Conservation Director's Report
2005 Season

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INTRODUCTION

The 2005 season brought new and exciting developments at the site of Kaman-Kalehöyük. Most noteworthy, of course, was the building of the new Japanese Institute of Anatolian Archaeology, which was celebrated with great pomp and circumstance in September of this year. Plans are already underway for outfitting the conservation laboratory at the new permanent facility based on recommendations made by predecessor Glenn Wharton, Director of Conservation Department for the past 13 years. As Wharton states in the previous volume of *AAS*, the role of the new Conservation Director will be an evolving one, reflecting the changes that will occur at the Institute as a whole over the next several years (Wharton 2005). The Director will not only be concerned with the day to day issues of artifact and site conservation and research, but also towards the larger and longer term goals of addressing the growing needs of the new permanent facility and a new museum, which will showcase the rich cultural remains excavated at the site of Kaman-Kalehöyük over the past 20 years.

During the 2005 season, the Conservation Department continued its work in preserving excavated materials at the site. In addition to this primary function, the staff and interns conducted research and helped train students and excavators at the site in safe methods of lifting, transporting, storing and caring for excavated materials. The excavation project has been scaled down this year, at least in part due to the fact that resources have been redirected toward the building of the new Japanese Institute. As a result, a reduced staff is working on site compared to previous years, and only about half the number of objects have come into the lab for treatment. This has given us the benefit of allowing us to finish the metal survey in good time, and starting a much needed survey of the ceramics collection in the Beton depot. The new ceramics survey is an important initiative for maintaining the physical and chemical stability of the collection and for providing information for inventory and research purposes. This information will be useful when the collection is moved into the new facility in 2006.

The problematic leak in the Beton storage depot in 2004 has not presented any serious new problems this year. There does, however, continue to be a slight drip in the area of the leak, where stalactites still form, and mold collects in the area below. Mold was found on canvas bags in the adjacent area, and in isolated places elsewhere in the storage depot, for example, on wooden storage boxes in the SW section of the depot and on some of the ceramic objects stored on open shelving in the SE section. This, of course, will no longer be an issue, once the collection is moved out of the depot and into the new facility.

Glenn Wharton is no longer Conservation Director; he was, therefore, not present at the start of this season to open the laboratory. The Kaman-Kalehöyük Conservation Laboratory Manual, Volumes I, II and III written by Wharton, however, were extremely helpful in providing a thorough introduction to the laboratory facility in his absence. These manuals are referred to in the Conservation Directors Report for 2003 (Wharton 2004). The position of Director and Field Conservator was held by Laura Lipcsei (June 24th - September 9th). The Conservation Intern this year was Carmen Li (June 20th - September 9th). Conservator Nina Zaitseva worked until the end of the season (September 7th - October 10th), together with Teaching

Assistant/Assistant Conservator Serap (Çelik) Acar (July 3rd - October 10th). Ceramics Technician Elçin Baş worked the entire season. The Conservation Laboratory was in operation from June 24th until October 10th 2005. 306 objects were treated this season. 243 of these objects were excavated in the 2005 season, while the remaining 63 unstable objects were pulled from storage for treatment from the storage facility.

ARTIFACT TREATMENT

Objects that were brought into the lab this season consist of the following:

Copper Alloys
Iron
Lead
Ceramics
Low Fired Tablet (Kültepe)
Stone
Bone/Horn/Ivory
Glass

METAL ARTIFACTS

Approximately 173 copper alloy, iron and lead objects were treated this year. An additional 63 metal objects were pulled from storage for treatment or retreatment. Once treated, objects were housed in archival materials for storage. Custom made polyethylene foam mounts were fabricated for each object and adhered to acid free card. The object and mount were then enclosed in a polyethylene bag and placed into sealed containers with conditioned silica gel.

Copper Alloy

As in previous years, copper alloys made up the majority of artifacts coming into the lab this season. In total, 121 new copper alloy objects were treated. Standard treatment protocols developed in previous years were followed. Briefly, this consists of mechanical cleaning using scalpel, pins and rotary tools, carefully, under the microscope. Objects exhibiting active corrosion, or 'bronze disease', were immersed in a 0.25 M solution of benzotriazole in ethanol under vacuum for a minimum of 3 hours. After drying, objects were given two protective coatings, one of 5-7% Paraloid B44 in acetone:ethanol and the other, a wax coating of BeSquare 195 and Polywax 200 in a 9:1 ratio. For localized treatments of bronze disease, affected areas were excavated, then packed with a slurry of silver oxide in ethanol. Objects that came into the lab consisted mainly of fibula, pins, arrowheads and unidentified objects and fragments. Noteworthy pieces included several fine examples of fibula, a few of which are intact and complete for example, C05-185 and C05-186. Of typological interest is an early Near Eastern fibula, C05-179, identified by fibula expert Mamoru Yamashita.

Iron

42 objects were treated this year, all of which received treatment according to established protocols. This consisted primarily of mechanical cleaning using scalpel, picks, rotary and vibratools to remove burial soil and concreted corrosion products. A few actively corroding objects, however, i.e. those exhibiting flakes and/or bright orange powdery products, were chemically treated. Some objects were treated using a 3% tannic acid solution, while others were treated with an alkaline dithionite solution. These procedures are outlined in greater detail in the Conservation Laboratory Manuals at Kaman-Kalehöyük (G.Wharton). The alkaline dithionite treatment was used on a select group of objects, however the procedure did not produce desired results. The first batch treatment resulted in the flash rusting on the surfaces of 3 of the 5 objects treated, during the deionized water bath/washing phase. After drying, affected objects were brushed and cleaned of corrosion products and reimmersed in alkaline sulfite for an additional 4 days, followed by rinsing in deionized water for 24 hours and dewatering in ethanol overnight. Because the treatment was not effective and because of time constraints at the end of the season, the objects were no longer treated with the alkaline sulfite method, but instead with a 7% tannic acid in ethanol solution. Interesting iron artifacts treated this year consist of objects found with pseudomorphs, e.g. an iron blade with wooden handle, C05-192, a spearhead, C05-173

and an object with a pseudomorph, C05-150. Other remarkable objects include an arrow with a unique shape, C05-217; a curious iron horn with incorporated organic material, C05-266, and a buckle composed of both iron and copper alloy elements, C05-71. A sizeable iron slag, C05-235, measuring 37 x 35 x 21 cm was found on top of a plank of charred wood; it was blocklifted from site early in the season. The materials of C05-217, C05-266 and C05-71 were analyzed using X-ray fluorescence spectrometry by chemist, Mariya Masubuchi.

Lead

11 lead objects were treated this year. All objects received a light mechanical cleaning to remove burial soil and corrosion products using wooden implements, fine glass bristle brush and ethanol/tap water where needed. Only one lead object, C05-167, pulled from the metals survey, exhibited active corrosion. It was chemically treated with EDTA. Special lead objects treated this year consist of a small plaque, C05-207, which features a human figure in relief, and two rolled strips of lead (similar to later Roman curse tablets?), C05-66 and C05-73. Because figures and inscriptions appeared to be present on C05 - 66, Masako Omura requested that an attempt be made to unravel the strips to determine whether more figures and inscriptions were present. An attempt was made to unravel the rolled strips after cleaning and applying gentle heat from a hair dryer to soften the metal. Efforts at unraveling the objects were not successful. The lead was simply too brittle and heavily corroded. Small fragments continued to break off as layers were moved and lifted. It might be worthwhile to have these objects x rayed using a neutron source which will penetrate the layers to determine if there are any inscriptions or figures present (common x rays, using x or gamma rays, do not penetrate lead). Consolidative reduction and/or electrolytic reduction might be tried to restore the heavily corroded lead back to its metallic form. This could potentially restore strength and flexibility to the metal. Tests, of course, should be conducted to ensure that reduction process will not have the effect of fusing layers together, or causing a tenuous and superficial flaky metallic layer to form. This is a controversial and experimental procedure which requires more research, and ethical consideration.

Ceramics

The majority of ceramic objects were treated by Elçin Baş, Conservation Technician in the restoration laboratory. A few ceramic small finds, however, came to the Conservation Laboratory for treatment. Stamp seal C05-177, for example, was received for cleaning. An impression was taken using Super Sculpey, after which the object was cleaned with ethanol. A clay tablet from Kültepe, C05-162, was brought to the laboratory for mechanical cleaning to remove burial soils from recesses of the cuneiform inscription to enable its reading and translation.

37 ceramic objects were treated by Elçin this year. Ceramic objects were treated with established protocols as described in the Laboratory Manual. Objects that were to be reconstructed were first desalinated until suitable conductivity levels were reached. After drying, join surfaces were coated with 7% B72 and fragments attached with 30-40 % B72 in acetone/ethanol. Larger vessels i.e. with fragments greater than 1.6 cm in thickness, were adhered with Paraloid B-48N. Only one artifact, C05-225, was chemically treated with 5% formic acid to remove carbonate incrustations to reveal details on its painted surface. Objects treated with acid are first soaked in deionized water for 24 hours to prepare the ceramic for treatment. Vessels are also soaked after treatment to ensure that all traces of acid have been removed. Very impressive was Elçin's reconstruction of two of the largest pithoi ever found at Kaman-Kalehöyük, C05-100 and C05-101. An object of archaeological interest was painted pottery vessel C05-153, which was reconstructed from fragments that link several provisional layers and structures together, namely Provisional Layers ㊺, ㊸, ㊻ and ⑦, Room 366 and Pit 375.

Stone

Two exciting stone objects came into the lab for cleaning and repair: a carved stone mold for casting metal objects, C05-84, and a round stone seal, C05-184. Impressions were taken of both objects using Super Sculpey. A mould of stone seal C05-184 was made with Reprosil, a Hydrophilic Vinyl Polysiloxane impression

material, from which a reproduction was cast in Fujirock dental stone.

Bone, Horn and Ivory

11 bone, ivory and antler objects were received for treatment in 2005. This includes bone hairpins, C05-40 and C05-195, which are similar to objects found last year. Button C05-32, appears to made of bone and was analyzed XRF, however the results are still somewhat inconclusive. A horn object was blocklifted from site after consolidation with cyclododecane. Once the cyclododecane had sublimated, the object was consolidated and fragments were adhered using various concentrations of B72 in acetone:ethanol, administered with a pipette and brush. Fiberglass tape was also used to bridge fragile joins, which were also adhered with 10-15% B72 in acetone:ethanol.

Glass

7 glass artifacts came into the laboratory for conservation. Of interest was a fragment of coloured glass from the Roman period that was analyzed by Mariya Masubuchi using XRF spectrometry. She presented her findings at one of our daily toplantı meetings.

XRF analysis

This year 6 objects were given to analytical chemist, Mariya Masubuchi for elemental analysis using X-ray fluorescence spectrometry: Fibula C05-01, Fe/Cu buckle C05-71, Roman glass fragment, a copper alloy pincette, bone/ceramic button C05-32, and iron paddle/implement 90000599.

CONSERVATION ON SITE

The conservation team was called on site on 6 different occasions to assist in the excavation and lifting of fragile objects. Objects lifted consisted of human skeletal remains, animal horn, two pithoi, iron slag and block samples of reed matting. The majority of objects were blocklifted in their surrounding soil using the plaster collar technique. An exception were the two pithoi C05-100 and C05-101, which were severely cracked and fragmentary, and thus excavated in large fragments. Some human skeletal remains were blocklifted while others were excavated in sections with the help of Veronica Hunt, human osteo-archaeologist. Cyclododecane, a wax- like cyclic hydrocarbon material, was used as the material of choice for consolidation. Cyclododecane was heated on site using a portable gas stove. It was applied in liquid form using a pipette or brush directly onto the surface of the object or onto gauze facing as an additional support. Cyclododecane is an extremely versatile material. It is simple to use and effective as a temporary or long term consolidant. It has a useful characteristic in that it readily volatile: it sublimates from solid to gas upon exposure to air and heat, and is therefore quickly and easily reversible. Another feature is that consolidated specimens can be stored in sealed containers for an indefinite period of time until the specialist, conservator, or archaeologist is ready to deal with them.

SURVEYS

Metals Survey

There are total of 6922 objects registered in the Metals Survey database. In 2005, 2780 objects were surveyed. 63 objects unstable objects were pulled from the survey and treated. There were 32 copper alloy, 30 iron and 1 lead object.

Ceramics Survey

In 2005, a survey of the ceramics collection housed in the Beton Depot was initiated. To date, 90 objects have been surveyed and the work continues. Minor changes were made to the existing survey form in the Kaman Filemaker Pro database to gather information that will be useful when the collection is moved into the new storage facility in 2006. In addition to assessing the condition of each object for its physical and chemical stability, each object was dry cleaned with a brush and suction, and cleaned with a cloth moistened with deionized water. All storage shelving was vacuumed and wiped clean before objects were returned to their original locations. Where possible, objects were placed into polyethylene bags, and shelves outfitted with dust

covers to prevent dust and dirt from accumulating on the objects. Bags and shelving were clearly labeled on their exteriors to minimize object handling. Information regarding the object's provenance and location in the depot were entered into the database. A current photograph was also taken and linked to each object's document record in the database, which will prove a useful reference for future inventory and research purposes.

Kırşehir Museum Survey

The Kırşehir Museum survey was not undertaken this year due to scheduling difficulties. The survey will continue in the 2006 season.

ENVIRONMENTAL MONITORING

New dataloggers, new software and a new laptop have allowed the conservation team to closely monitor the fluctuations in temperature and relative humidity of our storage spaces. The information gathered is extremely useful for and effective preventative conservation plan, in order to maintain and control on the environmental parameters of the storage facility, and make necessary changes necessary. All dataloggers were downloaded this year, and information stored on the laptop computer for the 2004-2005 year. Graphs reflecting environmental values for Temperature and Relative Humidity were prepared and disseminated for analysis at a toplantı meeting.

ONGOING RESEARCH

Two ongoing research projects were monitored this year: a set of 29 Oddy Tests, and Sarah Moy's ceramics adhesives research project. Sarah Moy's project was maintained and monitored from August 30 until October 1, 2005. Her work involves exposing pairs of ceramic tiles joined with various adhesives and solvents in five groups. One group was subjected to accelerated aging induced by freeze thaw cycles using a domestic freezer and direct sunlight. The other two sets were left outside, and in the freezer. The last two sets were left in the Beton storage depot, one group maintained at almost 100% humidity in a sealed container, and the other in ambient storage conditions. This year, only two failures were observed and recorded: both from the high humidity group in the Beton Storage Depot. The Oddy Test results did not differ greatly from the results obtained in 1999.

CURRENT RESEARCH

The unfortunate flooding of the storage facility during the 2003-2004 has lead to exciting new research on the topic of biodeterioration of collections and associated materials. This year's conservation intern, Carmen Li, conducted research into a related problem by studying the effect of microbiological growth on the breakdown of acrylic coatings. Her work entitled "Biodeterioration of Acrylic Polymers B-72 and B-44 - Field Trials" is found in this volume. Carmen's project involved background research and experimental field trials, which included testing samples, controls, and previously treated copper alloy objects from Kaman-Kalehöyük, under various temperature and RH conditions. Her research continues on the work of Nina Zaitseva, whose articles appear in the previous volume of *AAS*, entitled "Biodegradation of Wax Coatings on Copper Alloy Artifacts Treated with Benzotriazole (BTA)" (Zaitseva 2005a) and "Biodegradation of Microcrystalline Waxes" (Zaitseva 2005b).

FUTURE RESEARCH

The following topics have been put forth by the previous Director, in the last issue of *AAS*. Three are reiterated here, as being particularly relevant to the immediate needs of conservation and its collections this season. These are topics in need of further research, testing, evaluation and improvement upon current methods.

Iron Desalination

As indicated by less than desirable results obtained in this year's treatment using the alkaline sulfite

method, processes for the desalination of iron artifacts have not yet fully been understood and replicated with consistency. Several experiments were conducted in the past on the desalination of iron artifacts using alkaline sulfite, however, more work must be done in this area to improve our understanding of the mechanisms by which the process works and develop consistency in the treatment outcomes. This project involves reading past reports and current literature, then conducting field trials with variations on our standard treatment protocols.

Impression Materials

Impression materials of several kinds have been used at Kaman-Kalehöyük, with varying degrees of satisfaction. Several new products have come onto the market, and some are no longer available. This project includes a literature review of mold making and casting materials in order to help us improve our methods. The field component of the project will be to take impressions form various seals, and refine our protocol for use of different casting materials.

Emergency Preparedness

In light of the flooding of the storage facility in the winter of 2004, and because of lessons learned through other unfortunate events in the world (e.g. most recently, the earthquakes in Pakistan and Japan, and Hurricane Katrina, to name a few) it would be wise to have an Emergency Preparedness Plan in place at Kaman. The goal of this project would be to develop such a plan for protecting artifacts in case of earthquake, flooding and other natural disasters. Prior to coming to site, the intern will research plans at other field storage facilities and gather literature for our site library. The field component will include interviews with staff and assessment of our storage conditions along with implementing emergency preparedness procedures.

DAILY MEETINGS

Conservators reported on their daily work and progress at toplantı meetings. This year a presentation was given on blocklifting fragile artifacts from site, environmental monitoring, as well as a presentation of current research on the biodeterioration of acrylic coatings on metals objects in storage at Kaman-Kalehöyük.

HEALTH AND SAFETY

Mold in the storage facility and in the work area pose a potential health concern. Proper procedures should be followed when in working in the presence of or in contact with mold, e.g. toxic vapour masks, gloves and lab coats should be worn when handling or working with contaminated objects. Furthermore, a proper vacuum fitted with a HEPA filter should be used to prevent the circulation of fungal spores and the spread of mold though the storage and laboratory facilities. A request has been submitted for the purchase of a Nilfisk museum quality HEPA filter vacuum cleaner for use in the new permanent facility.

MOVE PROJECT

With the new Japanese Institute now built, we face the large task of moving the collections from the Beton depot and other storage areas, into the new facility. It will be a massive undertaking, which should not be taken lightly. Indeed, a move is much more than a mere relocation of objects. It is a complex process which requires foresight and careful planning in order to ensure a successful outcome. The goal is to carry out the move in a quick and efficient way, while minimizing the risk of damage or loss to artifacts in the move. It is essential that conservators play an integral role in this process. After researching other move projects of similar size and type, a comprehensive plan should be devised to outline all phases. An estimated timeline should also be established. The first stage of the process will involve close collaboration with the Registrar, to clearly document and label all objects. A condition survey should then be carried out by conservators to evaluate the stability of each object based on the potential for damage or loss during the move. Where necessary, stabilization and other remedial treatments should be performed. Each object should then be cleaned with a

vacuum under low suction and/or wiped with a soft cloth moistened with deionized water. A digital photograph should be taken of each object and linked to its object record in the Filemaker Pro database. In preparation for the move, materials for packing and padding should be assembled and/or constructed, whether they are generic bean bags, pot rings and ethafoam wedges or custom made mounts for object with special needs e.g. fragile, uniquely shaped or complicated objects. Appropriate shipping containers should be obtained to accommodate a wide range of objects of different sizes from very large to small. Finally, with the help of the Registrar, the new storage facility should be prepared and organized to accommodate the incoming artifacts. With a well thought out plan, a successful move is imminent.

ACKNOWLEDGEMENTS

This is my first season as Conservation Director at the site of Kaman-Kalehöyük. I would like to thank Dr. Sachihiro Omura, and Dr. Masako Omura for their commitment to conservation and for giving me the opportunity to work with them at this wonderful site. I would like to thank Glenn Wharton for creating a comprehensive conservation program and an impressive department, complete with a fully equipped laboratory and library, a great resource to conservators and researchers far from home. His Conservation Department serves as a model for other archaeological field projects abroad. His work over the past 13 years is a great legacy and testament to his vision, keen interest and devotion to the field of conservation. Finally, I would like to thank all staff and the intern this year for their hard work and dedication, without which none of the aforementioned would have been possible.

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