The Bead Necklace from the Child's Grave CG7: Conservation and Restoration of an Exceptional Find

Alice Costes and Andrea Fischer

Introduction

The conservation and restoration of the necklace from the child Burial CG7 (Loc. C1:46) in Room CR36.1, which was carried out at the Stuttgart Academy of Art and Design (ABK Stuttgart), is part of the CARE Project (Benz 2023). The aims of the CARE Project are scientific investigations, as well as the conservation and reconstruction of the grave. The conservation of the necklace was realised as there was a cooperation between ex oriente e.V. at the Institute of Near Eastern Archaeology, Free University Berlin and the ABK Stuttgart.[1]

In May 2019 the finds were surveyed at a first working meeting in Stuttgart to determine the objectives of the conservation treatment. In order to present the more than 2500 beads, and the mother-of-pearl ring as a necklace in the Petra Museum, the challenge was to mount as many elements of the ornament as possible for the exhibition. The reconstruction concept from Hala Alarashi (see Alarashi b this volume) should serve as a basis for the mounting in the exhibition. Due to the very poor condition of a considerable amount of the beads and in particular, of the mother-of-pearl ring, the feasibility of this approach was controversially discussed at the beginning. In a first brainstorming session, various concepts were outlined for the exhibition, taking into account the high fragility which prohibited the exposure of a large part of the individual items. The possibility of replica and/ or the production of a precisely fitting mounting support using micro computer tomography data, high-resolution 3-D scans, 3-D printing or CNC milling were considered in this context.

After further assessment, the condition of two thirds of the 2584 beads could be classified as good, while one third had suffered severe damage. During the first phase of work, the poorly preserved beads and the fragments of the mother-of-pearl ring remained in the conservation lab at Stuttgart. The collection of well-preserved beads was brought to CEPAM in Nice in order to conduct further investigations, and to work out the concept for the reconstruction.

All examinations and treatments related to the conservation of the finds were carried out by Alice Costes as part of her Master programme in Objects Conservation. The purpose of the treatment was to clean and to stabilise as many of those poorly preserved elements as possible, without compromising their authenticity and material substance.

In a second phase, after the conservation of the fragile beads and of the mother-of-pearl ring was completed, all components of the necklace were reassembled and mounted according to the reconstruction concept. The majority of the fragile finds could be stabilised to such an extent that a threading of the beads, as well as the presentation of the necklace including the mother-of-pearl spacer could be undertaken. High-resolution 3-D scans were performed for documentary purposes by N. Spichtig, Archäologische Bodenforschung Basel Stadt. However, due to the fragility and complex mounting of the sophisticated necklace, it was not possible to turn it upside down, and therefore a Micro-CT scan could not be realised.

[1] The reconstruction and conservation of the necklace was financed by an additional grant of the German Research Foundation (BO 1599/16-1), the Franz-and-Eva-Rutzen-Stiftung and private sponsors of ex oriente e.V. at the Free University of Berlin.

Benz M., Gresky J., Purschwitz C. and Gebel H.G.K. (eds.), *Death in Ba`ja. Sepulchral Identity and Symbolism in an Early Neolithic Community of the Transjordanian Highlands. Household and Death in Ba`ja* 2.
bibliotheca neolithica Asiae meridionalis et occidentalis. 2023. Berlin: ex oriente.
DOI: https://doi.org/10.11588/propylaeum.1224.c16951

Fig. 1 Fragments of the mother-of-pearl ring before treatment. (Photo: A. Costes)

Fig. 2 Detail of degraded mother-of-pearl ring showing a characteristic lamellar structure; covered with an alteration layer. (Photo: A. Costes)

The Finds and Their State of Preservation

The necklace includes a central ring made out of mother-of-pearl with a diameter of approximately 5cm, present in fragments. Most beads are small and discoid, and made from red limestone[2], only a few limestone beads have a tubular cylindrical shape. The white tubular beads (barrel-shaped or cylindrical) are made from shells. In total the inventory consists of 2584 beads. Amongst them there are five ovoid turquoise disc beads, two sub-spherical hematite beads (see Gerlitzki and Martin this volume) as well as two tubular brown, barrel-shaped resin[3] beads. In addition, the necklace includes a double-perforated hematite buckle.

The state of preservation of the beads is determined by the material itself and the storage conditions in the grave. The mother-of-pearl ring fragments and the shell beads are, with very few exceptions, highly degraded. In comparison, most limestone beads are in better condition. Turquoise and hematite items appear stable, and the hematite items even show dense, polished surfaces. Depending on the position in the grave, the beads on the upper right side of the buried child suffered more damage than those on the lower left side, since the child rested on its left side in a crouched position. In the reconstruction concept the beads of the child's left side form the right half of the necklace (from the perspective of the beholder). This observation regarding the degree of degradation was confirmed during the conservation treatment.

Mother-of-Pearl Ring

The ring is composed of two main fragments and several smaller fragments (Fig. 1). Both the surfaces as well as the edges of the fragments appear strongly fissured, and exhibit a lamellar structure (Fig. 2). Due to the advanced degradation, a clear definition of an "original" surface is not possible. The lamellar layers are partly whitish, powdery and dull, and partly reddish. In other areas, the layers appear yellowish and somewhat shiny. Iridescence, a characteristic feature of mother-of-pearl, can be observed here. The decomposed substrate is covered with white deposits, presumably calcium-containing alteration layers. Reddish precipitations are probably caused by the influence of iron ions.

The lamellar structure can be interpreted as being a characteristic damage pattern of mother-of-pearl, made from the inner shell layer of different bivalve shellfish species (Conchifera). In this case, the species *Pinctada margaritifera* was used for the mother-of-pearl.[4] The material consists of aragonite crystals (the orthorhombic form of calcium carbonate) which are joined together in an organic matrix made of the protein conchin (Götting 2014). While stored

[2] The reddish stone beads are simply called limestone beads, for detailed information on the composition see (Gerlitzki and Martin this volume).

[3] According to first FT-IR analyses by Julia Schultz, ABK Stuttgart. PerkinElmer Spectrum Two spectrometer was used for the investigation.

[4] Kind message from Hala Alarashi 03.03.2020.

in the soil, the organic matrix is degraded by hydrolysing, resulting in a loss of cohesion and therefore a loss of stability. Aragonite can be converted into the more stable calcite (trigonal crystal form of calcium carbonate). This transformation process leads to the loss of the typical feature of mother-of-pearl, its iridescence (Berducou 1990). Thus, the surface appears powdery, dull, and fragile.

Beads

Dealing with a large number of tiny beads was a challenging task. The 888 beads which remained in Stuttgart were documented using a flat board scanner.[5] Accordingly, the well preserved 1697 beads were scanned by Hala Alarashi in Nice. For detailed documentation of selected beads, a digital microscope was used in addition to the digital camera.[6]

The reddish limestone beads are most abundant. Small disc beads, various kinds of ring beads, barrel-shaped pieces, and others can be distinguished. The main portion of these beads is disc shaped. The total number amounts to 2264, with a diameter varying between six and seven millimetres. The number of tubular cylindrical limestone beads is much lower, with 66 items. Their diameter also varies between six and seven millimetres. Only seven limestone beads exhibit a flat, oval shape.

With few exceptions, almost all 232 shell beads are tubular. 178 of them are cylindrical and 54 are barrel-shaped. On well preserved samples the striped pattern of the *Tridacna* sp. shell variation in colour is clearly visible. This results in a very beautiful contrast in hue (Fig. 3).

Well preserved limestone beads are characterised by a well-defined, smooth and dense surface (Fig. 4, left). The stone substrate of poorly preserved samples is much more porous – its surface is eroded, dull and often covered with altered layers. Bulk depositions are presumably related to more advanced decay caused by leaching. The thicker the crust, the more fragile the structure of the beads. Whitish coarse-grained deposits usually adhere loosely to the surface (Fig. 4, right). Other alteration layers adhere firmly, forming hard, dense, and

Fig. 3 Barrel-shaped shell bead attached to six limestone disc beads (F.no. 100814.S) before treatment. (Photo: A. Costes)

Fig. 4 Disc-shaped limestone beads (F.no. 100814.124), (left) well preserved without alteration layers, (right) poor state of preservation with alteration layer. (Photos: A. Costes)

Fig. 5 Nine disc beads, one tubular cylindrical red bead and one tubular shell bead, attached to each other in a row in their original position (F.no. 100814.O). (Photo: A. Costes)

[5] *CanoScan 5600F*; 600 dpi

[6] The digital microscope *Keyence VHX-2000* and the digital camera *Canon EOS 80D* were used.

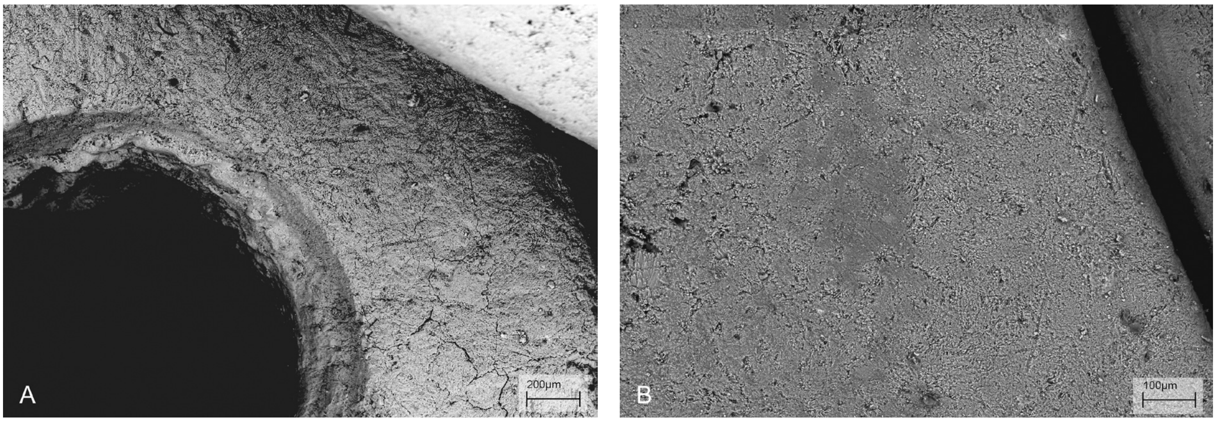

Fig. 6 SEM images of limestone bead (F.no. 100814.S): *A* traces of processing at the base of the perforation, *B* intact surface. (Photos: C. Krekel)

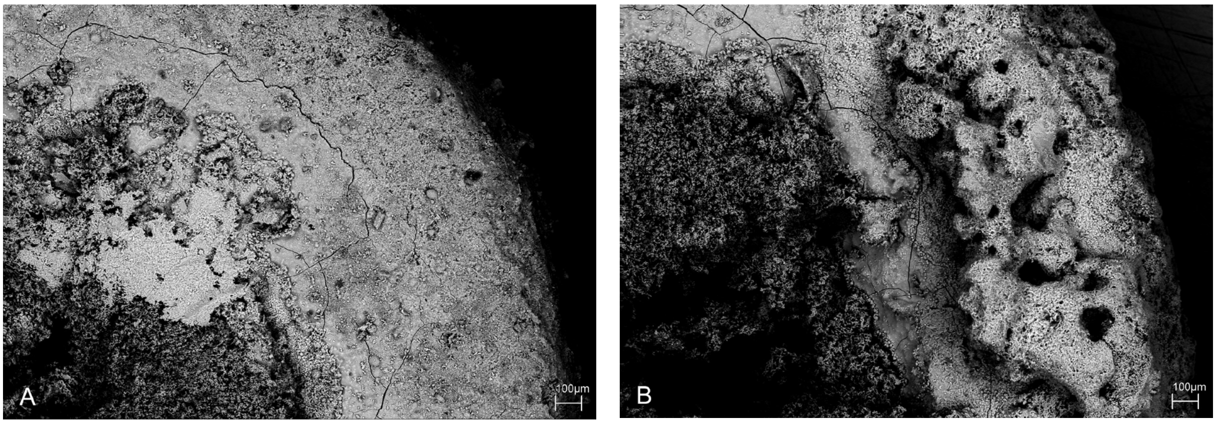

Fig. 7 SEM images of limestone bead (F.no. 100814.95): *A* degraded surface with cracks, deposits in the perforation, *B* bulky alteration layer covers the degraded surface. (Photos: C. Krekel)

irregular crusts. In many cases these deposits appear to be harder than the underlying porous material of the degraded limestone. The perforations of numerous beads are filled with deposits. Often several beads are cemented to each other by alteration products (Fig. 5).

Differences in the degree of degradation can be visualised using scanning electron microscopy (SEM).[7] Fig. 6 shows a well preserved limestone bead. The surface appears smooth, the edges are well defined, and traces of processing are visible. In the case of highly degraded beads, thick deposits are visible, along with a rough surface with cracks underneath and deposits[8] in the hole (Fig. 7).

Some shell beads are remarkably well preserved. These beads also exhibit distinct edges and smooth surfaces (Fig. 8). The surface of poorly preserved items is severely eroded. It appears highly irregular and rough, due to the specific structures of the degraded substrate. Fig. 9 presents an SEM image of a degraded shell bead with an alteration layer. In non-coloured striped areas, deep grooves have been formed due to enhanced decomposition.

To classify the beads according to their state of preservation, three groups were distinguished. Beads of Group 1 are well preserved and suitable for reconstructing the necklace, while beads of Group 2 are in a less good

[7] Investigations were carried out by Christoph Krekel, ABK Stuttgart. The *Zeiss EVO 60* electron microscope was used for imaging and elemental analysis. Detector: *Bruker X Flash 6130.*

[8] The deposits on the surface and in the perforation, field number 100814.95, consist mainly of calcium phosphate. Calcium originates from limestone ($CaCO_3$), phosphates are formed during the decomposition process of the corpse.

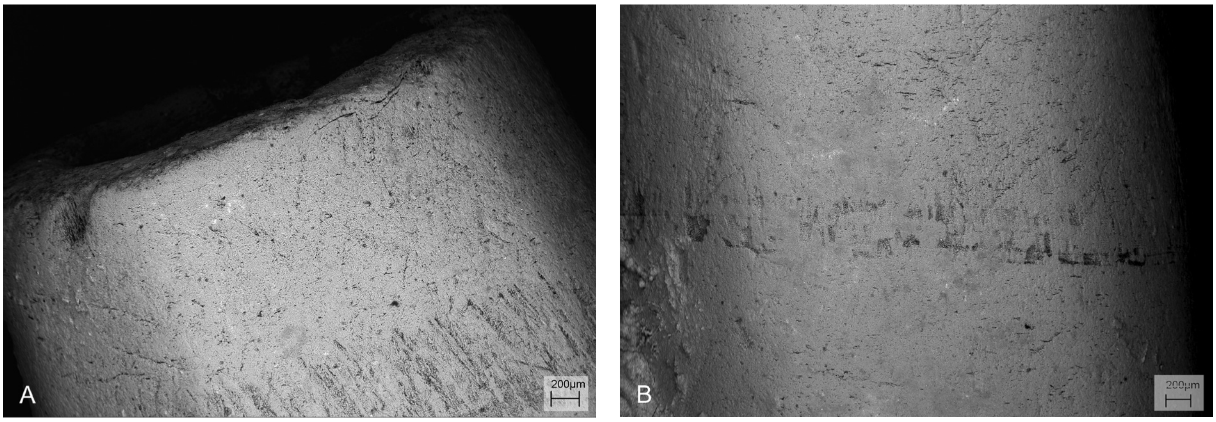

Fig. 8 SEM images of shell bead (F.no. 100814.S): *A* detail of the well preserved surface, *B* intact surface in the area of colour contrast. (Photos: C. Krekel)

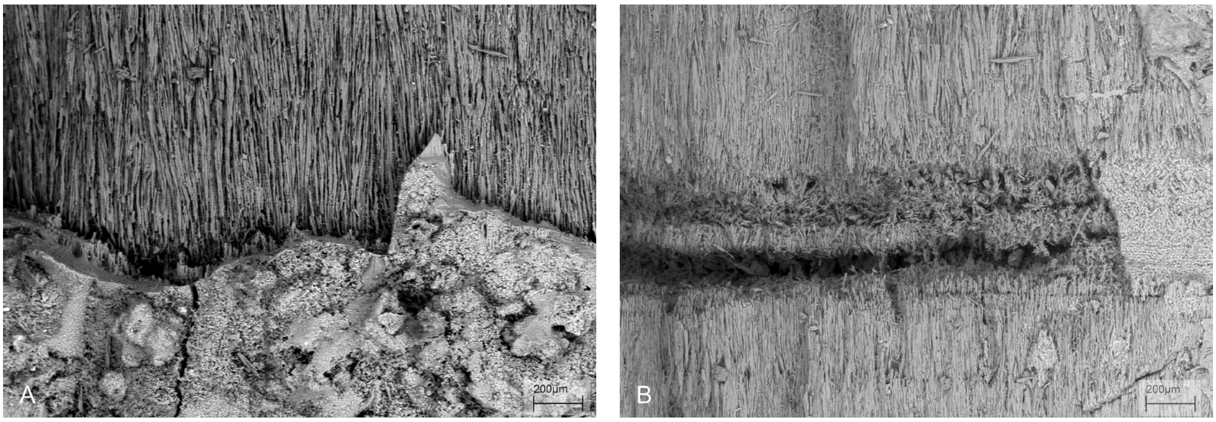

Fig. 9 SEM images of shell bead (F.no. 100814.65): *A* detail of the degraded substrate with alteration layer, *B* increased degradation in the area without colour contrast. (Photos: C. Krekel)

condition, and can only be displayed separately. The beads of the third group are very fragile and highly degraded. They are thus unsuitable for display (Table 1). The examination of all beads led to the conclusion that more than two thirds are stable enough, and therefore suitable for the reconstruction of the necklace (Fig. 10).

Conservation

The exhibition and treatment of the many tiny, fragile and delicate finds was a particular challenge. On the one hand, a concept for the active treatments had to be developed. The fragments of the mother-of-pearl ring had to be cleaned and stabilised as along with all the beads which seemed suitable for an exhibition, according to their classification. On the other hand, the display of the necklace could only be realised if as many elements as possible were assembled and presented on an adequate supporting mount. Furthermore, a concept for transporting the ensemble back to Jordan had to be developed. Due to inevitable vibrations, an exhibition mount cannot be used for transport.

Mother-of-Pearl Ring

Because of the high degree of degradation, a cleaning of the mother-of-pearl ring fragments was only possible to a limited extent. Deposits on the surface and in perforations could be removed mechanically, as long as no significant loss of material was caused by this approach. Alteration layers of mother-of-pearl were considered to be an integral part of the object, and have been therefore preserved. Fine brushes and stainless steel needles were used as tools for removing alteration layers and deposits, always working under a microscope. The use of chemical methods, *i.e.,* the application of acids or complexing agents, was not appropriate in this case. They would not only dissolve deposits, but also attack the calcium carbonate of the mother-of-pearl itself.

Table 1 Classification of beads according to their state of preservation.

Group 1	Beads suitable for exhibition, on display in the arrangement as a necklace. They are well preserved, have a sufficiently stable structure and are not, or only slightly, covered with deposits. The perforation is free of deposits and allows threading.
Group 2	Beads generally suitable for exhibition. The surfaces are more or less well preserved, though at least one side should appear intact. However, they cannot be included in the necklace as they are either too unstable, or are covered with deposits. Beads with holes closed by deposits cannot be used for reconstruction since they cannot be threaded. Items joined to conglomerates by deposits contain important information and represent the archaeological character of the finds.
Group 3	Beads not suitable for exhibition. They are preserved as fragments; broken, highly unstable and/ or show no smooth surface features at all.

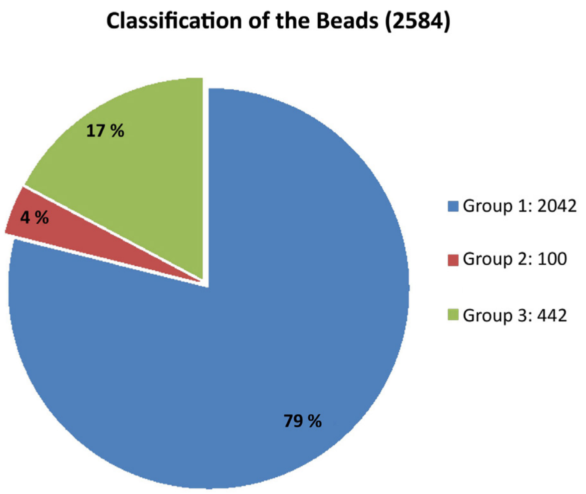

Fig. 10 Classification of the beads into three groups.

In order to avoid material loss, a consolidation of areas at risk was carried out before mechanical cleaning was completed. The acrylic resin *Paraloid B-44* was used for this purpose. The polymer is well established in conservation, it is characterised by good ageing properties, as well as adequate flexibility and adhesive strength (Down 2015). It is preferably used in regions where higher temperatures are expected. In a test series with small mother-of-pearl fragments, the appropriate concentration of the solution was evaluated. It has been observed that a solution of 3% *Paraloid B-44* in a mixture of acetone and ethanol, with following drying in controlled conditions, is best suited because it caused neither darkening nor flashiness that would be visible to the naked eye. However, in order to achieve more stability, at least two applications were necessary (Costes n.d.: 98). For consolidation, the solution was applied with an injection needle and dried in controlled conditions. A gradual cleaning process made it possible to improve the appearance of the fragments while still preserving the valuable archaeological finds. As a result, it was possible to bond single fragments using *Paraloid B-44* as an adhesive. In addition, extremely thin and fragile fragments were stabilised on both sides by small strips of glass fibre fabrics that were twice impregnated with a solution of 10% *Paraloid B-44* in a mixture of acetone and ethanol. The strips were dried under controlled conditions to obtain an evenly coated fabric, without entrapped air bubbles. A cellulose ether (7% *Klucel G*) was used for this purpose to ensure that they can be easily detached again later if necessary, without risking damage to the consolidated mother-of-pearl.

By joining the two main fragments and numerous small pieces it was possible to complete the mother-of-pearl ring. In three segments the ring widens outwards and perforations can be interpreted as a distributor for strands of beads (see Alarashi b this volume). The fourth, lower ring segment is heavily damaged; in this case the perforations are not preserved.

The so-called side B of the mother-of-pearl ring exhibits a better state of preservation than side A. The extent of surface degradation is much lower, and the shape of the ring is more evident. For this reason, side B will be exposed on display (Fig. 11).

Beads

Selected beads were mechanically cleaned under a microscope in order to remove alteration layers and deposits.

Fig. 11 The mother-of-pearl ring after treatment: *A* Side A, poorly preserved, the shape is difficult to follow, *B* Side B will be presented as the upper side. (Photos: A. Costes)

The final number of cleaned beads adds up to 480, and 360 of them have been attributed to Group 1. For the beads like for the ring, cleaning and consolidation went hand in hand. Consolidation with acrylic resin was only carried out if it was essential for the preservation of the beads. The fragile reddish limestone beads with strong crusts were particularly at risk. A large number of Group 1 shell beads with severely degraded surfaces also required treatment.

The aim of the consolidation treatment has been to provide sufficient stability without causing damage or changing the appearance of the beads. It is most important to achieve a homogeneous distribution of the polymer in the substrate, in order to avoid tension. The success of the treatment is determined by the choice of polymer and solvent, solution concentration, application method, impregnation time and also by the drying time (Sander-Conwell 1995; Dröber 2006). The acrylic resin *Paraloid B-44* has also been chosen for the beads for its above mentioned properties. A comprehensive series of tests has shown that the best results were achieved with a solid content of 3% dissolved in a 50:50 mixture of acetone and ethanol (Costes n.d.: 90). To allow the solution to be absorbed as gently as possible by the fragile shell and limestone beads, the capillary forces in these porous substrates were taken into account. After the beads had been impregnated, they were dried slowly and in a controlled process, to prevent the polymer from being transported to the surface when the solvent evaporates. All together 921 beads of Group 1 were treated using acrylic resin. This means that 45% of the beads selected for the reconstruction of the necklace are consolidated.

The time required to examine the beads one by one and assess their state of preservation should not be underestimated when planning conservation treatments. Although very large numbers of small finds are involved, decisions should not be made in a generalised manner. The aim was defined as treating only the material that actually needed preservation. This minute investigation took a lot of time, but was appropriate in regard to time management, as well as for achieving the defined objective.

The use of a digital microscope for the documentation of selected and representative beads has proven to be advantageous and time saving.

From the initial examination to cleaning, consolidation and mounting of the beads, a great deal of attention was required to ensure that the small objects remained associated with their find number.

The beads of Group 3 were deliberately excluded from cleaning and consolidation treatments in order to be able to use them for further investigation.

The chosen method of consolidation treatment is based on an approach well studied in ceramic conservation. Due to the porosity of the limestone and the degraded shell, it was possible to apply the same method to the beads. However, the tiny dimensions of the beads and their associated large surface area posed a challenge, especially in terms of achieving a slow drying process. This approach should be improved in any further series of tests. Slow controlled drying, in addition to the choice of polymer and solvent, has a major influence on the homogeneous distribution of the consolidating polymer.

Mounting for Exhibition

The concept for the reconstruction of the necklace was developed by Hala Alarashi (see Alarashi b this volume). The result is a nine-row necklace consisting of sixteen individual strands, a central mother-of-pearl ring and a hematite buckle. The realisation of the concept requires materials that do not harm the fragile and degraded components of the necklace, and provide sufficient stability. The individual beads needed to be threaded into strands on a suitable thread. On the one hand, the thread has to provide sufficient strength, but on the other hand it has to be soft enough to avoid damaging the beads. For the beads of Group 2 and 3, spacers had to be included which also fit into the visual concept of the presentation. The complete ensemble was mounted on a stable board. Its surface should again be as smooth and soft as possible.

Calcareous materials, here the limestone and shell beads but also the mother-of-pearl ring, are highly sensitive to air pollutants, especially to carbonyl compounds such as formic acid, acetic acid or formaldehyde (Tennent and Baird 1985; Gibson *et al.* 2010). These compounds can be emitted by wood, wood-based composites, plastics, textiles and others. High concentrations of pollutants can be found in small indoor spaces, such as display cases or cupboards. Conservation research has developed methods to evaluate the damage potential of materials used for the exhibition and storage of cultural heritage objects (Thickett and Lee 2004). The so-called Oddy test was carried out to examine various yarns and foams that were considered for the mounting of the necklace. Samples of the material in question were placed in airtight containers with three coupons of different metals – silver, lead, and copper (Fig. 12).

Fig. 12 Airtight glass tubes for the Oddy Test. Eleven different materials were tested to prove whether they are suitable for mounting. (Photo: A. Costes)

A small amount of water was added to retain a high level of humidity. These containers were kept in an oven at 60 °C for 28 days (Korenberg *et al.* 2018). Each metal detects different corrosive emissions. Lead detects organic acids and aldehydes. It is damaged by similar pollutants as calcareous materials, and is of particular importance in this case.

Seven different polyethylene foams with a fine-pored cell structure, and four yarns of various raw materials have been investigated. Yarns were tested in unwashed and washed condition. Washing made it possible to remove finishes that caused a negative influence on the emission of the yarns.

Based on the results of the investigation, the polyethylene foam *Plastazote LD 45* and a black linen yarn from *Amann* were chosen. The physical properties of the materials had an influence on the selection as well. The polyethylene foam is supported by a black polymethylmethacrylate (PMMA) base. Spacers with a diameter of 3mm could be made out of the above mentioned polyethylene foam, in order to replace the beads that could not be mounted (from Groups 2 and 3) without being too noticeable.

The mother-of-pearl ring was applied to a black archival cardboard, providing the most perfect shape with all perforations for the distribution of the strands of beads. The threaded strands and all other elements of the necklace were fixed to the polyethylene foam with the proven yarn. This foam can be placed on the PMMA base after mounting is completed (Figs. 13,14). If necessary, it can be removed to allow for changes.

Fig. 13 The mounted necklace. (Photo: A. Costes)

Fig. 14 Detail of mounted beads with placeholders made of polyethylene foam (top row). (Photo: A. Costes)

Fig. 15 Storage system for beads of Group 2 and 3. (Photo: A. Costes)

Transport to Jordan

For the journey to the Petra Museum, the mother-of-pearl ring, the sixteen individual bead strands and the buckle were separately embedded in polyethylene foam. Small storage units made of polyethylene foam, archival cardboard and polyethylene bags were produced for the beads of Group 2 and 3. The beads were placed in separate cavities and were thus protected from mechanical stress. The enclosed inscription was written with black drawing ink on acid-free archive cardboard (Fig. 15).

Mother-of-pearl, shells, and limestone suffer severe damage due to carbonyl-containing pollutants. To preserve this unique find, it is of utmost importance to use tested materials for storage and exhibition. Wood, wood composites and related construction materials have to be avoided.

Acknowledgements

We thank the Department of Antiquities for loaning the ornament elements (Permits 12/5/274 and 12/5/1334) for conservation and for the good cooperation. We sincerely thank the German Research Foundation for providing additional conservation funds for the Household and Death in Ba`ja Project (BO 599/16-1), the Franz-and-Eva Rutzen Stiftung, and private sponsors of ex oriente e.V., Berlin. We would like to express our sincere gratitute also to the Petra Development Tourism Regional Authority (PDTRA) and its Chief Commissioner Suleiman Farajat, Ismail Abu Amoud, Ibrahim Farajat, and the Petra Museum Director Nahar al-Rawadieh, and his team for their kind hospitality and support. Additionally, we appreciated the assistance of the JICA-Team at the Petra Museum. This paper would not have been possible without the support and excellent cooperation provided by Marion Benz (Institute of Near Eastern Archaeology, Free University, Berlin: co-director of the Household and Death Project), Hala Alarashi, IMF-CSIC, Barcelona, and the Ba`ja Neolithic Project (directed by Hans Georg K. Gebel) of which the Household and Death Project was part from 2018 to 2021. Finally, we are very grateful to Julia Schultz for performing FTIR analysis and Christoph Krekel for taking the SEM images, Stuttgart State Academy of Art and Design.

Alice Costes
Stuttgart State Academy of Art and Design
alicenathaliethierrie.costes@
stud.abk-stuttgart.de

Andrea Fischer
Stuttgart State Academy of Art and Design
andrea.fischer@abk-stuttgart.de

References

Benz M.
2023 A personal access to cultural heritage. In: H. Hayajneh (ed.) *At the intersection of the humanities and the sciences*: 73-86. Zürich: LIT.

Berducou M.C.
1990 *La conservation en archéologie. Méthodes et pratiques de la conservation-restauration des vestiges archéologiques*. Paris: Masson.

Costes A.
n.d. *Ein neolithisches Collier aus einem Kindergrab in Ba`ja (Jordanien). Konservierung, Restaurierung, Verpackung und Ausstellung*. Interim Report n.d. (April 2020). Stuttgart: Stuttgart State Academy of Art and Design.

Down J.L.
2015 The evaluation of selected poly(vinyl acetate) and acrylic adhesives: a final research update. *Studies in Conservation* 60(1): 33-54.

Dröber V.
2006 *Untersuchung zum Eindringverhalten von Polyacrylsäureestern bei der Festigung von porösen Materialien. Die Markierung von Paraloid B-72 mit Fluorescein-Isothiocyanat.* Unpub. Diploma Thesis. Stuttgart: Stuttgart Academy of Art and Design.

Gibson L.T., Claire M. and Watt C.M.
2010 Acetic and formic acids emitted from wood

samples and their effect on selected materials in museum environments. *Corrosion Science* 52(1): 172-178.

Götting K.J.
2014 *Malakozoologie. Weichtierkunde in Stichworten*. Stuttgart: Schweizerbart.

Korenberg C., Keable M., Phippard J. and Doyle A.
2018 Refinements introduced in the Oddy test methodology. *Studies in Conservation* 63(1): 2-12.

Sander-Conwell E.
1995 Tränkung poröser Keramik. *Arbeitsblätter für Restauratoren* 28(2), Gruppe 4: 94-97.

Tennent N.H. and Baird T.
1985 The deterioration of mollusca collections: identification of shell efflorescence. *Studies in Conservation* 30(2): 73-85.

Thickett D. and Lee L.R.
2004 *Selection of materials for the storage or display of museum objects*. London: British Museum.

Appendix 1

List of materials

Acetone, 99.5% for synthesis
Carl Roth GmbH und Co. KG

Double corrugated archival board, 940 g/m²
Klug-Conservation

Ethanol, 99.8% p.a.
Carl Roth GmbH und Co. KG

Glass filament fabric, plain weave, 25 g/m²
Lange und Ritter GmbH

Iso-propanol, 99.5%
Carl Roth GmbH und Co. KG

Klucel G, hydroxypropyl cellulose
Kremer-Pigmente GmbH und Co. KG

Lascaux Acrylic Adhesive 498 HV
Deffner und Johann GmbH

Minigrip-bags, LDPE, 80 x 120 x 0,060 mm
Kunststoff –Schmidt GmbH

Museum board, 360 g/m², black
Klug-Conservation

Museum paper, 90 g/m², cellulose with alkaline buffer
Klug-Conservation

Paraloid B-44 (methyl methacrylate polymer)
Kremer Pigmente GmbH und Co. KG

Pelikan, drawing ink A 17 black
Stationery store

Plexiglas, PMMA, carbon, matt finished
Ernst Kienzle GmbH und Co. KG

Polyethylene foam, *LD 45*, anthracite
Thimm Group GmbH und Co. KG

Yarn, 100% line, black, 0020
Amann und Söhne GmbH und Co. KG