The conservation project of underground tomb with wall painting in Burj al Shamali, Tyre, Lebanon

レバノン共和国所在のローマ時代壁画地下墓の修復

Yoichi NISHIYAMA[1*)]

西山要一[1)]

[1)] Department of Study of Cultural Properties, Faculty of Letters, Nara University

[1)] 奈良大学文学部文化財学科保存科学

**Correspondence to: Yoichi Nishiyama; E-mail: nisiyama@daibutsu.nara-u.ac.jp*

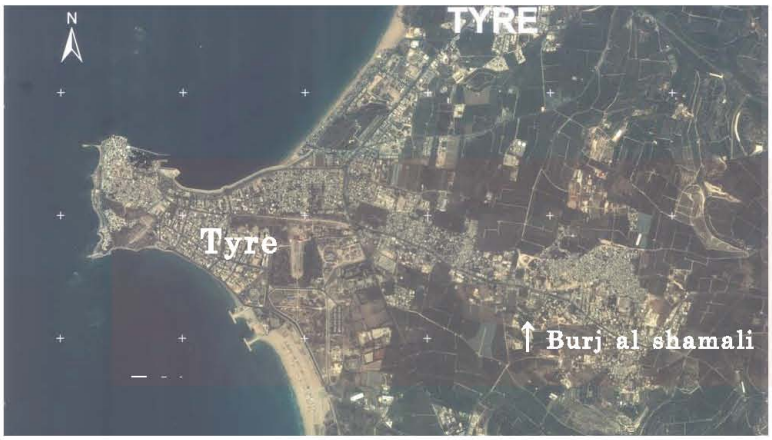
Introduction

The goal of this project is conservation and restoration of a Roman site T.01 at Burj al Shamali, Tyre, Lebanon. The site T.01 has 6 rock-cut graves (rock-cut grave=Rcg) in the underground chamber, and the site T.01 has been opened and damaged previously.

On the investigation of the T.01 in 2009-2011, we discovered many parts of pots, lamps, glasses, bones, wall paintings and mosaics in the underground chamber. We also collected a God Pan mask, some glass beads, coins, shell fragments and golden earrings in the Regs.

Other investigations were conducted simultaneously, including material analyses of the bedrock and the building stones; chemical analyses of the pigments, mosaics and glasses; a cleaning of the wall paintings; measurements of temperature, humidity, illumination, intensity of ultra-violet light, CO_2 concentration, and air pollution.

In this project, we make the scientific investigation based on conservation science, architecture, art history, restoration of ruins, and so on. We also make an academic study, e.g., passing on our techniques of scientific conservation and restoration. With these studies, we clarify and reconstruct the Lebanese culture and society in the Roman period, and we will hand the cultural heritage down to our posterity. Therefore, this project is dissimilar from the past common ones in the Middle East in which archaeological research and restorations have been done separately.



Research program

1. Outline of research

(1) Cleaning and excavation of the site T.01

(2) Documentation of the site T.01 and artifacts

(3) Examination of pigments and artifacts by scientific methods

(4) Measuring environmental data inside and outside of the T.01-Ⅰ chamber

(5) Cleaning and conservation treatment of the wall paintings.

(6) Reinforcement of bedrock and wall of the chamber by resin

2. Period of research

From 2009 to 2012

3. Organization

Yoichi NISHIYAMA and graduate students (Professor, Nara Univ., Japan)

Patorizia Lo SALDO (Restorer, Italy)

Gaby MAAMALY (Professor, Aramand University, Lebanon)

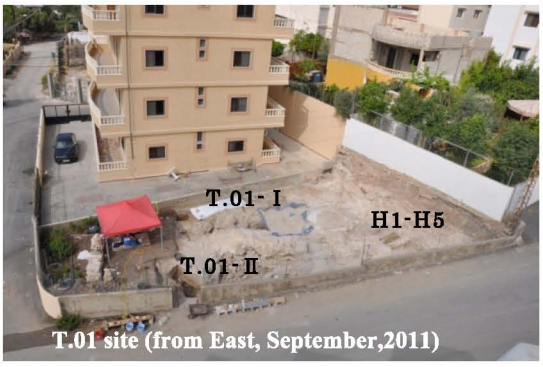
Hassan BADAWI (Professor, Lebanese University)

Assaad SEIF, Ali BADAWI, Nadel SEKRAWI (D.G.A. of Lebanese)

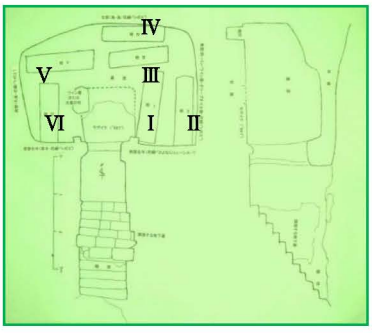
(1) Cleaning and excavation of the T.01 site

At this site, there are 2 underground tombs (T.01-Ⅰ andT.01-Ⅱ), 5 rock-cut graves (H1-H5) and 2 quarries. We found many fragments of earthenware (pot, lamp), glass, bone and painted wall in the underground chamber. Also, we found the mask of God Pan, glass beads, coins and golden earrings in rock-cut graves. We estimate that this site was built in AD 1st～2nd century.

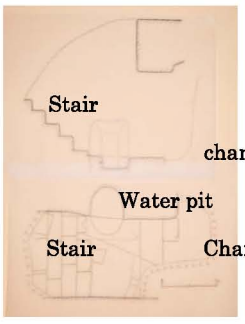
T.01 site (from West, October,2010)



T.01 site (from East, September,2011)



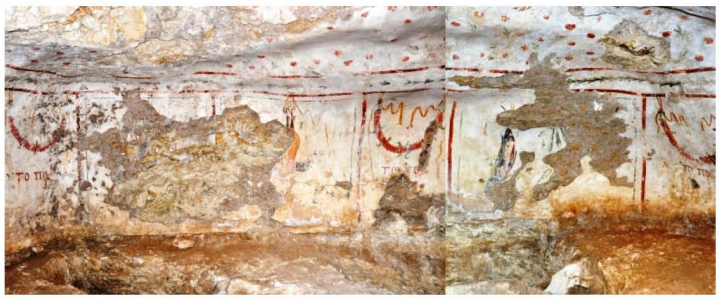
T.01-Ⅰ underground tomb



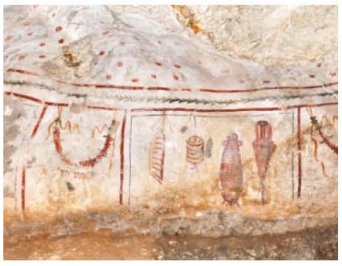

T.01-Ⅱ underground tomb

Wall paintings of the T.01-Ⅰ underground tomb

West wall



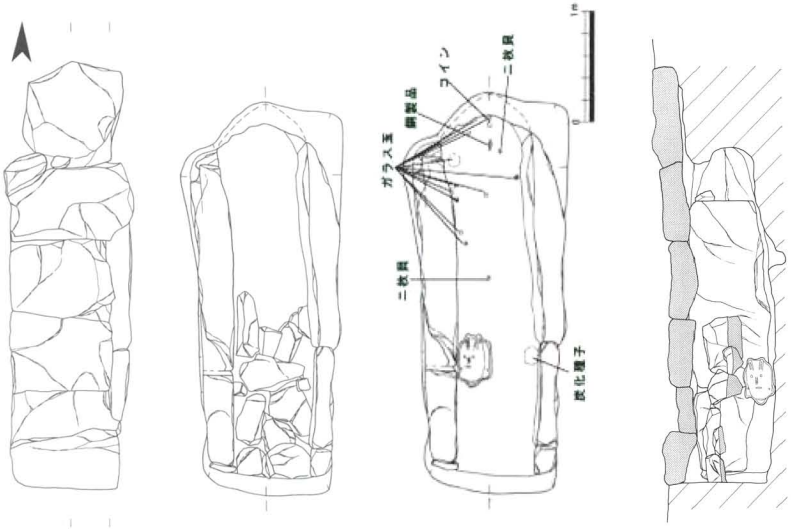
North wall



East wall

South wall

Rock cut grave H2



Mask of God Pan

Findings of rock cut grave H2

(2) Examination of pigments and some glass beads

We analyzed some parts of wall paintings and glass beads by X-ray fluorescence (XRF), X-ray diffraction (XRD) and EPMA. We obtained the important data and learned the original materials and the production techniques in the ancient Roman age. Red and yellow pigments are iron oxide (rouge), and green is earth green. Glass is soda of Roman.

Glass beads, from rock-cut grave H2

Color of bead	Element	Kind of glass	Coloring element
Clear reddish brown	Mg, Al, Si, S, K, Ca, Ti, Fe, Sr	Soda glass	Fe
Yellow and clear green	Mg, Al, Si, S, K, Ca, Ti, Fe, Sr (Mn, Sb from yellow part)	Soda glass	Fe, Mn, Sb (yellow) Fe (green)
Colorless	Mg, Al, Si, S, K, Ca, Ti, Fe, Sr, Sb, etc	Soda glass	Mn, Sb (vanish)
Light blue and Light greenish-blue	Mg, Al, Si, S, K, Ca, Ti, Fe, Sr, etc.	Soda glass	Fe, Sb
Clear yellow and Clear light yellow	Mg, Al, Si, S, K, Ca, Ti, Fe, Sr, Mn, etc.	Soda glass	Fe, Mn, Sb

Bones, in T.01-Ⅰchamber and rock cut grave (H5)

Sample	Anthropology*[1]	^{14}C dating(±2σ)*[2] (IntCa109, OxCal4.0.1)
Rock cut grave in the chamber of T.01-Ⅰ underground tomb		
Rock cut grave Ⅰ	Mail of mature age (40～60)	336～534A.D.
Rock cut grave Ⅱ	Female of womanhood (20～40)	
Rock cut grave Ⅲ	Mail of the first half of adult	140～336A.D.
Rock cut grave Ⅳ	Female of womanhood (20～40)	143～341A.D.
rock cut grave Ⅴ	(unknown)	
Rock cut grave Ⅵ	Mail of adult	
Rock cut grave H5		
Rock cut grave	Female of early teens	

(3) Measuring environmental data inside and outside of the tomb

We measured the environmental data inside and outside at the T.01-Ⅰ chamber (temperature, humidity, surface temperature of wall paintings, illumination, intensity of ultra-violet light (UV), concentration of CO_2).

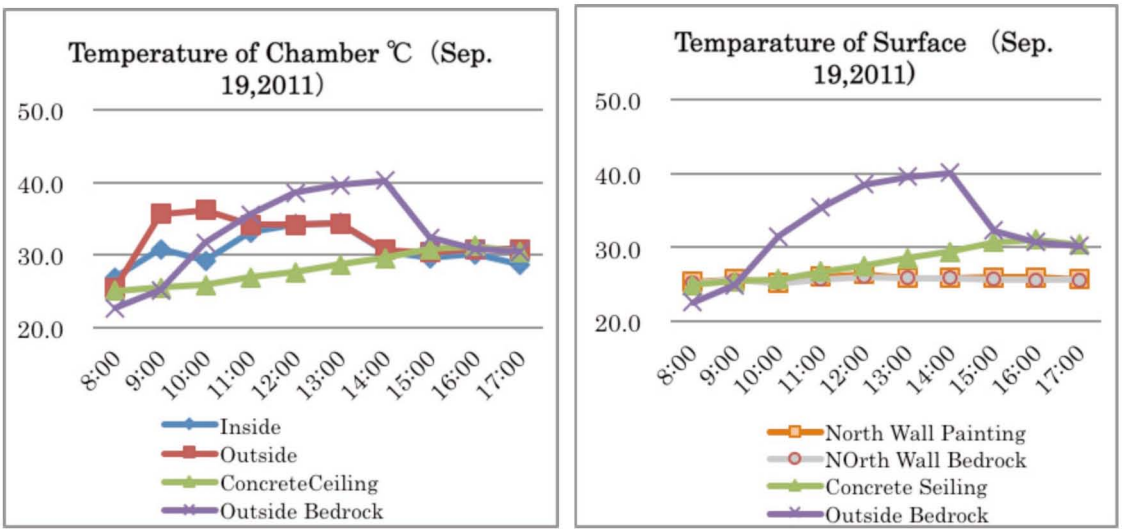
From these data in the last year, we found that the temperature of the chamber is indeed stable. Surface temperature values of the wall paintings are particularly constant, and their variance is less than 2℃.

But, in this season, we find that the temperature of the chamber changes indeed largely, with the maximum variance of 4.6 ℃ (Sep.12), and humidity changes by 20%. In the result of environmental change, $CaSO_4$ crystal covered a part of the wall paintings. We need to analyze this large change in environmental data and the effect to the wall paintings, most carefully.

Surface temperature values of the wall paintings are particularly stable, with the variance of less than 1.2℃, and this suggests that the paintings are in good condition.

Also, we can control the illumination and the UV intensity inside the chamber with the door. Therefore, we conclude that the environment of the chamber is kept under a suitable condition for the conservation of the wall paintings.

On the other hand, the concentration of CO_2 became higher when one person was working in the chamber (in the morning of Sep.19). We are afraid that the wall paintings will be damaged by high concentration of CO_2. Thus we have to pay attention to the number of workers inside the chamber.



(4) Cleaning and conservation of the wall paintings

We can clean the wall paintings and reinforce parts of fragile wall (plaster and bedrock). On the cleaning, we used AB57, ammonium carbonate and pallet. On the reinforcement, we used acrylic resin (Acrylem Ic-33) and three kinds of mortar.

As a result, we can look some parts of the paintings clearly.

Cleaning and conservation treatment of the wall paintings

(5) Researching of inscription on the wall paintings and mosaic

We found three kinds of important Greek inscription on the wall and on the floor mosaic in the T.01-I chamber.

"ΤΘΠΟC" is written at 3 corners and at the center of the north wall. "ΤΘΠΟC" means “place” and the deceased world. There are iron nails on both sides of the "ΤΘΠΟC”. We think they were used to nail a nameplate on "ΤΘΠΟC".

“XAIPE ΛΥCIC ΠΑΝΤΕC ΘΝΗΤΟΙ” is on the south wall. It means "Good-by ΛΥCIC, anybody is destined to die" and the words of comfort for him.

On the flower rope above the “ΛΥCIC” image, are iron nails, and we think they are to nail a name plate or an inscription plate.

“ΘA (PCI OYΔ) IC AΘANATOC BKT” means "Anybody is destined to die (wish to get endless life) 322". “BKT” is 322 year in Tyrian calendar, and this corresponds to Christian Era 196/197 A.D.

In Tyre, there is not any underground tomb with evident age, and so this is important finding. We continue to research on the inscription and the making techniques.

" ΤΘΠΟC "

”XAIPE・・・・・・”

"ΘA（ ）AΘANATOC（ ）IC BKT"

Summary

We got good results in the investigation of the Roman underground tombs T.01-Ⅰand T.01-Ⅱ, and rock-cut graves H1-H5.

Especially, we achieved new discovery of the underground tomb T.01-Ⅱ, clear date of formation and person’s name of the T.01-Ⅰby decoding Greek inscription, and enabled restoration of the wall paintings and the site, however, there still exist many problems on environment.

Based on these results, we will continue to research and restore the original structure of the site T.01. And we will be able to find the best environment.

We are planning to preserve the whole tomb and the wall paintings in particular, to prepare for an opening to the public of the site T.01 in 2012.

Acknowledgments

Mr. Assaad SEIF Mr. Ali BADAWI Mr. Nader SEKLAWI and D.G.A. Stuff

Thank you very much for your cooperation and advice.