all kinds of letters left on bone or tortoise shell, wooden tablet, earthenware, roof tile and brick. Therefore, geumseokmun, or epigraph, can be defined as letters written on materials other than paper.

Origin of Geumseokmun

The origin of geumseokmun is the origin of the script, because whether it is metal or wood, it is the script that is cast or carved on the material. Typically, the origin of geumseokmun is sought from the literary relics of the region where ancient civilizations developed. For example, the Code of Hammurabi, an epigraph representing the Mesopotamian civilizations, is a collection of 282 laws inscribed on a black basalt stele using cuneiform letters by the Old Babylonian king Hammurabi in 1790 BCE. The Rosetta Stone, a major epigraph from the Egyptian civilization, is an epitaph created in commemoration of the enthronement of Ptolemy V of ancient Egypt in 196 BCE. The Indus Scripts of the Indus Civilization are in the form of hieroglyphics inscribed on square stamp seals and China, the birthplace of the Yellow River civilization, has inscriptions on bronze ritual vessels as well as oracle bone scripts dating back to 1200 BCE.



1 Petroglyphs of Bangudae Terrace in Daegok-ri, Ulju (National Treasure)



2 Epitaph of Yi Yun-tak written in Hangeul (Korean alphabet), Seoul (Treasure)

Types and Characteristics of Korean Epigraph

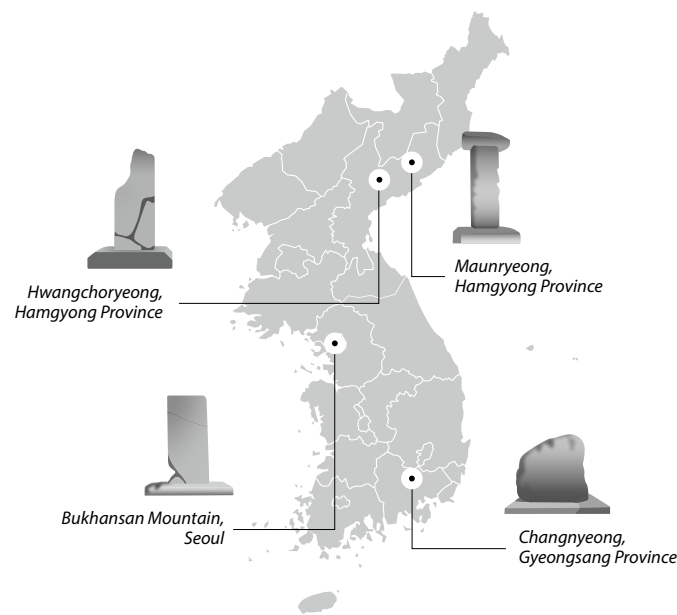
The origin of Korean epigraphs can be found in the petroglyphs such as the Petroglyphs of Cheonjeon-ri, Ulju, and the Petroglyphs of Bangudae Terrace in Daegok-ri, Ulju (Figure 1), which date back to prehistoric times. Since then, after Chinese characters were introduced, various types of epigraphs featuring Chinese characters have been produced in diverse materials and purposes. After the creation of Hangeul, the Korean Alphabet, in the Joseon Dynasty (1392-1910), epigraphs using Hangeul (Figure 2) also appeared. Currently, there are about 15,000 epigraphs existing in Korea and they can be classified according to their shape and content, resulting in following features.

In the Korean peninsula, epigraphs began to be produced in full fledged from the

Three Kingdoms era. For example, the Gwanggaeto Stele from the Goguryeo Kingdom is outstanding in its appearance, calligraphy and its content. The Gwanggaeto Stele was erected to honor the achievements of Gwanggaeto the Great, the 19th king of Goguryeo, by his son King Jangsu in 414. This granite stele is approximately 6.39 meters tall with 1,775 characters inscribed on it. Major epigraphs of the Baekje Kingdom include the Stele for Sataek Jijeok, Buyeo; Buried Memorial Tablets from the Tomb of King Muryeong; and Reliquary from Wangheungsa Temple Site, Buyeo (Figure 3). During the Silla Kingdom, more writings on stone than metal are extant and most of the stone writings are epitaphs. The most well-known epitaph from Silla era is the



3 Reliquary from Wangheungsa Temple Site, Buyeo (National Treasure)

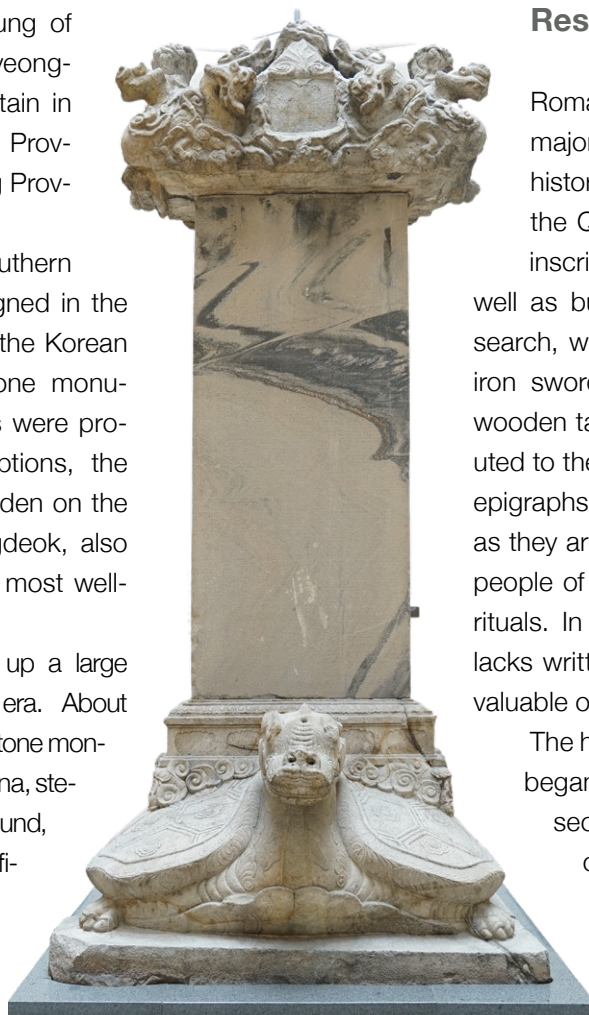


④ Monument commemorating the border inspection by King Jinheung of Silla

four monuments commemorating the border inspection by King Jinheung of Silla in Changnyeong in South Gyeongsang Province, Bukhansan Mountain in Seoul, Hamju in South Hamgyong Province and Iwon in South Hamgyong Province (Figure 4).

During the Northern and Southern States era, when Unified Silla reigned in the south and Balhae in the north of the Korean peninsula, respectively, many stone monuments honoring kings and monks were produced. Among the metal inscriptions, the text and two pairs of celestial maiden on the Sacred Bell of Great King Seongdeok, also known as the Emille Bell, are the most well-known.

Stone inscribed epigraphs take up a large amount among Goryeo Dynasty era. About 70~80% out of the total are from the stone monuments. When monks enter into Nirvana, steles (Figure 5) were erected on the ground, while when nobles or high-ranking officials pass away, epitaph tablets were buried in the tomb. In the case of metal inscriptions, production details for metal crafts such as bells, bronze drums and incense burners were en-



⑤ Stele of Master Wonrang from Wolgwangsa Temple Site, Jecheon (Treasure), which was featured in the background of K-pop boy band BTS performing for the "Dear Class of 2020" virtual event

graved, but the content is very concise.

The amount of epigraphs increase during Joseon Dynasty, but most of those are stone monuments produced from a Confucian perspective. Stone tower steles, which were popular during Goryeo era, slowly disappeared and replaced by building splendid tombs and setting up epitaphs befitting their status as a way to emphasize filial piety for parents or ancestors. *Sindobi* steles, inscribed with biographical information, for kings and special monuments such as the Monument for the Victory at Myeongnyang Battle in Haenam, commemorating the achievements of Admiral Yi Sun-sin were erected. Sign boards and column couplets in palaces and *seowon* (Confucian academy) are also notable elements of existing epigraphs from Joseon era.

The types of epigraphs produced after modernization include *sindobi* and *yuheobi* for honoring ancestors and *sihyebi* for the rich who saved local residents when there is a famine and the epigraphs played a role in inspiring affection and pride for the region.

History of Korean Epigraph Research

Roman epitaphs and papyrus played a major role in the restoration of Roman history. In China, since the advent of the Qin and Han Dynasties, a variety of inscriptions on bamboo and wood as well as burial tablets enriched historical research, while text inlaid in ancient Japanese iron swords and Shōsō-in Documents and wooden tablets from the 8th century contributed to the research of Japanese history. The epigraphs of Korea are of great historical value as they are the primary sources made by the people of the time and reflect their lives and rituals. In the field of ancient history, which lacks written materials, the epigraphs are invaluable objects for research.

The history of research epigraph in Korea began with Yi U (1637-1693), son of Joseon's 14th king and calligrapher. Yi U compiled *Daedong geumseok seo*, a collection of some 300 rubbed copies of epigraphs from the monument for King Jinheung of Silla to Joseon era ones, in 1668.

However, it was only in the 19th century that the study of epigraph developed into the field of epigraphy. Kim Jeong-hui (1786-1856), also known as his pen name Chusa, was a major figure in epigraphy. He published *Geumseok gwaanrok* after researching major epigraphs in Korea. He deciphered and researched the content of the monuments for King Jinheung in Hwang cho ryeong in Hamju, South Hamgyong Province and Mount Bukhansan in Seoul. Then O Gyeong-seok (1831-1879), who succeeded to Kim's epigraphy, wrote *Samhan geumseok rok*, compiling a list of epigraphs since the Three Kingdoms era and interpretation of major epigraphs.

Under the Japanese colonial rule, the Japanese Government-General of Joseon surveyed epigraphs across the country for six years, produced about 1,000 rubbings and published *Joseon Geumseok Chongram*.

After liberation, a lot of new epigraphic materials were excavated, introduced and deciphered and books related to epigraphy were actively published. Some examples include Lee Nan-yeong's *Hanguk Geumseokmun Chubo* (Korean epigraphs supplementary) (1968), Hwang Soo-young's *Hanguk Geumseok Yumun* (Korean epigraphs posthumous writings) (1976) and volumes 1-7 of Cho Dong-won's *Hanguk Geumseokmun Daegye* (Korean epigraph series). Annotations on epigraphic sources, including *Annotation on Ancient Korean Epigraph* volumes 1-3 (1992), *Compared Annotation on Epigraphs of Monks in History* (1993-1995) and *Annotation on Epigraphs of late Silla and early Goryeo Era* volumes 1 and 2 (1996), were also published. Thanks to these academic activities, the research of epigraph ma-



⑥ A series of books on Korean epigraphy by the NRICH

⑦ A web service providing digital version of Korean epigraphs, powered by the NRICH

terials in Korea was able to take a step further. Since 2000, knowledge digitization project boomed and analysis and research of epigraphs entered a new stage (Figure 6). In 2005, the NRICH launched a web service by establishing digital data of 3,000 photos of rubbings, outlines, texts and interpretations of epigraphs from ancient times to early Joseon Dynasty.

And in 2020, we started to build digital data for the "Collection of Korean Epigraph," which has never been done until now (Figure 7). We are making a new database of Korean epigraphs by updating some 3,000 data organized 15 years ago and revamping the range and method of building data. The range of location is expanded to Korean epigraphs located outside Korea and time to include those produced until 1945 (Figure 8), building a prototype of Korean epigraphs of documentary heritage using state-of-the-art technology. It is based on high-definition digital photography and aerial photography provides additional data on the location of the epigraph, while Reflectance Transformation Imaging (RTI) photography (Figure 9) offers more detailed image data.



⑧ Reading rubbings of epigraphs



⑨ Reflectance Transformation Imaging (RTI) photography of epigraphs

Preservation of Phimai Historical Park in Thailand: Five Years of Joint Research between Korea and Thailand

Research Division of Architectural Heritage

HONG Eunki



① The main tower seen from the south gateway

The NRICH has been operating the Asia Cooperation Program on Conservation Science (ACPCS) since 2005 to share knowledge and experience on the preservation of cultural heritage conservation and build a human resources network. Starting in the field of conservation science, this program has laid the groundwork for cultural heritage experts in Asia from various fields such as architecture, archaeology, and art to share their experiences and techniques to promote exchanges.

The joint research project on architectural cultural heritage between Korea and Thailand was also initiated from the exchanges.

An expert from the Ministry of Culture, Thailand, who participated in the program, offered the idea of the technical exchange on preservation and research of stone cultural heritages.

In 2015, the NRICH under Korea's Cultural Heritage Administration and the Fine Arts Department in the Ministry of Culture, Thailand shared the need for personnel and technical exchanges related to stone cultural heritages in the Asia-Pacific region. In 2016, the two countries signed the "Memorandum of Understanding on Technological Exchange for Preservation of Cultural Heritage" to develop technical capabilities in cultural heritage preservation and maintenance and decided to provide mutual support for visits, research, and field investigations.

In the following year, a working-level agreement was made to find ways to preserve the Phimai ruins in Thailand which included ways to expand technical exchanges in the fields such as archaeology, conservation science and architecture. From the NRICH, experts in architecture, safety and conservation took part in the joint research project with



③ A view of the Phimai Historical Park in Thailand

architecture experts from the Fine Arts Department of the Thai Ministry of Culture.

The Phimai Historical Park in Thailand is a temple built during the Khmer Empire in the 11th century, along with the Angkor Wat in Cambodia. It is in the ancient town of Phimai in Nakhon Ratchasima Province on the Khorat Plateau. Phimai was the destination of the Royal Road connecting Angkor Wat and Phimai, and the temple ruins in the center of the town are one of the major Khmer temples in Thailand, established in 1108 CE as a Mahayana Buddhist temple. It was later discovered by a French archaeologist in 1901 and registered as Thailand's national monument in 1936 with continuous excavation, reinforcement, and restoration projects have been carried out. Major restoration began in 1954 and the central tower was restored in 1962 by a joint project between the Thai and the French governments. The Phimai Historical Park opened in 1989 after excavating and restoring major buildings, and the surrounding areas are continuously repaired and restored to this day. However, natural and artificial factors continue to cause damage to the site after the restoration, which resulted Korea and Thailand to join hands to find ways to preserve the cultural heritage.

The Phimai Historical Park is surrounded by two layers of corridors in a square arrangement and a gateway, or gopura, is installed in the north, south, east, and west of the inner and outer corridors, respectively. Inside the inner corridor, the Main Tower is located at the center of the east-west and north-south axis and Prang Phrommathat is on the southeast of the Main Tower, Prang Hin Daeng on the southeast of the Main Tower, and the Brahman Shrine behind Prang Hin Daeng, all damaged. Between the inner



② Memorandum of Understanding between Korea and Thailand

and outer corridors is the Library.

A joint research team of experts from Korea and Thailand conducted investigations on the origin and properties of rocks and carried safety inspection and evaluation to study the status of buildings, case study, and conservation and restoration plan of the Phimai ruins in Thailand from 2016 to 2020. In the survey of status, researchers looked into the surrounding environment, the status of the historical landscape and entry into the ruins, the status of major buildings, the viewing environment, and convenient facilities. Case studies included the repair status and techniques of three historical sites in Bangkok, including Wat Arun Temple, and major Khmer sites such as Phnom Rung Temple and Prasat Muang Tam Temple. To estimate the rock's origin and investigate physical properties, experiments were conducted to analyze the origin of stones in order to find out the characteristics of the rocks constituting the Phimai Historical Park. Rock samples were collected from three major production areas around the park, Shikiho, Lungpuradu, and Seongnoen, and a comparative analysis was performed with the samples collected in the Phimai Historical Park. For safety inspection and evaluation, buildings in the historical park were divided into 33 zones, and buildings in each zone went through investigations for structural and material damage.

Structural damage includes separation, tilt, swelling, differential settlement, breakage, dropout and collapse, and material damage includes weathering, abrasion, crack, and peeling off. The architectural cultural heritages were classified into five grades from grade A, the best condition without safety issues, to grade E, which requires the cessation of immediate use and additional re-

inforcement or repair is needed due to serious defects in major materials. Two sites in the ruins were selected to be monitored twice to see the inclination of the wall and uneven settlement of the foundation. Through three years of thorough research, we tried to establish a comprehensive conservation and maintenance plan for the Phimai Historical Park to restore the authenticity and historicity of the ruins.

The Thai authorities put priority on establishing a conservation plan for Prang Hin Daeng, which is the most damaged structure in the Phimai Historical Park and is inspected as the grade E in a safety grade. Structural deformation of Prang Hin Daeng due to differential settlement of soil is already confirmed and materials were severely damaged due to weathering and breakage with a high risk of parts falling off. Since there were limitations in reusing original materials, there were concerns over the authenticity of the cultural heritage after the repair, which led to a greater need to preserve it in its current state. A workshop of experts was held in 2019 to discuss the ways to preserve and restore Prang Hin Daeng through joint research. During the meeting, a study of the Angkor ruins in Cambodia in 2020 was suggested to research the technical methodology of stone architecture in a similar environment built with similar materials, but it fell through due to the COVID-19 situation. So, the five-year joint project ended with the Korean side establishing a plan for conservation and maintenance of the ruins and sharing it with Thailand.

Based on the survey of the Phimai Historical Park in Thailand, we proposed a basic plan draft for maintenance in three areas of architecture, conservation, and safety on the Thai side. First, in the field of architecture, we presented a step-by-step improvement plan centering on restoring the historic value of the ruins and creating a historical environment that can coexist with residents and visitors. In



5 Restoration case study (Outer walls of Wat Mahatatat)



7 Joint research - Analysis of architectural drawings

the first stage, ruins maintenance is conducted in the order of urgent need for reinforcement based on the result of safety inspection and reorganized the access route and internal circulation route to improve accessibility to the relic and efficiency of viewing. The second stage expands out to the Phimai Historic City area, surrounded by four gateways and corridors, with an aim of restoring the now-lost east gate and repairing the overall town walls to seek the original state of the Phimai Historic City. The final maintenance plan was established by organizing ideas in the fields of construction, safety and conservation. In the field of construction, the northwestern side of the outer corridor, where structures graded D and E during the safety inspection are clustered, is selected as the priority area. We suggested focusing on maintaining the current status of the ruins and strengthening stability using the anastylosis technique¹⁾.

The related relics are of high importance and require careful measures for restoration and repair, hence we suggested creating a distant viewing environment after preparing long-term measures for restoration and preservation. Visitors are allowed to view the ruins freely within the site, so we proposed to overhaul the guidance system by adding more information centers, facilities for the handicapped



6 Investigation of Prang Hin Daeng - Measuring weathering rates of stone



8 Expert workshop on Prang Hin Daeng

and information boards. In the field of safety, we suggested a step-by-step conservation plan based on the status of damage on each architectural ruin considering various types of material damage and structural deformation found during the safety evaluation of the ruins in Phimai Historical Park, which were severely damaged at the time of the investigation. For conservation, we shared the need to research similar materials to recover the authenticity of architectural materials and physical reinforcement and replacement of parts to reduce damage to the ruins.

The investigation and research on the Phimai Historical Park in Thailand were jointly conducted by experts from Korea and Thailand to establish a maintenance plan the most suitable for the current status of the ruins. It is the result of the efforts of both countries to restore the historical meaning and promote its value based on the authenticity of the relics. However, due to COVID-19, the opinions of the Thai side were not reflected thoroughly in the final product of the five-year joint research. Given the chance in the future, the NRICH hopes that the results of this joint research project would be applied to the actual maintenance of Phimai Historical Park in Thailand, contributing to the restoration of authenticity and historic values of the site.

4 Prang Hin Daeng
(Red stone tower)



1) Anastylosis technique: A reconstruction technique using the original architectural material to the greatest degree possible when restoring a ruined building or monument, which is commonly used for cultural heritage repair in Thailand and Cambodia

Efforts in Preservation and Utilization of Columnar Joint as a Natural Monument

Natural Heritage Division
JUNG Seunggho



1 A panoramic view of the Jeju Jungmun and Daepo Coastal Columnar Joints

In 2000 in Pohang, Gyeongsangbuk-do Province, a columnar joint with a polygonal cross-section was found along the slope of a mountain that used to be a quarry. The geological structure was formed when basaltic lava erupted to the surface and cooled down during the Miocene Epoch of the Cenozoic Era (roughly 15 million years ago). The 20-meter-high and 100-meter-wide structure is surrounded like a folding screen. It was designated as a Natural Monument in recognition of its academic value as it is located inland, away from the coast, and the joints are developed vertically and radially. In general, when high-temperature magma or lava comes into contact with the surrounding air (or the ground) or water and cools, a contraction occurs and

columnar joints are formed. At this time, the contact surface (cooling surface) shows the most stable and efficient cross-sectional shape (mostly quadrangle to septangle) as the volume decreases and columnar joints are developed by extending vertically to the contact surface, as if polygonal stone pillars were clustered together to form a bundle. After its value was recognized, Jeju Jungmun and Daepo Coastal Columnar Joints (2005), Mudeungsan Columnar Joints (2005), and Gyeongju Yangnam Columnar Joints (2012) were also designated as natural monument¹⁾ as well, and columnar joints with various formation periods, constituent rocks, and distribution patterns have been nationally preserved and managed.

1) Four of the 88 geological natural monuments designated in Korea are columnar joints.

Monitoring After Multiple Earthquakes: Columnar Joint in Daljeon-ri, Pohang

The Pohang Daljeon-ri Columnar Joint consists of a number of naturally formed vertical and horizontal joints. It is weathered and eroded continuously due to unstable steep slopes, upper vegetation cover and soiling, while a series of earthquakes hit Gyeongju (magnitude 5.8) and Pohang (magnitude 5.4) in 2016 and 2017 raised awareness of damage to natural heritage

and large-scale disasters. The Natural Heritage Division of the NRICH designated the Pohang Daljeon-ri Columnar Joint as a priority management object due to its vulnerability to earthquakes and monitoring its rockfall monthly since 2018. The monthly monitoring showed that rockfall from the columnar joints is mainly caused by various causes such as seasonal factors (temperature change and growth of plants), wind, rainfall and mineralogical characteristics of the rock. It mostly happens during the thawing and the rainy season (directly influenced by monsoons or typhoons). Although we do not yet have data to relate rockfalls with earthquakes, we have also proposed the local governments the need to prepare mid- to long-term management measures in preparation for this.

Natural Damage Factors and Indiscriminate Industrial Development: Columnar Joint in Yangnam, Gyeongju

The columnar joints cluster in Yangnam, Gyeongju, located along the shore, was created during the Miocene Epoch of the Cenozoic Era (about 20 million years ago) by active volcanic activity in the southeastern part of the Korean Peninsula in relation to the opening of the East Sea²⁾. The distribution pattern, size and shape of columnar joints are very diverse. The diameter of the cross-section is between 20 and 100 centimeters, while the diameter between 30 and 50 centimeters predominates. The shape of the cross-section is primarily pentagonal or hexagonal.

2) East Sea opening: The plate tectonics that opened the East Sea as the Japanese Archipelago separated from the continent from the Oligocene Epoch to the Miocene Epoch of the Cenozoic Era.

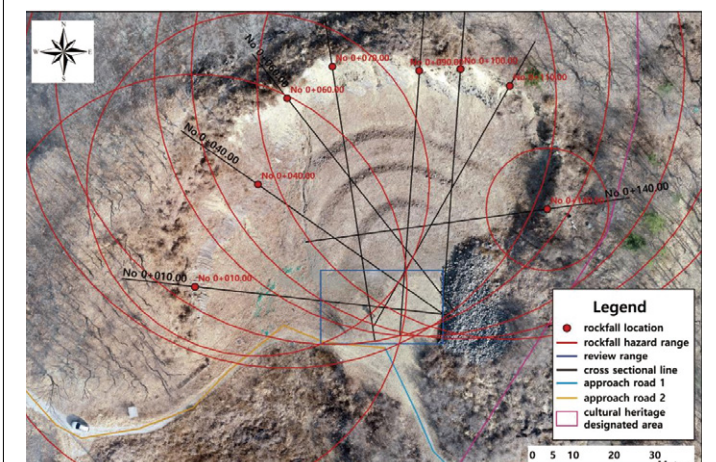
3) Kim et al., 2021, A Study on Evaluation of Slope Stability and Range of Rockfall Hazard of Daljeon-ri Columnar Joint in Pohang, Korea. Journal of Conservation Science, 37(5), 505-515 (in Korean).



2 The columnar joints developed nearly vertically along a steep slope



3 Fallen rocks in the columnar joints



4 The range of rockfall hazards based on rockfall simulation (Kim et al., 2021³⁾)

The columnar joints are developed in various ways, including vertically, inclined, horizontal or fan-shaped like a circle. Along the coastal promenade Padosori-gil (a 1.7 kilometers route between Eupcheon Port and Haseo Port), you



5 Various shapes of the cross-section of the vertical joints, mainly in a pentagon- or hexagon shape

can observe columnar joints that overlap in various shapes or develop in different directions. There always are possibilities of natural damage due to the composition of rocks, joint development characteristics, waves and tides. Moreover, many restaurants and accommodations are concentrated along the boundaries of the designated protected areas, so we requested the managing entity of Gyeongju City to constantly improve the environment and observe the changes over worries regarding possible indiscriminate industrial development that may cause harm to the natural environment.

Efforts to Preserve and Manage Natural Heritage: First Step in 3D Digital Documentation

In October 2020, inquiries regarding rockfall risks were received in the Ipseokdae Rock section of the Mudeungsan Columnar Joints. The columnar joint in Mudeungsan Mountain was formed as a result of volcanic activities during the Cretaceous period of the Mesozoic Era (approximately 85

million years ago). Composed of Mudeungsan tuff, the columnar joint is distributed at an altitude of 950 to 1,050 meters above sea level, differentiating from other columnar joints. In particular, the Ipseokdae Rock and the Seoseokdae Rock consist of dozens or hundreds of independent stone pillars with pentagonal or hexagonal cross-section shapes that developed vertically or spread like a folding screen. Each stone column has a circumference of 6 to 7 meters and a height of 10 to 20 meters, and the Mudeungsan Columnar Joints are one of the largest columnar joints in South Korea. We analyzed the changes in the columnar joints according to previous periodic survey reports and related data. We found that the reported cracks are not a recent deformation to the columnar joints. Still, in a regular survey in 2015, we observed no visible changes in the facade, such as collapse, fall or reversal. Nevertheless, due to the inherent nature of the columnar joint, there is a possibility of natural weathering or damage due to the natural development of the vertical and horizontal joints. Hence, additional efforts should be made to prevent rockfalls that could threaten the safety of climbers and visitors.

Natural heritage is widely distributed and often exposed



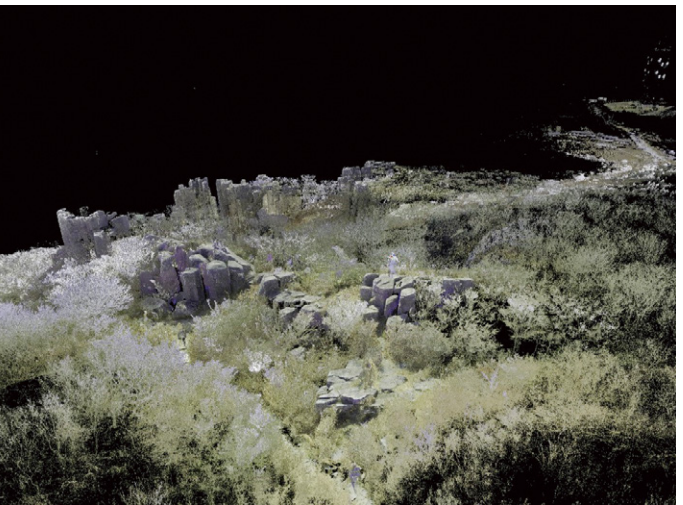
6 A view of the Mudeungsan Columnar Joints (Ipseokdae Rock)

outdoors, resulting in difficulties in managing and preserving it from erosion and weathering, rapid environmental change (abnormal climate) and occasional artificial damage. The Natural Heritage Division is attempting to document natural heritage in three dimensions with the Digital Heritage Team of the Cultural Heritage Administration (CHA) to find ways to find a sustainable management and utilization plan. In other words, we aim to construct accurate basic data of the site using digital technology and applying various methods suitable for each type, overcoming internal and external research environment's limitations and preparing additional measures.

The Jeju Jungmun and Daepo Coastal Columnar Joints, exposed in various forms over a coast of about 2.7 kilometers, were formed in the Pleistocene Epoch in the Cenozoic Era (about 250,000 years ago). It is an important geological resource to study and observe the geological phenomenon when basalt lava hardens and the development of coastal topography due to marine erosion. Most columnar joints



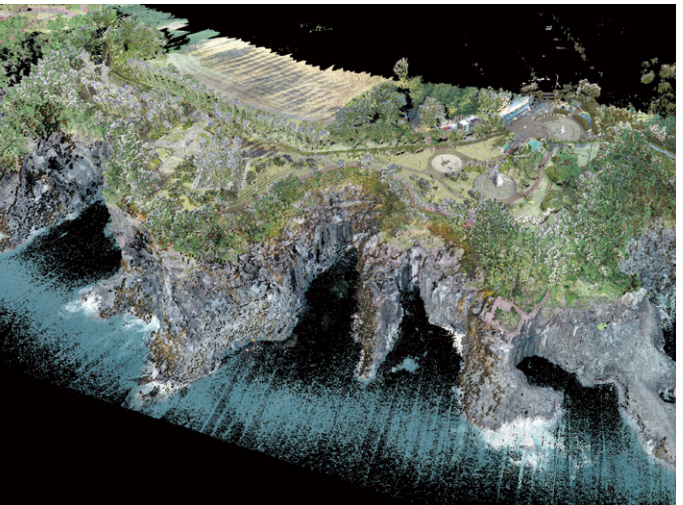
8 A panoramic view of the Jeju Jungmun and Daepo Coastal Columnar Joints



7 Scan data from the Mudeungsan Columnar Joints

are sea cliffs and are constantly influenced by waves and typhoons, so periodic monitoring is necessary to identify changes to the columnar joints. Considering the weather conditions such as wind, seawater and waves, we attempted to document the shape of the entire columnar joints, the development of the joints, the status of rockfall, and the data on overlapping and curved slopes using scanning equipment accessible to the site to acquire data continuously from both above and below the sea level. Data collected by drones, broadband scanners and photography are compared with the result of the Mudeungsan Columnar Joints, located in inland/mountainous terrain to find data processing and application measures suitable for the situation.

Through these attempts, we prepare a standard plan for building 3D data for each natural heritage, establish a reasonable conservation plan with preventive management system and make sustainable use of natural heritage through regular surveys, constant monitoring and field investigation.



9 Scan data from the Jeju Jungmun and Daepo Coastal Columnar Joints

Working-Level Agreement on Cultural Heritage Safety Disaster Prevention Cooperation between Korea and Mongolia

Safety and Disaster Prevention Division
PARK Chanmin

The Safety and Disaster Prevention Division of the NRICH was established in 2017 and conducts researches on ‘safety control of architectural heritage,’ ‘the impact of the disaster on cultural heritage and damage reduction’ and ‘experiments on the structural performance of architectural heritage.’ Among these tasks, we use diverse measuring instruments to investigate the structural and material damage on architectural heritage thoroughly for research on ‘safety control of architectural heritage,’ and draw ways to determine the exact state and cause of damage and produce preventive conservation measures.

In 2017, the NRICH signed an agreement on protecting cultural heritage and fostering related human resources

with the National Cultural Heritage Center of Mongolia to cooperate in promoting the preservation of the cultural heritages of both countries through cultural heritage conservation and academic, human resources and technological exchanges.

The NRICH's Safety and Disaster Prevention Division and Mongolia's emergency cultural heritage protection division made a 'Working-level on Exchange and Cooperation for Disaster Prevention of Architectural Heritage' (2019-2023) on June 16, 2018. The agreement on joint research and technology exchange for the safety and disaster prevention of architectural cultural heritage is based on the shared ideas on the importance of preventive safety management and the need for technological exchange.



Through this exchange and cooperation, it is expected that Mongolia will advance the conservation technology of Mongolian architectural heritage by incorporating Korea's systematic and scientific safety management technology for architectural heritage while the Korean side would be able to acquire data on the status and causes of various damage to the architectural cultural heritage of Mongolia which has already been significantly damaged due to various factors.

Plan for cooperation on architectural heritage between Korea and Mongolia

Year	Format and content	Note
1	Conference: Conservation status of architectural heritage	2019
2~4	Field Study: Condition of architectural heritage Seminar: Conservation method of architectural heritage	2022~
5	Conference: Sharing the result of exchange and cooperation and publishing final report	2025 (planned)

Korea-Mongolia Joint Conference on Disaster Prevention for Architectural Heritage in 2019

During the first exchange in 2019, a conference was held under the topic of the policies and technologies for preservation and damage cases of architectural heritage in both countries. The conference was held at the National Cultural Heritage Center of Mongolia and Mongolia's Ministry of Education, Culture, Science and Sports, the National Cultural Heritage Center, National Emergency Management Agency, National Agency for Meteorology and Environmental Monitoring as well as regional disaster management authorities and major museums participated in the conference along with the Safety and Disaster Prevention Division from Korea's NRICH. At this event, seven presentations (four from Mongolia and three from Korea) were made on the safety management system and technology for the preservation of cultural heritage, the status of preservation of architectural heritage, and disaster prevention and damage cases for cultural heritage.

Through presentations, it was identified that major damaging factors for architectural heritage in both Korea and Mongolia are precipitation and ultraviolet rays in summer, snowfall and freezing injury in winter. Especially, the pres-

entations showed the relationship between the climatic condition of Mongolia, which is harsher than that of Korea, and the damages caused to architectural heritage. The conference also provided an opportunity to understand the current status of preservation and management of architectural heritage in both countries and to give shape to future exchanges and cooperation.

The First Survey on Preservation Status of Major Architectural Heritages in Mongolia

The cooperation for the second to fourth year consists of a field study on major architectural heritages in Mongolia and a seminar on conservation methods. The field study investigates architectural types of major architectural heritages of Mongolia and discusses its status and cause of damage as well as a reasonable conservation plan. The seminar is to share architectural characteristics, conservation policies and technologies, and damage cases of architectural heritages in Korea and Mongolia. The exchanges were temporarily suspended due to the global spread of COVID-19 in 2020 and 2021 and resumed in 2022.



❶ The signing of a working-level agreement on exchange and cooperation for disaster prevention of architectural heritage in 2018



❷ Korea-Mongolia joint conference on disaster prevention for architectural heritage in 2019

The second exchange was held for nine days from 2022, July 25, Monday through August 2, Tuesday, including a field study of major architectural heritages in Mongolia and a seminar. The object of research was the Erdene Zuu Monastery in Kharkhorin, Mongolia. Included in the UNESCO World Heritage Site (2004) of 'Orkhon Valley Cultural Landscape,' Kharkhorin is a 13th century capital of the Mongol Empire where the monastery is located.

The Orkhon Valley Cultural Landscape, recognized for its historical values as the nomadic and pastoral culture, is well preserved; the site was the center of ancient trade routes connecting the East and the West as it served as the capital of Uighur in the 8th century and the capital of Mongol imperial in the 13th century. The Orkhon Valley is also the birthplace of the Mongolian form of Buddhism. The Erdene Zuu Monastery, established in 1586, is presumed to be the oldest Buddhist monastery in Mongolia. The monastery was damaged in the 17th century during the wars between Dzungars and Khalkha Mongols but was rebuilt in the 18th century. However, it was once again destroyed in the 20th century. The monastery is considered an important cultural heritage site globally and various professionals and tourists enjoy visiting the site.

Seven researchers took part in the project: Kim Seongdo (Director of Safety and Disaster Prevention Division), Park Chanmin (Research Official), Lee Hana (Researcher), Kim Sunghan (Researcher) and Tumendelger Erdenetsogt (Researcher at Research Division of Architectural Heritage) from Korea and Baasandorj (Researcher at Department for Protection and Rescue of Cultural Heritage in Emergency) and Amgalan Erdenetssetseg (Researcher at Department of Preservation of Historical Buildings and Architectural Monuments) from Mongolia.

The field study was conducted in three stages.

① Visual investigation of damages to architecture

- Investigate and document damages to architectural structure through visual investigation (taking photos, marking architectural drawings).
- Share and discuss the status and causes of damages to architecture

② Detailed investigation of damage to architecture

- Detailed investigation using measuring equipment for damaged parts of buildings (structural deformation, material damage)
- Main investigation equipment: high-resolution camera,

360-degree camera, aerial photography (infrared imaging), 3D scanner

③ Analysis of causes of damage to architecture and discussion on conservation measures

- Analysis of conservation status and causes of damage to cultural heritage, discussion of reasonable conservation measures leading to comprehensive conservation plans



③ View of the Erdene Zuu Monastery in Kharkhorin, Mongolia

The on-site investigation of the architectural and cultural heritage of Erdenzo Temple will yield comprehensive results through a detailed analysis process. The field study of the architectural heritage of the Erdene Zuu Monastery will yield comprehensive results after detailed analysis. Major research results from the visual investigation can be summarized as follows.

① Framed Wooden Structure: Zuun Zuu Temple

- Three two-story wooden buildings are placed parallel facing the south, and a Buddha statue is enshrined inside. On the outer walls of the first and second floors of the building, masonry walls surround the columns up to a certain height, and glazed tiles are placed on the roof.
- Roof tile breakage, drop-out and leakage: Leaking water deteriorates structural performance by decaying the timber of the building, hence the roof tiles should be repaired to prevent further damage to wood
 - Masonry wall cracks: Considering the location of the cracks, they are likely to be caused by the difference in materials between the masonry wall and the wooden column. The inside of the wall offers a moist environment where the wooden columns might go rot, hence there is a

possibility for rotten columns in the long term.

- Loss of soro (bearing block and inbang (lintel)) members in the brackets of the structure: It does not have a significant effect on the building in the short term, however it may lead to damage such as the breakage of certain parts and the tilting of the building due to unbalanced loads.

② Masonry Pagoda

- The pagoda and base are constructed by stacking bricks, and the exterior is finished with lime plaster.
- Lifting and drop-out of finishing material (lime plaster): The exposed inner bricks are damaged or weathered.
 - Damage to the finishing material causes rainwater to penetrate into the pagoda which weakens the ground in the long term.
 - It is necessary to repair the external finishing materials periodically to prevent damage to bricks and structural deformation.

③ Masonry Stone Structure: Lavran Temple

- The stone temple is a Tibetan-style masonry building with three stories of stacked up bricks. The center of the first floor is used for Buddhist ceremonies and the second and the third floors are used for offices or to store Buddha images and Buddhist tools.
- Recently, the outer wall of the building has been repaired with lime plaster, and it is impossible to inspect the structure and materials of the interior due to decorations and furniture.
 - Typical damages in masonry structures such as wall cracks, swelling and water leakage were not found and no damage found to the wooden parts of the indoor ceiling and floor.

Further field study on the conservation status of Mongolia's major architectural heritage is scheduled to be conducted on the 17th-century stone temples and the 18th-century wooden temples in 2023 and on stone fortress walls and modern buildings near Ulaanbaatar in 2024. In addition, three seminars on the conservation management of architectural heritage are scheduled as well. Experts will discuss the results of field studies on architectural heritage and share information on materials and structural characteristics of architectural heritage in Korea and Mongolia as well as conservation policies and techniques along with case studies. The 2022 seminar will be held virtually later this year due to the resurgence of COVID-19 in Mongolia. The NRICH hopes that the cooperation for disaster prevention of architectural heritage between Korea and Mongolia could expand technical exchanges and cooperation between countries sharing similar cultural heritages.



④ A wooden temple structure of the Erdene Zuu Monastery in Mongolia



⑤ A Lamaist pagoda in the Erdene Zuu Monastery in Mongolia



⑥ A stone Tibetan Buddhist temple structure of the Erdene Zuu Monastery in Mongolia



⑦ Members of the field study team and staffs of the Erdene Zuu Monastery Museum

Interview

An Institution Heading Towards the Future with Active Listening and Communication

New Director General of The NRICH



In February, the National Research Institute of Cultural Heritage (NRICH), which has been dedicated to research major cultural heritage in Korea, changed its official Korean name, reflecting its elevated status. The Korean name was changed from Gungnim Munhwajae Yeonguso to Gungnim Munhwajae Yeonguwon after 27 years to differentiate the headquarters from its seven regional institutes and respond to the transition to a digital society and development of advanced technologies. We met Director General Kim Yeonsoo, who took helm of the newly named National Research Institute of Cultural Heritage to listen to her thoughts on the inauguration and her goals as the Director General.

How do you feel about taking the office as the new Director General of the National Research Institute of Cultural Heritage?

I have both expectations and burdens as I take charge of the National Research Institute of Cultural Heritage (NRICH), a research institute affiliated with the Cultural Heritage Administration and has been supporting heritage policies for a long time. The NRICH is the only national institute related to heritage in Korea and has been at the forefront of researching, preserving and restoring Korea's cultural heritage over the past five decades with remarkable results. In 2022, the institute changed its official Korean name reflecting its elevated status. I feel some pressure by taking office at an important time, but my excitement and anticipation is greater as I think of working together with the people who love Korea's cultural heritage.

You have been engaged in public duties for a long time. Please tell us the most rewarding moment among your achievements.

I have taken interest in history and culture since childhood, so it was natural for me to pursue the path in historical studies. Beginning as a curator, I was able to have a variety of experiences at the National Palace Museum of Korea, the National Intangible Heritage Center and the National Research Institute of Maritime Cultural Heritage.

At the National Palace Museum of Korea, I was able to see various exhibitions and connect with the people through the exhibits and found a new joy in exploring the royal culture. At the National Intangible Heritage Center, I broaden my perspective on cultural heritage as I realized that I was biased toward tangible cultural assets. The times at the National Research Institute of Maritime Cultural Her-

itage allowed me to explore the mystery of relics in the sea as well as to realize the difficulties coming from the field researches. On top of that, I was able to broaden the scope of cultural heritage research from the Korean peninsula to the East Sea, West Sea and South Sea. In 2015, I worked as the Director of International Affairs Division at the Cultural Heritage Administration and experienced the new field of having Korea's cultural heritage internationally recognized such as the return of Deokjong Eobo, a Joseon era royal stamp, the registration of the Baekje Historic Areas to the UNESCO World Heritage List and *Juldarigi*, or Tugging Rituals, to the UNESCO's Intangible Cultural Heritage of Humanity, gaining a sense of accomplishment through the process.

Instead of choosing one particular achievement during my public service, I will do my best in assisting the NRICH and its researchers in making bigger achievements based on my experiences.

You served as the directors of the National Palace Museum of Korea, the National Intangible Heritage Center and the National Research Institute of Maritime Cultural Heritage before inaugurating as the director general of the NRICH. In your opinion, what distinguishes the NRICH from other institutions?

The NRICH is the only institution specializing in cultural heritage research in Korea, which has grown rapidly over the past 50 years and is now on a stable track. Korea also has become a country internationally known for state-of-the-art technology, and various world-class level cutting-edge scientific methods are applied to the field of cultural heritage research. Cultural heritage research is centering on mid to

long-term on-site research plans, instead of researches based on existing collections, as the country itself is a historical site and relic for studies. We are also expanding the field of research on cultural heritage by encompassing natural heritage as well as cultural heritage in Korea. Cultural heritage research is a major humane studies and it should be for the people. I am confident that we could be more creative by pursuing convergence research with assistance from natural science.

As the nation's top institute specializing in cultural heritage in Korea, what do you think is the ideal image of the NRICH?

When we research something, we might be concerned about the economic value of the project by quantifying the result and wondering whether the result would bring economic benefits. However, research on heritage is difficult to evaluate in those economic value or the amount of money, hence it is very important to work with pride than anything else. As the NRICH is funded by the state, we cannot avoid evaluation, but the researches we conduct are pump-priming studies with potential added value in the future as seen in the rapid growth of hallyu, or Korean wave. So the NRICH will strive to be a righteous, devoted and future-oriented institution.



What do you want to focus on during your tenure?

Research on cultural heritage is conducted on the entire territory of Korea, and it is true that current manpower in the field of cultural heritage research is not sufficient to cover the whole country. However, given the nature of a state-funded national research institute, if we are not likely to recruit more researchers, I think it is important to understand the competency and strength we have and create a system to maximize it. For example, as the country's sole cultural heritage research institution, we have an extensive documents and materials accumulated over the last 50 years. So we plan to systematically organize, classify and use the data through efficient and systematic operation of the institution.

Lastly, is there a message you want to convey to the researchers as well as the readers of the NRICH magazine?

First of all, I want to express my sincere gratitude. I am always grateful for the researchers' hard work at sites across the country for excavation and research on the major ancient cultures of Korea including Silla Kingdom, Baekje Kingdom and Gaya confederacy despite the lack of workforce in the

main office as well as regional institutes. Recently, the gold leaf relic from Silla era, excavated from the Donggung Palace and Wolji Pond in Gyeongju, North Gyeongsang Province, is extremely small with the size of 3.6-centimeter-wide, 1.17-centimeter-long and 0.04-millimeter thick, which is hard to discern with naked eyes. This was discovered while sieving the soil of the site by a handful. It was almost a miracle like finding a needle in a haystack. Research on heritage is not possible without faith and affection, and I would like to express my gratitude for their efforts on site.

Also with improved communication skills through media and social media allowing people to quickly and easily obtain various information, it has increased the intellectual level, curiosity and interest of general public on cultural heritage. The "NRICH," an English magazine by the institute, is one of the communication channel sharing the NRICH's research accomplishments and promoting Korea's cultural heritage overseas. We will continue to communicate through this magazine, introducing the researches conducted at the institute and sharing news in various ways so the NRICH is not just for researchers but for everyone. So please pay attention to our projects.

Due to the COVID-19 pandemic, international exchanges have been shrinking. How do you think about the NRICH's international relations such as collaboration with overseas institutions and training at the Asia Cooperation Program on Conservation Science (ACPCS) and the international readers interested in the NRICH's achievements?

Despite the coronavirus pandemic, we continue to share strategic cooperation related to cultural heritage with Mongolia, Kazakhstan and Egypt. We are also excavating overseas sites related to Korea's ancient culture to find its origin despite difficulties caused by the country's division. As a leading institution in cultural heritage research, we will continue to exchange and cooperate with cultural heritage research institutes in other countries with a sense of responsibility.



Profile of KIM Yeonsoo

Kim Yeonsoo earned her bachelor's and master's degree from the Department of Archaeology and Art History at Seoul National University. She entered public service in 1986 as a curator and worked at the Royal Museum (the forerunner of the National Palace Museum of Korea) under the Cultural Heritage Administration, the National Palace Museum of Korea and the National Research Institute of Cultural Heritage.

Encountering Silla in Baekje's Capital

A Special Exhibition on Ancient Silla Tombs from the Jjoksaem District, Gyeongju



The Hanseong Period (18 BCE – CE 475) refers to when Baekje's capital was located in Wiryeseong, Hanam, until it moved to Ungjin in 475. Hanseong was the capital of Baekje for 500 years of the nearly 700-year history of Baekje. An exhibition on the Jjoksaem District of Gyeongju, the capital of Silla, was held in the ancient capital of Baekje. What would it be like to encounter the capital of Silla in the heart of Baekje? Researcher Jeong Daehong of the Gyeongju National Research Institute of Cultural Heritage and Korean language and culture YouTuber "Korean Unnie" visited the exhibition.

An Opportunity to Identify Results of Excavation of Silla Tombs in Jjoksaem District

This special exhibition "The Ancient Tombs Site at Jjoksaem" is the second joint project of the Gyeongju National Research Institute of Cultural Heritage and the Seoul Baekje Museum. In 2019, the two institutes joined hands to present a special exhibition "Wolseong Palace of Silla" presenting the living space

of the Silla people and this time, the exhibit centers on the tombs, the space of death, and burial goods recovered from tombs. The exhibition aimed to introduce the result of the excavation of Silla tombs from the Jjoksaem District in Gyeongju, to the citizens of Seoul, who had difficulty accessing the Silla tombs and relics.

The Gyeongju National Research Institute of Cultural Heritage began excavation campaign on the remains of the Jjoksaem area in 2007. The site holds an

important place in Korea's archaeological study, but the full-scale investigation came rather late. After the Silla tombs were excavated in the 1970s, the Cheonmachong Tomb and Hwangnamdaechong Tomb were recognized for their values and named the Daereungwon Ancient Tomb Complex; but the Jjoksaem site, right next to the complex, was excluded from the designation. However, the academia pointed out the ruins are not properly managed and preserved considering its importance and the major investigation project began afterward. The results of the investigation are fully covered at the exhibition.

Life of Silla People Seen through Their Burial Contexts

It is presumed that the site was a cemetery burying people living in the royal capital of Silla. Some of the tombs found on the site are huge, reaching up to 30 meters in length, but small tombs are about 3-4 meters long. Researcher Jeong

Daehong said, "Considering the splendid metal crafts and large amounts of grave goods in the larger tombs show that the tombs belonged to the nobles and royalty of Silla." On the other hand, the smaller tombs are estimated to be the tombs of people of lower ranks due to the small number of burial accessories. Korean Unnie said, "It reminds me of 'wooden chamber tomb' that I learned from the Korean history class," after touring the exhibition, adding that she is curious about the life of Silla people found from the site.

As of now, about 500 tombs, estimated to be wooden chamber tombs, were found from the site and take up the largest quantity among the grave types from the site. Researcher Jeong Daehong said, "We can find out about life and death of Silla people in high and low ranks through burial contexts," and "Brazier-shaped jars from the site was made around the 3rd century and provides information on when the tomb was built."

About 100 stone-lined tombs and 37 jar coffins tombs were also found at the Jjoksaem site and most of the tombs are presumed to be built during the 5th century. Most of the stone-lined tombs are small in size with few amounts of grave goods, suggesting that they belong to the lower ranks, while the jar coffin tombs using large jars are estimated to be the tombs of young children. The jar coffin tombs provide an insight into the ancient society with high infant child mortality rates.



① Horse armor (replica) from Tomb No. C10



② Long-necked Jar engraved with a procession scene from Tomb No. 44

Goods From Grave Out Into World

A variety of relics were identified from the tombs of the site. Tomb itself is a very valuable historical material, but the artifacts from the tomb provide precious information about the tomb. Among the relics found from the site, the horse armor excavated from a wooden chamber in Tomb No. C10 drew much attention. Horse armors have been recovered in the past, but in most cases only partially found and it was difficult to restore them to their original state. However, an whole horse armor was found intact in Tomb No. C10, providing great resources to the study of ancient heavy cavalry.

A long-necked jar inscribed with a procession scene, presumed to be used for rituals, was excavated from the stones surrounding the base of Tomb No. 44. The inscribed scene consists of a procession, dance and hunting and it is considered an important material showcasing the idea of the afterlife of ancient Silla people.

“

Though we don't have a plan for the next exhibit yet, the Gyeongju National Research Institute of Cultural Heritage and the Seoul Baekje Museum will continue to cooperate academically on exhibitions related to Silla and Baekje.

“

It was a truly unique experience to encounter the past through the tombs as well as to experience the capital of Silla Kingdom at the capital of Baekje Kingdom.



Korean Unnie is a creator of contents on hallyu (Korean wave), Korean language and Korean culture and her YouTube channel has over 1.14 million subscribers from 300 countries.



Same but Different, 'Namdaemun' of South and North Korea

Namdaemun is a major landmark in Seoul, attracting foreign tourists. Officially known as Sungnyemun, it is also commonly referred to as Namdaemun. However, Namdaemun not only exists in Seoul, but also is in Kaesong, North Hwanghae Province, North Korea. What is the history behind the same but different Namdaemun in the North and the South?

Sungnyemun Gate (Namdaemun) in Seoul, Dropped the National Treasure No. 1 Title after 87 Years

Sungnyemun Gate, the oldest among the existing wooden buildings in Seoul, is one of the four main gates of the city walls built to protect the capital of Joseon, which is present-day Seoul. It has been called Namdaemun for a long time since it is located in the south and the Korean word 'nam' means south, but its official title is Sungnyemun Gate. *Sungnye* means respecting and propriety, and the name of the gate comes from the five virtues of Confucianism

including benevolence, righteousness, propriety, wisdom and trustworthiness. During its long history Sungnyemun has suffered all kinds of hardships and even dangers of demolition. In particular, during the Japanese colonial period, most of the city walls were demolished as Japan constructed major streets in Seoul and the gate was also subject to demolition. Sungnyemun only avoided demolition as Japanese general Kato Kiyomasa (1562-1611), who led the Japanese army during the 1592–1598 Imjin War, was believed to have entered Seoul through the Sungnyemun Gate during the war. Later in 1934, Japan designated the treasures of Joseon and assigned the Treasure No. 1. to the Sungnyemun Gate. When the Korean government started to designate national treasures and treasures in 1962 after independence, it inherited the old numbering system and Sungnyemun Gate continued to be known as Korea's "National Treasure No. 1" for the next 87 years. In 1996, a controversy was sparked over the "meaningless" numbering of national treasures and the Cultural Heritage Administration decided in 2021 to remove the number assigned to national treasures, putting an end to the decades-old controversy.

1 Namdaemun of South Korea



Kaesong Namdaemun, the Only Remaining Gate of Kaeseong's Inner Walls

While the Sungnyemun Gate, also known as Namdaemun, in Seoul is the symbol of South Korea's capital, Namdaemun in Kaeseong is the symbol of the North Korean city. Part of the Historic Monuments and Sites in Kaesong, a UNESCO World Heritage site, Namdaemun Gate is the south gate of the inner walls of Kaesong, which was built to protect the city. The Namdaemun Gate in Kaeseong is known as one of the best wooden structure from the late Goryeo period, but it also could not escape the history of suffering.

Kaesong Namdaemun was the battlefield during the Second Strife of Princes in the early Joseon Dynasty era in 1400, but it was on the verge of being torn down by Japan who were demolishing town walls under the Japanese colonial rule. However, Kaesong residents strongly opposed the demolition and Namdaemun survived while the inner

walls and East and West Gates were torn down. The adversity did not end there. The gate was destroyed during the Korean War and was restored in 1954 after the war.

The gate houses the Bell of the Yeonboksae Temple, one of the five famous bells of Korea. The bell, which weighs about 14 tons, was originally hung at the Yeonboksae Temple located south of the gate. It was moved to the upper story of the gate in 1563 (18th year of King Myeongjong) when the temple burnt down. The bell tolled to mark the hour for the people of Kaesong until early in the 1900s.

Many heritage were lost or destroyed during urban development under the Japanese colonial rule, the Korean War, and later in the process of urban reconstruction and expansion. Seoul and Kaesong's Naedaemun Gates are no exceptions. They were under the threat of disappearance as they went through the history of suffering, but through restoration, they continue to carry the history that might have been lost.

	Namdaemun of South Korea	Namdaemun of North Korea
Location	40 Sejong-daero, Jung-gu, Seoul	Namdaemun of North Korea Bukan-dong, Kaesong city
Period	1398 in Joseon Dynasty, Restored in 2013	1394 in Joseon Dynasty
Structure	An arch-shaped Hongyemun located in the center of granite block masonry structure and a two-story wooden pavilion with five kan (space unit between two columns) to the front and two kan to the side.	First floor: Stonework Second floor: A single-story wooden pavilion with three kan to the front, two kan to the side, and a gable roof.
Restoration	Originally built in 1398. The second story roof and part of first story roof was destroyed due to an arson attack in 2008. The gate was restored in May 2013 after five years and two months of restoration.	Originally built in 1394. Destroyed in December 1950 and restored in 1954.

2 Namdaemun of North Korea



Getbol, Land of Coexistence Where Life Sprouts

Far Eastern curlew, an endangered bird included in the International Union for Conservation of Nature (IUCN) Red List, is a migratory bird that comes to Korea's tidal flats every spring and autumn. After flying for thousands of kilometers without a single break, the Far Eastern curlew replenishes energy in Korea's vast tidal flats and starts flying again. Although it seems like there is nothing, there are many creatures living in the tidal flats where the long, curved beak of the Far Eastern curlew digs through.

On July 26, 2021, "Getbol, Korean Tidal Flats" made its way into UNESCO's World Heritage List, becoming Korea's

second natural heritage site, following the Jeju Volcanic Island and Lava Tubes inscribed in 2007. The listing of Korea's tidal flats to UNESCO World Heritage provided an opportunity to reexamine the ecological and environmental value of the tidal flats, which has been considered abandoned land by the sea.

In 2009, the Wadden Sea, tidal flats that extend over three countries of the Netherlands, Germany and Denmark, was inscribed on the UNESCO World Heritage List, for the first time as tidal flats. It is the largest tidal flats system in the world, where natural processes are almost undisturbed,

many plants and animals including marine mammal species of harbor seal (*Phoca vitulina*), grey seal (*Halichoerus grypus*) and harbor porpoise (*Phocoena phocoena*) inhabit the tidal flats and where some 12 million birds pass through each year. Moreover, up to 80 million visitors travel to the Wadden Sea region every year thanks to the three countries' tidal flat conservation policy. Nature and humans co-exist in the Wadden Sea.

The tidal flats of Korea are also a land of coexistence. It is home to about 2,150 species of flora and fauna, including 47 indigenous species and 22 endangered waterfowl. Far Eastern curlew is one of them. The tidal flats are also a land of livelihood for nearby residents who live by the sea. It has become the foundation of the local economy through sun-dried salt making, tidal flats fishery and fixed net laver aquaculture. Korea's tidal flats in 2022 are economic means for residents, a treasure trove of the ecosystem providing resting areas and food for animals and plants, including birds.

However, at one time in the past, tidal flats in Korea were regarded as useless land and reclamation projects were implemented with the goal of constructing cities and expanding territories. Experts say about half of Korea's tidal flats have been lost due to reclamation projects. However, with the Ramsar Convention for the protection of wetlands and the inscription of Korean tidal flats on the UNESCO World Heritage List, the importance of tidal flats are now being recognized and the perceptions are changing. The Korean government has designated 14 tidal flats as Wetland Protected Areas to protect the tidal flats and working on a tidal flat ecosystem restoration project as well.

Tidal flats cannot be negotiated for economic value. It is a space where the sea meets land and the people meet nature. Numerous creatures live together in organic relations in the vast space of tidal flats. The tidal flats, land of coexistence where life flourishes, are filled with life today.



2 Tidal flats of Wadden Sea



3 Brant goose by low tide on the tidal flats of the Wadden sea



4 Eastern curlew



1 Tidal flats and reed fields in Suncheon Bay near Suncheon



5 Oyster farms and tidal flats in Nambae, South Gyeongsang Province

Thousand Year History of Buryeongsa Temple Threatened by Fire

Buryeongsa Temple Heritage Urgently Evacuated During Uljin Wildfire

Gyeongju National Research Institute of Cultural Heritage

SIM Myungbo

March 4, 2022, Buryeongsa Temple Placed in Danger of Fire Due to Uljin Wildfire

On March 4, a wildfire broke out in Uljin, Korea's eastern costal county. Driven by strong winds and dry weather, the fire spread rapidly. If the fire continued to blaze, cultural heritage in the Uljin area were expected to suffer from fire damage. The Cultural Heritage Risk Management Division of the Cultural Heritage Administration (CHA) kept an eye on the Uljin wildfire as the wildfire continued the next day, heading south and drawing closer to the Buryeongsa Temple, founded by the great monk Uisang during Silla era. The fire approached as close as about 7 kilometers, and Buryeongsa Temple, one of the representative heritage of Uljin, was in danger of being burned down.

Buryeongsa Temple was founded in 651 (the fifth year of the reign of Queen Jindeok of Silla Kingdom) and is currently a branch temple of Bulguksa Temple in Gyeongju, the head temple of the 11th district of the Jogye Order of Korean Buddhism. Buryeongsa Temple's Eungjinjeon Hall and Daeungbojeon Hall as well as the Buddhist Painting (The Vulture Peak Assembly) and Buddhist Palanquins are designated as Treasure. The temple's Three-Story Stone Pagoda, Buddhist Tablet and Buddhist Painting (Guardian Deities) are City/Province-Designated Tangible Cultural Heritage and the Stupa is Cultural Heritage Material. If the Buryeongsa Temple gets burnt down in a fire, valuable assets including designated cultural heritage and scenic sites will lose their value. Such crisis was just upon Buryeongsa Temple in March.

Gyeongju National Research Institute of Cultural Heritage on Mission to Evacuate Cultural Heritage of Buryeongsa Temple

At 1 p.m. on March 6, Sunday, Researcher Sim Myungbo of the Gyeongju National Research Institute of Cultural Heritage received an urgent phone call. He had just returned to Gyeongju from a trip to Seoul with his family. He heard from the Cultural Heritage Administration that the heritage objects in the Buryeongsa Temple should be evacuated urgently. Senior researcher Kang Dongseok and researchers Kim Dongha, Park Jeongjae and Sim Myungbo, who were in Gyeongju at the moment, headed to the temple immediately with the necessary equipment. In constant communication on their way, they were receiving information on what has to be evacuated, how many items need to be evacuated and what was needed for evacuation. Driving for three hours without a break, they arrived at the Temple where the sky was already red and the air was smoky. Firefighting helicopters were continuously carrying water from

the river to spray water over the flames.

The researchers from the Gyeongju National Research Institute of Cultural Heritage were assigned to take charge of the wrapping and transferring the four pieces of three designated heritages, including the two Buddhist Palanquins, the Buddhist Painting of The Vulture Peak Assembly and the Buddhist painting of Guardian Deities. These cultural heritages required a more professional handling in packing and moving compared to other heritages of the temple.

Buddhist Palanquin, the Most Difficult to Pack Due to Many Ornaments and Sculptures

As soon as they arrived at Buryeongsa Temple, the researchers checked on the relics to be moved and confirmed the sequence of work. The first to be packed were the Buddhist Palanquins. The Buddhist palanquin is an important element of Buddhist rituals, carrying the object of worship such as Buddhist tablets, Buddhist bone relics or Buddhist scriptures. The two Buddhist palanquins in Buryeongsa Temple could be separated into smaller parts of the handle, seat and the roof. The handle part consists of two long shafts with dragons carved on the edge and at the end of the shaft. The four sides of the seat are splendidly colored and sculptured, and glass bead windows are fitted on three sides. The corners of the roof are decorated with carvings believed to be phoenixes with a lotus flower sculpted in the center. Sophisticatedly produced, the palanquin is known to be the oldest one of such kind in the Joseon Dynasty and recognized for its cultural values.

The Buddhist palanquins were created with various materials and in a three-dimensional structure, so the researchers had to approach carefully to pack the palanquins despite the urgency. Even the slightest wrong move would



❶ The complex structure and decorations of the Buddhist palanquins



2 Packing Buddhist Palanquin

harm the decorations or cause the glass beads to fall off. However, evacuation could not be delayed. The researchers immediately reviewed ways of packing and decided to separate the roof and the seat of the palanquin to minimize the damage caused by the movement. Sharp, protruding parts were wrapped with acid-free paper and soft packing material to prepare for possible impact and damage and joint structures were tied together with strings to prevent them from falling off. The Buddhist palanquin was tied to a wooden base to minimize vibration. This was the moment when the researchers of the Gyeongju National Research Institute of Cultural Heritage showed their expertise on cultural heritage conservation.



3 Disassembling and wrapping the Buddhist Painting of Guardian Deities

Difficulty in Disassembling Large-Scale Buddhist Paintings

As soon as the complex structure and decorations of the Buddhist palanquins were packed, the researchers set on dismantling and wrapping the Buddhist Painting of Buryeongsa Temple (The Vulture Peak Assembly), which is over 4 meters long. The painting, located behind the Buddhist statues, describes a scene in which Buddha is delivering a sermon. Typically, eight leading bodhisattvas are featured in the Vulture Peak Assembly paintings, but the one in Buryeongsa Temple has the Buddha surrounded by ten noticeably large bodhisattvas, five on each side of Buddha. It has been designated as a Treasure for its dignified style, unique composition and preservation in good conditions along with the markings at the bottom clearly stating the year and background of production. These aforementioned information made the painting a valuable material for studying the Buddhist paintings of the 18th century Joseon era.

The Buddhist Painting of the Vulture Peak Assembly was connected to the girder above the high ceiling. The height was barely reachable even with a ladder and working in an emergency could cause the person to fall and be easily injured. Luckily, there were firefighters on standby at the temple to prepare for the approaching wildfire and the researchers could remove the painting from the wall with the help from them. The researchers thought about how to pack it safely while minimizing damage after separating it from the wall. Normally, the painting is inspected for possible existing damage and packed after the safety measures, but it was an urgent situation in the dark of night, so the researchers had no choice but to start packing right away

after checking on the most problematic parts based on their experiences. First, they checked whether the colored pigment layer of the painting was strong enough and then covered the surface with acid-free paper. Then several people joined to roll the painting at the same speed to prevent it from being lopsided, and they successfully wrapped the painting safely.

The Buddhist Painting of Buryeongsa Temple (Guardian Deities), designated as City/Province-Designated Tangible Cultural Heritage, depicts protective deities who guard the Buddha Dharma and is enshrined in the Daengbojeon Hall of the Temple. According to the text at the bottom, the painting was created in 1860 by five painters including 'Uiundang Jau.' Jau was a *geumeo* (painter monk specializing in dancheong paintwork or Buddhist painting) active in Gyeongsang and Gangwon Provinces and considered the most skillful painter of his time. The Buryeongsa Temple's Guardian Deities painting is recognized for its precise description, harmonious use of color and decoration as a 19th century Buddhist painting and has been designated as a Tangible Cultural Heritage.

The Guardian Deities painting, which was in a square frame, was already taken down from the wall when the researchers arrived. Before wrapping it, the researchers protected the painting's surface and its each corner to prevent from the possible damages. In order to protect the large-scale cultural heritages of the Buryeongsa Temple from possible damages during transportation, an air suspension vehicle was needed to reduce vibration. After asking all around, a truck equipped with air suspension was located near Uljin and was called to the temple in a hurry. The packed relics were safely positioned and fastened to prevent shaking as they were loaded onto the air suspension truck.

In an urgent situation of wildfire with entire nation's attention, the researchers of the Gyeongju National Research Institute of Cultural Heritage were dispatched to the temple, packed and moved the artifacts without wasting an inch of time based on their best judgment at the critical moment.

From their arrival at the Buryeongsa Temple, it took exactly three hours to pack and load all the cultural heritages on the air suspension truck. The air suspension truck departed the temple over 9 p.m. They couldn't see anything on the winding mountain road leading from the Buryeongsa Temple. Having a hard time passing through the mountain road with steep slopes and downhill, the truck finally entered a driveway. They then drove for four more hours at 60 kilometers per hour with convoys in front and behind. The four precious artifacts from the Buryeongsa Temple finally



5 Heritage of Buryeongsa in the storage of the Gyeongju National Research Institute of Cultural Heritage

made their way to the storage of the Gyeongju National Research Institute of Cultural Heritage around early morning.

Evacuation of Heritage From Buryeongsa Temple Left Many Tasks

Fortunately, the Uljin wildfire did not spread further from 7 kilometers away from the Buryeongsa Temple. The four relics, stored at the Gyeongju National Research Institute of Cultural Heritage, were safely returned to the temple on March 24. The evacuation of the artifacts of the Buryeongsa Temple due to the Uljin wildfire demonstrated how well cultural heritage researchers promptly ran the emergency response network and how relevant departments and personnels closely cooperated with each other. However, it also awakened many concerns and challenges for the protection of the cultural heritages. Although museum storage or research centers are well designed and built considering the flow of traffic, the fire reminded that there are much more variables existing for the relics stored in deep mountains. There is still a lot of work to be done in reviewing and reorganizing in terms of cultural heritage protection such as preparing a space for quick evacuation in case of an emergency as well as securing an evacuation route and conducting emergency drills preparing for disasters.

Korea has already had the experience of losing the renowned cultural heritage Sunghyeonmun, the National Treasure, back in 2008. Due to the arson attack, all the wooden structures except for stonework were destroyed and its restoration process took over five years. Even after the restoration, there are controversies over whether the restored relic has the same cultural value as before the disaster. Fire damage takes a lot of time to restore and furthermore, it undermines the value of the heritage. This is the reason why we should pay close attention to fire protection cultural heritages and make an effort in establishing a risk management system.



4 Researcher Sim Myungbo explained the mission to evacuated cultural heritages of Buryeongsa temple

Gwaebul, Artwork that Overwhelms with Immense Size and Splendid Colors

Research Division of Artistic Heritage

PARK Yoonhee

There is a Korean word, *yadan beopseok*, which describes a fussy and noisy situation. In fact, this word came from a Buddhist term as when monks held an outdoor Buddhist service to preach Buddhist sermons, many people gathered and created a fuss, which was called *yadan beopseok*. *Gwaebul*, or a large Buddhist hanging scroll, was hung during the *yadan beopseok*.

Such Buddhist paintings were produced in an enormous size so anyone who attended the Buddhist service could see them. Recently, high-resolution digital images of *gwaebul* were released online at NRICH Research Portal. We sat down with researcher Park Yoonhee of the Research Division of Artistic Heritage at the NRICH, who organized the project, to talk about *gwaebul*.



① Treasure, Gwaebul Painting of Buddha Triad at Chiljangsa Temple, 1710



What is gwaebul?

Gwaebul is a type of Buddhist painting produced for outdoor Buddhist rituals during the Joseon Dynasty. The hanging scrolls generally reach up to 10 meters since it was for outdoor ceremonies attracting many people, such as Buddha's Birthday, Yeongsanjae (Korean Buddhist ceremony reenacting Buddha's delivery of the *Lotus Sutra*), and Cheondojae (Buddhist ritual for the deceased). Since there were so many people and it was impossible for the Buddhist temple halls to accommodate all the people, those outside the building could participate in the rite by watching the Buddhist painting hanging outside the Buddhist sanctuary. It can be understood as a way to share the Buddha's mercy and merit with more people.



② Jingwansa Suryukjae, also known as Water and Land Ceremony of Jingwansa Temple (National Intangible Heritage Center)



It would not have been easy to paint such a large painting. Is it painted by a single person?

No. Gwaebul is a painting drawn elaborately by several *hwaseung*, or monk-painters. It was a large-scale Buddhist affair, and a veteran head monk-painter led the co-production with several assistant painters and each person drew one's own part. Through these collaborations, a unique style of painting could be handed down in each region. If the *gwaebul* is worn and discolored after a long time, other monk-painters carefully repaired it to the extent that it did not harm the original style.



Is there any information left about the year when the gwaebul was produced and the person who drew it?



③ Ceremony of gwaebul (hanging Buddhist painting) transfer during Yeongsanjae (Celebration of Buddha's Sermon on Vulture Peak Mountain) (National Intangible Heritage Center)

The painting's chronicle was written at the bottom of the painting, and it included a wide range of information such as the year of production and the list of people who took part in the Buddhist affair from the monk-painters to those who donated for the painting. Research on Buddhist painting history as well as temple history and Buddhist rituals is conducted based on the painting's chronicle.



Since gwaebul is quite big, it would not have been easy to produce and store the Buddhist hanging scrolls.

What temple made gwaebul and how did the monks keep it?

Due to its large size, it costed a lot to produce a *gwaebul*. Therefore, *gwaebul* was produced among temples with a long history or large and powerful temples. In case of temples in Gyeonggi Province, many large-scale Buddhist paintings belong to royal votive shrines, called *wondang*, to pray for happiness of deceased kings and queens in the afterlife, which suggests that the *gwaebul* was made to pray for the souls of royal figures. Since the *gwaebul* was made in the form of a hanging scroll, it was usually rolled, placed in a pine tree box and stored behind the Buddhist altar in the temple. It was moved outside to be hung during outdoor Buddhist service.



Since when gwaebul was painted and what is the reason for painting gwaebul?

The origin of *gwaebul* is not known exactly. We only presume that it was created after the Imjin War, or 1592–1598 Japanese invasions of Korea, and the Byeongja War, or the 1636–1637 Manchu Invasion of Korea, as there were large-scale rituals to soothe the souls of the dead. As the nation suffered from disasters, the rituals to console the souls

were held at Buddhist temples to pray for those who died of war and starvation and to comfort the sick people; this is presumed to be the beginning of gwaebul.

Q What is the significance of gwaebul in Korea's art history?

Gwaebul is an essence of Buddhist art and faith. Gwaebul is known for its overwhelming size as well as bright colors and intricate descriptions. That is why we consider gwaebul as a major art heritage that showcases the development of Korean Buddhist faith and art. It has an originality that cannot be found anywhere else in the world and that is why gwaebul is designated as state-designated heritage Treasure for conservation and management.

Q Since when and how did the research on gwaebul take place?

The Research Division of Artistic Heritage at the NRICH began research on gwaebul in full swing and conducted investigation on 53 large Buddhist hanging scrolls in Korean temples from 1985 to 2001. This long-term project provided basic data for Buddhist painting in Korea and discovered the cultural value of gwaebul. It led gwaebul to become the state-designated heritage.

Q Is the research on gwaebul still going on?

Of course. The NRICH is conducting the “In-depth Research Project of Large Buddhist Paintings” from 2015 to 2024 with the Conservation Science Division of the NRICH and the Research Institute of Sungbo Cultural Heritage, including scientific investigations such as analysis on coloring pigments and other materials used to produce gwaebul. To promote the artistic value of gwaebul to the public, the Research Division of Artistic Heritage unveiled the high-resolution gwaebul image database this year.

Q Where can I see the high-definition images of gwaebul?

It can be found at the NRICH Research Portal (<https://portal.nrich.go.kr>) under the "Gwaebul of Korea" gallery menu. We unveiled high-resolution images of 47 gwaebuls this



4 Researchers studying Hanging Painting of Jeokcheonsa Temple in the early 2000s



"Gwaebul of Korea" gallery

<https://portal.nrich.go.kr/kor/buddhaNdGallery.do?menuIdx=1092>

year in the first phase and will continue to release more photos as the project progresses. The high-definition photos available from the gallery are at least 30 million pixels up to 60 million, allowing the viewers to see the full view as well as detailed patterns magnified. I hope you can see the beauty of gwaebul, which was painted with sincerity and devotion by painter-monks of the Joseon Dynasty.

Q Do you have any plans for future gwaebul research?

The NRICH has recently conducted scientific research for efficient conservation and management of gwaebul. Starting this year, we are preparing to publish a catalog examining formative characteristics of Korean gwaebul combining art historical analysis perspective with the data accumulated by scientific research. This would provide an opportunity to understand the formative characteristics of gwaebul from the Joseon era, which has aesthetics different from Goryeo-era, and take a step closer to Buddhist painting, which has been considered difficult.



5 Gwaebul Painting of Eunhaesa Temple

Cultural Heritage Conservation Science Center Finishes Conservation of Transcription of Shurangama Sutra in Silver on White Paper

The Cultural Heritage Conservation Science Center completed conservation treatment of the Treasure *Transcription of Shurangama Sutra (The Sutra of the Heroic One) in Silver on White Paper*, Volume 10 (hereafter *Transcription of Shurangama Sutra in Silver on White Paper*).

The *Transcription of Shurangama Sutra in Silver on White Paper* is a transcription of *Neungeomgyeong*, or *Shurangama Sutra*, a Buddhist scriptures for monks in training, in silver pigment. The copy is the last of the 10 chapters of the *Shurangama Sutra* and currently chapters 1 through 9 are missing. At the end of the book, there is a record that it was made to pray for the late Yi Bang-han's mother in 1365, clarifying the writer and the year produced. The book is 11.2 centimeters wide and 30.5 centimeters long and



in accordion style binding, folded 57 times, and when unfolded, the width reaches 6.3 meters.

During this conservation process, it was newly found that the book was made of *Baekji* (white paper), specifically a type of Hanji (Korean paper) made from a paper mulberry through paper fiber analysis. The Cultural Heritage Conservation Science Center

will publish a report in 2023 including details of the conservation treatment and research. The *Transcription of Shurangama Sutra in Silver on White Paper* after conservation treatment will be displayed at the Kyungpook National University Museum and available for the public next year.

Presentations on Research Results of Baekje and Southern Dynasties of China

The Buyeo National Research Institute of Cultural Heritage and the BK21 Four team of Pusan National University co-hosted an international conference on "A New Perspective on Baekje and Southern Dynasties of China through Buddhism" at Yousung Hotel in Daejeon on July 8.

The event was organized to newly recognize the influence and relations of ancient East Asian Buddhist cultures based on the latest researches. The conference consisted of eight presentations including the building



principles of structure in Stone Pagoda at Mireuksa Temple Site, Iksan, the largest temple during the Baekje era, and temple building layouts during the Southern Dynasties of China and a general discussion.

The Buyeo National Research Institute of Cultural Heritage is conducting excavations and interdisciplinary

researches to reveal the splendid Buddhist culture of Baekje Kingdom. The institute will verify and restore the authentic Baekje era temple based on the results.



Link to the conference

Gyeongju National Research Institute of Cultural Heritage, ICOMOS-KOREA Co-hosts Conference on 5Cs



The Gyeongju National Research Institute of Cultural Heritage, along with ICOMOS-KOREA hosted a conference entitled "The 5Cs Approach to the Conservation and Management of the Royal Capital of Silla World Heritage Site" at the Gyeongju Hilton Hotel on August 25.

The 5Cs refer to five strategic goals, "Credibility," "Conservation," "Capacity-Building," "Communication" and "Communities" to promote the implementation of the World Heritage Convention, developed by the World Heritage Committee in UNESCO. At this conference, comprehensive dis-

cussions were held on the current status and future of heritage conservation and management of the Silla royal capital on the basis of these five strategic goals of the World Heritage convention.

This conference provided an opportunity to assess the current status of heritage conservation and management in Gyeongju through the strategic goals (5Cs) of the World Heritage Convention and use findings of the Heritage Impact Assessment (HIA) to identify potential threats and future approaches to effective management that may emerge from the conflicting values of conservation and development of heritage.



Official YouTube channel of the Gyeongju National Research Institute of Cultural Heritage

2022 Stone·Wood·Earth ISCARSAH International Expert Workshop Held

The NRICH under the Cultural Heritage Administration held the "2022 Stone·Wood·Earth ISCARSAH International Expert Workshop - Scientific Seminar" at Lotte City Hotel Daejeon from August 30 to 31. Experts of conservation and repairing of architectural heritage from home and abroad attended the workshop.

The conference began with a pre-event on August 29, followed by scientific seminars on August 30 and 31 and on-site workshops on September 1 to 2. At the scientific seminar, experts from 12 countries, including Turkey, Italy and the United States, presented cases of conservation and repairing of architectural heritage and shared international trends.



During the conference, the participants also visited the NRICH and its Conservation Science Center to see the conservation treatment work of various cultural heritages and national treasures.

This scientific seminar aimed to hear the voices of experts from home and abroad and collect various global cases and current situations. By the

expansion of the global network and deepening the global understanding of international regulations on conservation and repairing of architectural heritages, the seminar opened the floor to review the adaptability of current restoration regulations as well as the environmental factors of modern and contemporary architectural heritage of Korea.

The NRICH Successfully Restores Traditional Pigment Dongrok



Traditional mineral pigment Dongrok's raw materials and restored pigment

The NRICH succeeded in reproducing the artificial inorganic pigment Dongrok (copper green rust), which was mainly used in Dancheong (multicolored patchwork) for wooden buildings as well as hanging Buddhist paintings, and temple murals, through a traditional manufacturing technique.

This research aiming to restore materials and manufacturing tech-

niques for traditional artificial inorganic pigments was conducted from 2019 to 2022, following the research on natural inorganic pigments for Dancheong. Representative traditional artificial inorganic pigments include Dongrok, Heocheong (smalt), Miltaseung (litharge), Yeondan (lead red) and Yeonbaek (lead white). Among them, it has been difficult to restore Dongrok thus far because the material and manufacturing techniques were not identified clearly unlike other pigments.

In order to reproduce the manufacturing techniques of traditional pigment Dongrok, the acid corrosion and salt corrosion methods were attempted in consecutive order.

As a result, the Dongrok pigment reproduced through the salt corrosion method using pure copper and

five types of copper alloy powder as raw material has the same color and component as the Hayeob color of the old Dancheong in the actual cultural heritage and has the most similar particle shape.

The research has a great significance for defining the materials and identifying the characteristics of Dongrok, which is the pigment of Hayeob color widely used in colored cultural heritage for a long time. In future, the NRICH is planning to compile the research result on manufacturing techniques of traditional Dancheong pigment, present it to the academic world and make detailed research outcomes open to the public including the application for patents of the manufacturing techniques, technology transfer and publication of a comprehensive report.

Excavation and Research for Restoring Gwanghwamun Gate's Woldae Begins

The Ganghwa National Research Institute of Cultural Heritage kicked off the excavation and research for restoring the Gwanghwamun Gate's lost *Woldae* on September 1 through the end of the year.

This excavation and research are part of the 'Gyeongbokgung Palace's Gwanghwamun Gate Woldae Restoration and Surrounding Area Maintenance Project,' co-hosted by the Seoul Metropolitan Government and the Cultural Heritage Administration from 2018 to 2023. It aims to identify the exact size and structure of Gwanghwamun Woldae and find data for restoration. The institute has

been conducting excavation surveys for the restoration of the Gyeongbokgung Palace since 1990 to revive the historicity of the Gyeongbokgung Palace, damaged and distorted under Japanese colonial rule.

The Royal Palaces and Tombs Center of the Cultural Heritage Administration said after the completion of the excavation survey by the Ganghwa National Research Institute of Cultural Heritage, it aims to restore the Gwanghwamun Woldae and open to the public by 2023.



International Symposium on Digital Transformation of Archaeological Information



The NRICH hosted the International Symposium under the theme of "Digital Transformation of Archaeological Information" at Hotel ICC, Daejeon on September 28.

This symposium provided a platform to discuss potential tasks and strategies needed for Korean archaeology to move toward the digital transformation of information in the era of digital transformation. Experts from archaeology and digital humanities shared domestic and international cases of data collection and management and digital transformation of archaeological information.

The institute will continue to put the effort in ensuring user satisfaction by providing customized archaeological information in the era of digitalization and boost the studies of Korean archaeology.



Official YouTube channel of the NRICH

Upcoming Events

Exhibition "The World of the Ancients through Genetic Information"	Venue: Daejeon Convention Center Content: Genetic information research open lab exhibition and operation from acquisition of sample to DNA analysis Date: Thursday, October 20 - Saturday, October 22
Academic Symposium on Mural Painting in Josadang Shrine of Buseoksa Temple	Venue: National Palace Museum of Korea Content: Unveiling the results of digital restoration of Mural Painting in Josadang Shrine of Buseoksa Temple Date: Thursday, October 27
Asian Archaeology	Venue: NRICH Cultural Heritage Analysis Information Center (CHAIC) Content: Sharing results of major researches and domestic and international excavation surveys Date: Friday, October 28
The Palace of Light, Wolseong	Venue: Wolseong Palace Site, Gyeongju Content: Wolseong Palace Site opening at night and programs for citizens to explore the site Date: Thursday, October 6 - Saturday, October 8
Exhibition on Inter-institutional Collaborative Research Results	Venue: World Heritage Office, Jeju Special Self-Governing Province Content: Exhibiting Natural Monuments inhabiting on Jeju Island and research results on natural history resources Date: Tuesday, November 1
The 46th National Archaeological Conference	Venue: International Conference Center at Jeonbuk National University Content: National Archaeological Conference, co-hosted by the Wanju National Research Institute of Cultural Heritage and the Korean Archaeological Society Date: Friday, November 4 - Saturday, November 5
Commemoration of Publication of <i>Iron Manufacture Relics on Korean Peninsula II</i>	Venue: Jungwon National Research Institute of Cultural Heritage Content: Sharing the results of iron manufacture relics in Korea and discussing outlook in commemoration of the publication of <i>Iron Manufacture Relics on Korean Peninsula II</i> Date: Thursday, December 15

The Dictionary of Korean Archaeology – Bronze Age - (Revised and Expanded)



The NRICH has updated the *Dictionary of Korean Archaeology – Bronze Age* with new research dating from after 2004. The three volumes contain a total of 2,132 entries including 221 definitions (130 from Korea, 91 from overseas) and 1,911 archaeological sites (1,516 from Korea, 395 from overseas).

Volumes I and II feature research outcomes in Korea, while Volume III contains details about archaeological sites, artifacts and related terms about China, Japan, Kazakhstan, Mongolia, Russia and other countries to help understand the extensive Bronze Age cultures within Northeast Asia alongside Korean Peninsula.

This updated version puts forward a Hangeul Standardization of Bronze Age terminology, clarifying frequently used Sino-Korean words to help readers comprehend the materials better.

Plastering Techniques Depicted in Salleung Uigwe (Royal Protocols for Tomb Construction)



The NRICH published *Plastering Techniques Depicted in Salleung Uigwe (Royal Protocols for Tomb Construction)*, compiling and translating ancient literature on traditional plastering.

The *Salleung Uigwe* is to the part of Joseon-era royal protocols dealing with ceremonies, procedures and construction techniques in relations to tomb construction and Nijang refers to artisans who were in charges of applying soil, lime, cement and other materials on walls, ceilings and floors.

The technique used by Joseon-era nijang died away under the Japanese colonial rule and it is difficult to repair and restore heritage using the original method. The institute conducted researches in various ways including translating of ancient literature, investigating dismantling sites and listening to artisans to confirm traditional plastering technique which could be used for repairing cultural heritage.

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Our Paper, Hanji - Analysis

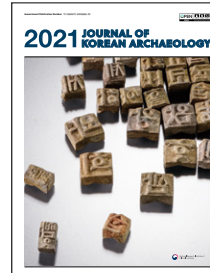


The NRICH published the report *Our Paper, Hanji - Analysis* based on an analysis of 48 kinds of Hanji, or Korean traditional paper.

Hanji is a unique handmade Korean paper known for its preservability. This report includes 48 kinds of Hanji manufactured by combining different raw materials and Choji (sheet-formation) techniques, resulting in different colors and preservability levels.

The results can be used to create a standard quality plan for the use of Hanji in the restoration of cultural heritage. Through comparison with Chinese Xuan paper and Japanese Washi paper, the NRICH plans to scientifically display the originality of Hanji.

2021 Journal of Korean Archaeology



The NRICH published Korean and English edition of the *2021 Journal of Korean Archaeology*, a magazine featuring major excavation results in Korea.

In 2021, a total of 1,894 buried heritages from the Paleolithic Era through the Joseon Dynasty were excavated and 31 of high academic value, including the Maedun Cave in Jeongseon and the Jungseong Fortress

on Ganghwa Island, are included in the magazine.

The excavation of 1,600 pieces of Joseon-era metal movable type in Gongpyeong-dong, central Seoul received much attention from the public. The Jongno area where the Gongpyeong relic is located is often dubbed as the "Pompeii of Joseon" as thick sedimentary layers since the Joseon Dynasty unveils relics or artifacts intact.

The magazine also offers "Excavation Sites Seen through YouTube" for the public to easily access cultural heritage excavation and statistics as supplement to provide more information on buried cultural heritage.

6 WORDS THAT YOU NEED TO KNOW

01

Gold Leaf

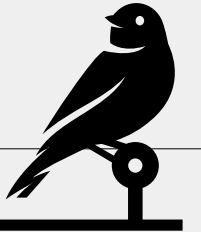
The gold leaf artifact from Silla era is made by chasing a pattern on a large gold leaf and then cutting the part needed.



02

Turtle Dove

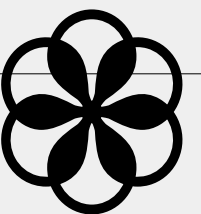
The turtle dove is a member of the bird family Columbidae. The species has a wide native distribution range from Europe, east across Asia to Japan.



03

Round Flower

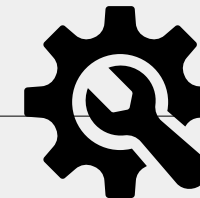
The flower carved on the gold leaf excavated from the Donggung Palace and Wolji Pond in Gyeongju is an imaginary flower. This was a decorative pattern popular during the Unified Silla era and also found in relics excavated from the Hwangnyongsa Temple site and the Garden Site in Guhwang-dong, Gyeongju.



04

Anastylosis Technique

A reconstruction technique using the original architectural material to the greatest degree possible when restoring a ruined building or monument, which is commonly used for cultural heritage repair in Thailand and Cambodia.



05

Columnar Joint

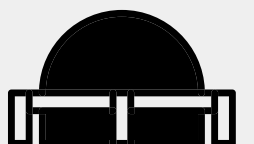
Joints are shaped during contraction when magma or lava cools down. Columnar joints typically take the shape of a hexagon and appear close together in a unique shape and many of columnar joints have developed into touristic sites.



06

Jjoksaem District

Jjoksaem District refers to an ancient cemetery for the royal family and nobles of the Silla Kingdom from the 4th to 6th century, found in Hwango-dong, Hwangnam-dong and Inwang-dong areas in Gyeongju, North Gyeongsang Province.





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