

The Reconstruction of Historical Jewellery and its Relevance as Contemporary Artefact

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Philosophy*

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For Appropriate Durable Record & Exegesis

Declaration

I hereby declare that the Appropriate Durable Record and Exegesis for the work entitled The Reconstruction of Historical Jewellery and its Relevance as Contemporary Artefact, as submitted on seventeenth of November for the qualification of PhD, represents the work of myself, except where due acknowledgement has been made in the documentation.

The work entitled The Reconstruction of Historical Jewellery and its Relevance as Contemporary Artefact, has not been submitted, either in whole or in part, for any other academic award. The Appropriate Durable Record represents the work undertaken during the period of candidature from 01/01/1999 – 17/11/2005 being part-time by research.

Some material included here represents a revision and extension of previous conclusions.

Yours sincerely

Robert Baines
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Glossary

Abbreviations - Journals, Institutions, Catalogues and Books

AJA:	American Journal of Archaeology.
ARV2	J.D. Beazley, Attic Red figure Vase-Painters, 2nd ed. OUP. (Oxford 1963).
BM:	British Museum.
BMCI:	F.H. Marshall Catalogue of the Jewellery, Greek, Etruscan and Roman, in the Department of Antiquities, BM,(London, 1911).
BMCR:	F.H. Marshall, Catalogue of Finger Rings, Greek, Etruscan and Roman, in the Department of Antiquities, BM,(London, 1907).
BMOP:	British Museum Occasional Paper.
CBA:	Council for British Archaeology.
GB:	Gold Bulletin.
GR:	Greek and Roman (BM)
JAS:	Journal of Archaeological Science.
JHMS:	Journal of the Historical Metallurgical Society.
JHS:	Journal of Hellenic Studies.
JPGM:	J. Paul Getty Museum, Malibu
MASCA:	Museum Applied Science Centre for Archaeology, The University of Pennsylvania.
MCA:	Museum of Contemporary Art, Sydney.
MMA:	The Metropolitan Museum of Art, New York.
MNAA:	Nacional Museu de Arte Antiga, Lisboa
NGA:	National Gallery of Australia, Canberra.
NGV:	National Gallery of Victoria, Melbourne.
NYHS:	New York Historical Society.
OAQ:	Outils et Ateliers d'Orfèvres des Temps Anciens, (St. Germain-en-Laye, 1993).
SAM:	
SJH:	Society of Jewellery Historians.
St. Etr.:	Studi Etruschi.
St. Va:	Studia Varia.
TWMA:	TarraWarra Museum of Art, Healesville.
V&A:	Victoria and Albert Museum, South Kensington.
W.C.G.:	Worshipful Company of Goldsmiths.

Technical Abbreviations

EDAX:	Energy Dispersive Spectrometer
EMP:	Electron Microprobe
PGE:	Platinum Groups
SEM:	Scanning Electron Microscope
SEMEDS:	Scanning Electron Microscope Energy Dispersive Spectrometer
XRF:	X Ray Fluorescence

Au:	Gold
Ag:	Silver
Cl:	Chloride
Co:	Carbonate
Cu:	Copper
Na:	Sodium

Summary of Research

The dating of ancient jewellery is given by the archaeological context. Technology applied by the ancient goldsmith is traceable through archaeometallurgy. The aim of this research is to analyse historical jewellery and to construct copies based on the known technology of the era. Resultant laboratory constructions with their historical correctness and the new knowledge of jewellery structures will then be available for reworking to convey a contemporary visual relevance and a statement of history. The results of these analyses and reconstructions will form the basis of metalwork objects in which contemporary aesthetics are informed by historical practice.

1. Introduction/Summary of Exegesis

1.1. Two Major Antecedents

Streams of archaeometallurgy and studio art practice as a goldsmith come together in this body of research though there have been on going periods of mutual exclusivity of both endeavors. I was introduced to the jewellery technique of granulation by my lecturer Wolf Wennrich in the Gold and Silversmithing Diploma Course at Royal Melbourne Institute of Technology. Following graduation in 1970 I pursued a studio investigation of the granulation technique using combinations of silver and gold alloys and applications of this acquired skill became an important aesthetic component in my studio artwork.

Archaeometallurgy

In 1979 I was awarded a Winston Churchill Fellowship Study to examine the fine jewellery of Greek and Etruscan goldsmiths.¹ The objective of the study tour was to gather information on the varied structural contexts of granulation joining and their possible application in a contemporary goldsmith practice.

The Churchill Fellowship Study facilitated my first visit overseas to examine ancient jewellery in public and private collections and initiate what became an ongoing dialogue with curators, researchers and material scientists in the major museums of Europe and the USA. Ongoing visits to examine goldworks predominantly in public collections ensued and resulted in writing research papers² and presentations at major conferences and workshops on the subject.³ In 1989 at Royal Melbourne Institute of Technology I supervised a multi disciplinary research project into the analysis and evaluation of a gold jewellery piece from the Antiquities collection in the National Gallery of Victoria.⁴

In 1997 I conducted a Senior Fulbright research project at the Metropolitan Museum of Art in New York in the Sherman Fairchild Center for Objects Conservation. The research was primarily centred on Etruscan and some Greek gold jewellery. This was a critical point for personal discovery due to the very supportive staff at the museum and availability of primary research material.

Studio Art and the Practice Based Research

I have been a practicing artist goldsmith continuing to exhibit internationally since "Tendenzen 1982", Schmuckmuseum, Pforzheim Germany.

Subject based jewellery and larger works have been commissioned and shown extensively in Europe, USA and New Zealand and I have been awarded major art prizes including the Colin and Cecily Rigg Award 1997 (NGV, Melbourne) and the Seppelt Contemporary Art Awards 1998 (MCA, Sydney). Larger works acquired for public collections include The Spray Brooch (Powerhouse Museum, Sydney), The Entropy of Red, Trumpet (Victoria and Albert Museum, London), and Tea Sets (NGV, NGA,

¹ CHURCHILL FELLOWSHIP STUDY, 1979 To undertake a study in Europe and the U.S.A. of the fine Metalwork of the Ancient Greek and Etruscan goldsmiths and the method of Granulation in particular, in order to apply such techniques to the artistic expression of the ancient, but timeless quality of the Antipodes. Places and collections visited: Athens, National Museum - Strathatos Collection, Benarki Museum, Rome, Villa Giulia, Museo Dell Terme, Pigorini Museum, Florence, Museo Archeologica, Hamburg, Museum for Kunst and Gewerbe, Munich, Antikensummlungen, Pforzheim, Schmuckmuseum, England, British Museum, Fitzwilliam Museum – Cambridge, Victoria and Albert Museum, Brooklyn, U.S.A., Brooklyn Museum, Boston, Boston Museum of Fine Arts, Richmond Virginia Museum of Fine Arts.

² R.Baines, (1992) 43-48. R.Baines, (1993) 39-44.

³ In correspondence to the Fulbright Review committee on this subject Dr. Barbara Deppert-Lippitz wrote, "His (Baines) articles on the gold cylinders from Praeneste, published in 1992 and 1993, have set a completely new standard in the scientific as well as in the art historical analysis of ancient jewellery. For about 30 years most of the research on ancient goldsmithing techniques has been quite repetitive. Mr. Baines' work was the only remarkable exception. His approach lead to the discovery that in ancient goldwork stylistic features are often the result of technical necessities" (05-09-1995). Dr. Joan Mertens, curator of the Greek and Roman Department of the Metropolitan Museum in New York, wrote "To my knowledge, Mr. Baines is the only person who is focussing specifically on the process of construction of ancient jewellery and the degree to which technical factors determine the appearance of the finished object."

⁴ R.Baines, *et al.* (1989).

Powerhouse Museum). Major pieces such as *The Entropy of Red*, *Table* were acquired for private collections.

A significant turning point was the award of an Australia Council Arts Fellowship Grant in 1992. The study period provided investigative research in the building of linear structures using wire. Formats of wire configurations and systems of solder and fusion joining were experimented with and from this synthesis of knowledge and ideas came a technical dexterity in construction and rudimentary basis for future studio work.

1.2. A Personal Fine Art Statement

The subject directed studio based work in a broad way is the furthering of a Christological statement. This is an expression of personal belief and the intention is to build jewellery as a personal form of worship; it is not intended to be didactic or evangelical. The colour red can be a vehicle to carry reference to Judaic-Christian practice of a sin offering where there is a [cultural] belief of the requirement of the shedding of blood for the remission of sin. This is part of my own spiritual enquiry and questioning. I do not regard theological discussion as relevant to this research.

REDEVENT

The conveying of love and sacrifice through the vehicle of red has antecedents since time immemorial. Within all the substances to convey red is the enjoyment of entropy and in its ultimate state of degeneration the symbol becomes quiescent. The fullness of red remains untold. A,AAA,AAA...REDEVENT is a jewellery group comprising the following series: *The Intervention of Red*, commencing 1994; *The Entropy of Red* 1995; *REDLINE*, commencing 1996; *A Vesseled History* 1997; *Bloodier than Black*, commencing 1998, *Meaner than Yellow*, commencing 2001, and *Whiter than Red* commencing 2004.

1.3. Laboratory Analysis, Reconstruction and Authentication

Laboratory reconstruction of ancient goldworks and the making of copies of particular jewellery types have a number of attributes. Prior to the Victoria and Albert a baule⁵ laboratory reconstruction important test pieces investigating the Palestrina cylinders⁶ were constructed in my studio in Melbourne and later published (Fig.1.1). Much of the goldsmithing of the test pieces and this PhD research into ancient goldsmithing is centred around the technical joining process commonly called granulation.

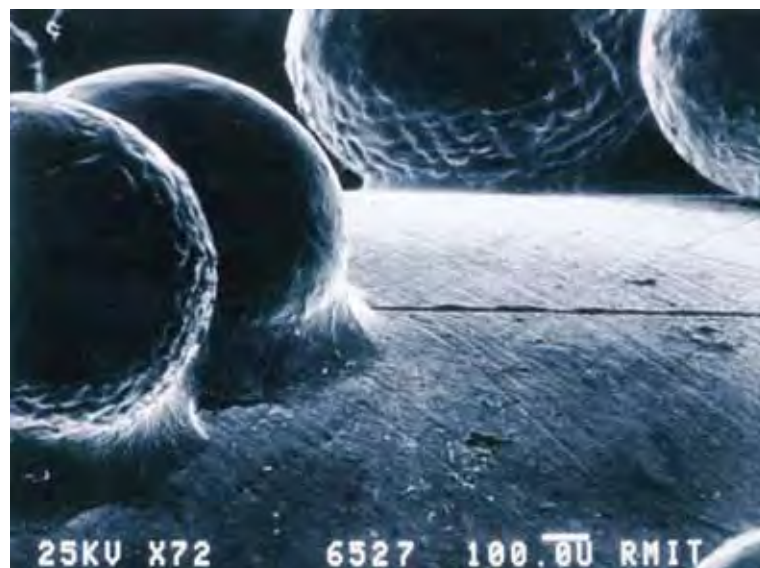


Figure 1.1. Test piece by Robert Baines: granulation on convex substrate, showing the fusion of the granules to each other and to their base. The substrate has not been part of the melting process, and the surface abrasion and scribing are unaffected. (x 72) SEM image by Barry Smith and Robert Baines courtesy of RMIT.

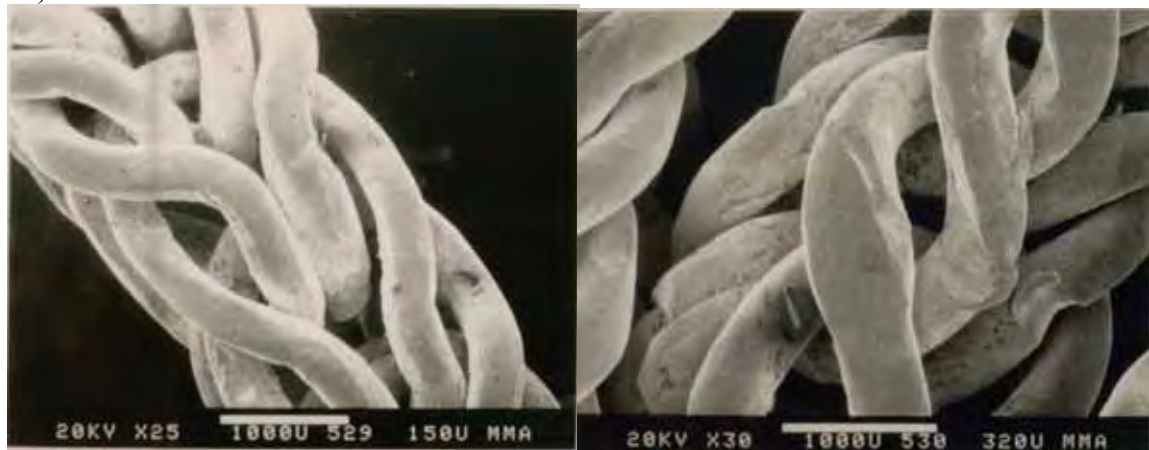
⁵ See 3. Examples of Analysis and Reconstruction, 2. A Baule Ear Ornaments p.56

⁶ See note 3 and fig.1.1.

Granulation is a decorative jewellery technique by the goldsmith describing the joining of small round balls or granules to a substrate. This is the most common application. It can also be the joining of granules (balls) to granules or wire to granules and wires to a substrate. The joining is by fusion and so the term granulation is used to describe the fusion process when objects of gold and silver are placed in contact to be joined and are heated to a molten state and surfaces become liquid and join at the contact points. Fusion identifies that surfaces are joined in a molten state and implies an intermolecular penetration making a join that is very fine, stable and does not remelt.⁷

Information gleaned from laboratory recording and analysis identifies and broadens and increases knowledge of museum collections. Laboratory reconstruction principally tests assumptions and theoretical strategies of working by the ancient goldsmith. Using goldsmithing skills based on known technology of the same era, theories of manufacture can be tested.⁸ This can also establish a vantage point of knowledge to authenticate and identify fakes.

A further objective is to identify worked surfaces and structures and place them in a technological and chronological context. Such evidence can also develop the source and location of theories of manufacture (Figs.1.2-5).



Figures 1.2,3. Wire working characterising ‘loop in loop’ chain type with marks caused by use of tools in a modern copy of an ancient chain. SEM image by Robert Baines and Mark Wypiski courtesy of the Metropolitan Museum of Art in NY.



Figures 1.4,5. Wire working in a loop and loop chain of a fake that has the same stylistic mistakes as figures 5,6. Clearly the chain is not made by the same goldsmith. Photo by Gail Spring and SEM image by Robert Baines and Barry Smith courtesy of RMIT.

It has to be stressed that all surface and subsurface alloy analysis conducted on the jewellery items in Section 3 are not published in this exegesis. Weights and measurements in tables and on drawings have also been removed from the publication of this research at the request of the Greek and Roman

⁷ K.R. Maxwell-Hyslop, (1974); M. Rosenberg, M. (1918); Wolters, J. (1975); J. Wolters, (1980); J. Wolters, (1981)119-129; J. Wolters, (1981); J. Wolters, (1983); P. Hoffman & H. Davidson, (1965); D.L. Carroll, (1974) 33-39.

Department of the Metropolitan Museum of Art in New York. This leaves the methodology of research still identifiable but without my making available material which could be employed for fraudulent replication. Measurements of alloys, dimensions and weights are enclosed in research reports at the Metropolitan Museum.

The same investigative scrutiny is made of the later laboratory samples for comparative analysis. This provides a vantage point to consider the broad manufacturing aspects of sheet, wire and granules in ancient gold jewellery artifact and my personal methods of fine gold construction work.

Series of drawings are made of selected artefacts depicting possible sequence of assemblage based on the copper salt diffusion joining system. The drawings are used as maps for the scanning microscopy. The Energy Dispersive Spectrometer (EDS) elemental analyses of artefacts and samples identify surface and subsurface alloys and this is integral to the research and discussions. Using the SEM, markings and structures indicating manufacture of the decorative components are observed and photographed. This visual information on surfaces reveals sequences of assemblage and identifies goldworking methods.

1.4. Jewellery ‘Play’, Fake and Forgery and the Research Questions

From a goldsmith’s point of view I am considering how formulated heritage is available for reference, questioning and modification. The option to copy, to replicate, or to modify the historic document jewellery is a possibility and new inputs can both verify or be used to engender falsehood. Laboratory samples are made replicating jewellery by means of goldsmithing skills based on typical technology of the same era.

The laboratory constructed samples become available for reinterpretation as artistic expression. The pieces can be reworked and physically changed in response to the inclusion of contemporary materials and thinking. Found object and modern materials placed into the “historically correct” jewellery will interfere with and confront the previous orthodoxy of the jewellery object. What was once “historically correct” will thereby become stylistically distorted. Such “interfered with” jewellery objects offer a new experience of jewellery as a historical and contemporary document.

I have had a shared concern particularly with Dr. Joan Mertens at the Metropolitan Museum of Art in New York for the past ten years concerning my laboratory constructed copies and their eventual destination. The possibility existed of these investigative pieces later being sold as fakes if I was to continue to show them (with some modification) in exhibitions in commercial fine art galleries. It was resolved that if they were to be shown it would be on a ‘scientific research basis’⁹ and not in a commercial context. The work would remain in my collection and eventually be donated to either the National Gallery of Victoria or the Metropolitan Museum of Art in New York.

Investigations of the fake and the genuine are not alien to archaeology and the study of our cultural history. Objects of suspicious provenance or actual fakes are exhibited in museums or galleries, and published or presented to the world as authentic artefacts. They then become components of our intellectual culture and capital. Inclusion of the bogus into that which is accepted as the standard or primary reference subverts knowledge of the genuine. Can this be prevented? Is it being nurtured by the publication of research findings? Is it possible to safeguard our cultural history from sabotage?

These are personal confronting questions. Is it valid for a goldsmith like myself to ‘play’ with these issues? Working as a goldsmith, it comes very easy to build fictitious “historical” jewellery.

Is it a sin if it is just an artist at ‘play’?

The questions I posed for research

In what ancient jewellery types is style or placement of iconographic forms as much a consequence of technology as the stylistic genre of the day?

What new knowledge of technology and modification of current theories can be gleaned from laboratory reconstruction of historical goldworks?

Is it possible to construct artefacts that are stylistically, chemically and methodologically conformable to ancient examples?

How can my work express aspects of the knowledge gained from analysis and reconstruction in contemporary jewellery and object using both historic and current forms and materials?

⁹“Robert Baines Entdecker der antiken Goldschmiedetechnik,” Staatliche Antikensammlungen, München, Germany 2004.

2. Historical Background

2.1. Development of Analysis Techniques

A main theme of this PhD research is the idea that the application of technology, together with experience with the properties of gold and silver is part of human history alongside other cultural statements of politics, society, ideas and art. Jewellery encapsulates and becomes a document that holds such historical meanings.

It is not possible to take readings of fingerprints from the gold works considered in this research but there are identifying outward marks which mirror the inner thinking of the jewellery makers. Mental planning and “jotting” is evident in some jewellery. Quite often it is found they are purposefully applied with the expectancy that in a later sequence the process will erase or cover over any such indication. On other occasions such preliminary markings in a later sequence provide a facility for the addition of further construction, for example a scribed line becomes a location for a row of granules.



Figures 2.1,2. Etruscan gold *a baule* ear ornament MMA 95.15.139, fourth century BC. The grooved folded strip has lifted to reveal preliminary marking out on the substrate by the goldsmith. SEM image courtesy of the Metropolitan Museum of Art in NY.

Visible Signs of Inner Thinking

Almost nothing has been written of these expressions of preliminary design thinking.¹⁰ They have been generally overlooked or disregarded, but signage of planning and designing can identify them as the visible working out of an idea.¹¹ This offers a window into the design thinking or strategies of the maker identifying methodologies that are principally invisible in the finished object. Obscure markings on artefacts belonging to a peripheral time for the contemporary goldsmith identify strategies of working and these are available for consideration and evaluation (Figs.2.1,2).

In particular ancient gold jewellery the decorative configurations that accumulatively mark their style can also be regarded as a consequence of technologies. Their placement and relationship to each other is in part a testimony to the joining technology carried out by the goldsmith.¹²

Jewellery artefacts selected for this research appear to confirm this argument, and by observing them through the microscope working drawings were constructed. Series of drawings of the selected artefacts develop the method and strategies of analysis and can also depict possible sequences of assemblage of the gold jewellery. Detailed drawings of surfaces and structures describe the geography of the jewellery and these are used as maps while in the chamber of the SEM. The drawn maps facilitate an orienteering through the complex jewellery landscape. The drawings highlight locations and areas of interest for observation and analysis.

Historical Location of Technology

¹⁰ R. Baines, (1992) 43-48, (1993) 39-44; also G. Nestler and E. Formigli, (1993) 67.

¹¹ While there are some gems and silverware with marks of the maker, there is an absence of signed pieces in the domain of gold jewellery. Together with the absence of any written or illustrative script attribution is quite rare in the discussion of Etruscan and Greek goldworks. There is no figure like the Greek painter Amasis, one of many potters and painters who signed their works in the sixth century B.C.

¹² It is with an understanding of the technology of the manufacture I have ‘played’ with. The knowledge becomes a vantage point for interpretation. This is explained in section 4. Development of Original Work. p. 106

The SEM provides detailed examination imaging and high quality photography with clear depth of field resolution. This facilitates identifying and recording characteristics of manufacture; the sequential mode of assembly of the various components. Identification of beaded, spool and flat sided wires can be attained and observations of granulation with its diverse configurations and possibilities of joining are accurately recorded. The first objective in such methodology is to articulate metal analysis and define its contextual meaning with regard to the period of gold technology in the historic sequence. The second objective is to identify worked surfaces and structures and place them in a technological and chronological context. Such evidence can also develop theories of the source and location of manufacture.

Generally the mode of joining by the goldsmith can be identified first by visual inspection, for observation of contact points reveals the characteristics of particular heat systems of fusion. However visual perception can quite often be misleading. Metal surfaces can vary considerably according to diverse combinations of heat, atmosphere and chemical contexts (Figs.2.3-6). More comprehensively, comparing the joined core can make identification by qualitative analysis with the substance of the joining material using EDS. Finally, scanning electron micrographs of cross sections can be compared with the surface and the core material of heat joined regions. This qualitative analysis and comparison of regions using the EDS clearly shows the application of copper in the diffusion bonding system.¹³ Further to this can now be added, in some instances, the observation of stylistic configurations of gold works.



Figure 2.3. Test piece by Robert Baines: Copper salt diffusion joining of granules to the substrate by the goldsmith can be identified first by visual inspection. SEM image Nigel Meeks by Nigel Meeks, Scientific Research Department courtesy of the British Museum.

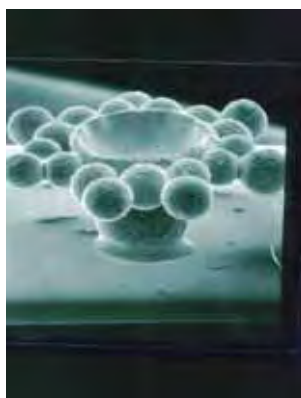


Figure 2.4. Test piece by Robert Baines. SEM clearly identifies the stability of copper salt diffusion joining system. SEM image by Barry Smith and Robert Baines courtesy of RMIT.

¹³ Gold joining using copper salt diffusion : J. Wolters, (1985) 173-191. H.A.P. Littledale, (1933), Littledale delivered a lecture on this subject titled, "A New Process Of Hard-Soldering And Its Possible Connection With The Methods Used By The Ancient Greeks And Etruscans" at the Goldsmiths Hall, London, 1934. P. Parrini *et. al* (1982) 118 - 121, pls. 13 - 14. Minto (supra n. 6) 199, pl. 11. P. G. Guzzo, (1968) 278, n. 2, pl. 69a. G. Nestler and E. Formigli, (1993) 24, 25, pl. 23.

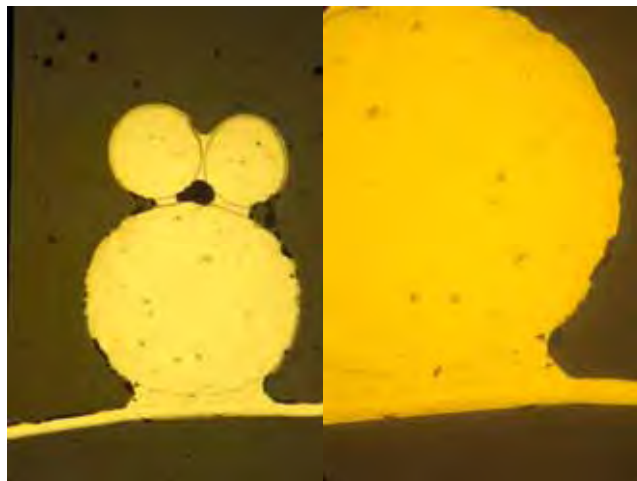


Figure 2.5,6. Test piece by Robert Baines and prepared by Elizabeth Hendrix (MMA). Photomicrographs of constructed samples investigate the migration of copper in the diffusion process and methods leading to surface enrichment. SEM photo courtesy of the Metropolitan Museum of Art in NY.

A Personal Research Methodology

A premise to my research has been that the design configuration of some goldworks in antiquity is a consequence of technical factors. In particular, marking out, the placement of structures, the varying types of structures and the repairing of connections can identify the copper salt diffusion joining system. This can be tested by laboratory reconstruction of selected gold works, and making of samples and replicating museum artefacts using goldsmithing skills based on known technology of the same era.

In particular ancient jewellery, the decorative configurations that accumulatively mark their style can also be regarded as a consequence of technology. Their placement and relationship to each other is in part a testimony to the joining technology carried out by the goldsmith.¹⁴ The method of this laboratory research is to identify the mode of joining first by visual inspection, as observation of contact points reveal the characteristics of particular heat systems of joining. Further identification can be made by comparing the joined core by qualitative analysis with the substance of the joining material using an energy-dispersive x-ray fluorescence spectrometer. An objective in such methodology is to articulate metal analysis and define its contextual meaning with regard to the period of gold technology of the Classical Era. Laboratory reconstructions follow, with the manufacture based on the known technology of the period.

This research methodology was a new direction of investigation in the research of ancient gold technology. It is based on a theory, which can be tested through materials research and construction.¹⁵ This tested current theories and raised further questions.

2.2. Laboratory Research at the Metropolitan Museum of Art in New York

During this PhD research period there have been visits to the Getty Center in Los Angeles and the Antikensammlung in München to conduct basic inspection work of specific jewellery works. A more substantial visit at the Scientific Research Department of the British Museum was directed to the use of stereo-microscope imaging of the recrystallisation of gold on the gold Etruscan disc *BMCJ 1419*.¹⁶

¹⁴ The stylistic configuration of the most complex goldworks can be characteristic of the diffusion bonding system. This theory was first presented by the author at the international conference *The Art of the Greek Goldsmith* held at the British Museum in October 1994.

¹⁵ See Note 3. Introduction Summary.

¹⁶ This was made through the generosity of Dr. Dyfri Williams keeper of the Greek and Roman Department and Nigel Meeks of the Scientific Research Department at the British Museum.

In 1997 during long service leave from RMIT I carried out a four-month Senior Fulbright research project in The Sherman Fairchild Center for Objects Conservation at the Metropolitan Museum of Art in New York. This was primarily on Etruscan and some Greek gold jewellery. Two Andrew Mellon research fellowships followed, first in 2000, with the investigation of selected gold jewellery from the Egyptian Department of the Hellenistic period. In 2003, examination of a substantial portion of the Etruscan collection of one hundred and five Etruscan jewellery items was carried out and basic notes on each work were recorded. Suggestions were made of some conservation needs and follow up treatment occurred. The Etruscan jewellery group from Vulci was a focus of research activity throughout that Fellowship term.¹⁷ Stereomicroscope photography recording descriptions of manufacture was carried out on the neckpiece, *MMA 40.11.7* and the two quartz inset discs, *MMA 40.11.8,9*. Hollow ball construction was a major enquiry relating to this group.

The research methodology involved the taking of detailed measurements. Some samples were made of some components in the pieces such as wire types and the hollow balls. Making comparisons of size and quality of manufacture between the hollow balls on each of the pieces was then compared with another pair of Etruscan discs *MMA 30.225.30A,B*. (Figs.2.7-9).



Figure 2.7. Gold Etruscan disc *MMA 30.225.30A*. Hollow ball construction. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.



Figure 2.8,9. Test piece by Robert Baines. Hollow ball construction using copper salt diffusion joining. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

The important note about these previous laboratory reconstructions was that they were all built using a secondary heat source- that is, either a jeweller's 'French'¹⁸ gas torch or blow pipe for focusing heat on the jewellery object. A major part of the 2003 Fellowship was to investigate a single heat source for the manufacture of ancient gold artifacts. This activity was carried out in the Installer's workshop in the Sherman Fairchild Center for Objects Conservation initially using a charcoal fire with a primary and secondary pottery shard canopy and the use of a blowpipe to create a broad heat. Silver granulation

¹⁷ Etruscan Jewellery Group from Vulci *MMA 40.11.7, 8-9*.

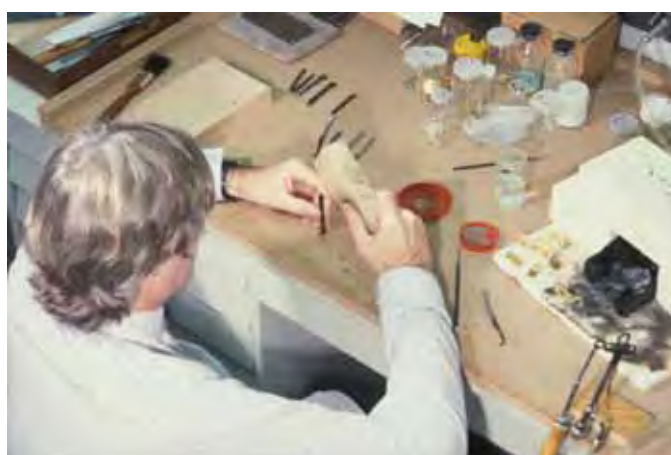
¹⁸ Commonly called a 'French' torch, they require the jeweler to supply the air into the fire by blowing in a tube leading to the flame.

samples using copper salt diffusion followed by fusion were successful. The size of the fire was inadequate for gold fusion and hence appeared insufficient for manufacture of larger jewellery pieces of the classical era. (Appendix B)

A larger heat source was established using a constructed muffle beneath a more substantial charcoal fire and the required heat was achieved for gold manufacture. Many issues had finally been resolved and further improvements appear quite feasible. A number of conservators and curators from the Greek and Roman Department and Medieval Department attended a demonstration firing.¹⁹ (Appendix C)

Research Plan, Methods and Techniques.

A laboratory workstation was established at The Sherman Fairchild Center for Object Conservation at the museum for the construction of sample/reproductions and test pieces²⁰ (Figs.2.10-12). Examination, photographing and drawing of work was made at Objects Conservation and the chemistry laboratory, as the major place for the manufacture and preparation of gold samples wire making, granules and the fire joining of gold samples. The Installers workshop was a second facility for larger fire work such as the alloying and melting of gold. It was also the most suitable place for hammering out sheet and wire. The investigation of the two charcoal fire types were built and tested in the Installers workshop. (Appendix B,C.)



¹⁹ Rudi Coban from the Sherman Fairchild Center for objects Conservation photographed the seminars.

²⁰ My thanks go to Tony Frantz and the people within "Objects Conservation" for providing such a practical working environment. I would like to express my appreciation of Richard Stone for his knowledge and the opportunity to share and exchange opinions. Other special thanks are to Carlos Picon and the Greek and Roman Department and particularly to Dr. Joan Mertens for her continuing support and encouragement and of course for making the jewellery available.



Figures 2.10-12. A laboratory workstation in the chemistry laboratory was established at The Sherman Fairchild Center for Object Conservation at the Metropolitan Museum of Art in New York. Preparation of gold samples, wire making with chisel and wood block, granules and the fire joining of gold samples. photo courtesy of the Metropolitan Museum of Art in NY.

Following observation by microscope of selected goldworks from the Museum's Egyptian, Greek and Roman collection, samples were made replicating artefacts by means of goldsmithing skills based on typical technology of the same era. Sets of drawings of selected artefacts depicting possible sequence of assemblage were also used as maps for the SEM imaging and analyses. The sequence of assemblage is critically affected by the process of joining using copper salt diffusion. Photomicrographs of constructed samples investigate the migration of copper in the diffusion process and methods leading to surface enrichment.

The research plan gleaned a great amount of information. SEM further identified manufacturing idiosyncrasies and surface and sub surface analyses of alloys. The same scrutiny was made of laboratory samples for comparative analysis. This provided a vantage point to consider the broad aspects of manufacture-sheet, wire and granules.²¹

Surface depletion as a sequence of manufacture and grain growth indicating manufacture has been topics of ongoing discussion and these questions remain at the forefront of research.

Constructing goldworks by diffusion bonding with a copper salt causes a copper enriched surface. Compositional changes to surface alloys as a result of the application of copper during the heat joining process became major issues for reconsideration. The relevance of flux as a reduction agent of copper oxide on heat joined gold alloy was also a major consideration as the interference of copper oxide on surfaces proved quite problematic during ongoing joining campaigns. An accumulation of copper on some samples suggests there could have been a conscious depleting of surfaces as the final sequence of manufacture. The absence of fluorate or borate material in the Etruscan and Greek era initially determined the non-use of a flux in the constructing of replicas and test pieces and this caused some difficulties with multiple joining. A typical natron material was used in later samples as a flux agent for heat joining, and also for the making of button ingots. Surface treatment with the natron material for the reduction of copper oxide proved quite effective.²² Microscopy identified surfaces as not being 'typically ancient' in appearance though, and so questions remain unanswered.

It was during this research period I observed extensive grain growth on some gold artefacts and this can, in addition to being an indicator of sequence of manufacture, offer insight into the duration of firing time to construct goldworks.²³

²¹ See 3. Examples of Analysis and Reconstruction, 3. A Greek Disc and Pendant Ear Ornament. p.77

²² Natron, Na₂ Co₃, Na Cl, Na₂ So₄. There appears to be no references to firing natron as a flux for soldering or casting. Natron is a naturally occurring compound and found in three localities in Egypt, See A. Lucas, (1912) 2. Lucas states the Egyptian usage of natron varied from purification purposes, for making incense, for the manufacture of glass, glaze, for cooking, in medicine, for bleaching linen and mummification (1989) 267.

²³ This will be mentioned further in 2. Historical Background, 4. Recrystallisation and Grain Growth. p.30

These broad issues are all relevant to goldworks of the Etruscan, Classical Greek and Ptolemaic Egyptian period. There has been very little technical investigation of the Hellenistic Egyptian goldworks and the research Fellowship facilitated in depth inquiry into works from the Egyptian collection at the Metropolitan Museum of Art. Increased knowledge of these respective eras enhances a greater understanding of the museum collection and broadens the knowledge base of the museum curator to authenticate goldworks in public collections and potential acquisitions. The identifying of fakes leads to the furthering of knowledge of individual fakers or workshops.

Laboratory Reconstruction of Baule Ornaments

Goldsmiths' fingers hold the blowpipe at the mouth and physically interact with the gold alloy in the fire. This can no more be neglected than the emotions and thoughts of spatial arrangement or the placement of symbolic meaning with gold sheet, wire and granules. The investigation of possible fire sources is first referenced by the artifact and what texts are available. Signs of fire applications on works help in the identification of fakes.



Figure 2.13. After Davies, *The Tomb of Rekh-Mi-Re at Thebes*, 1943, pl.55. An Egyptian goldsmith at a charcoal fire. The fire bed is housed in a pottery receptacle and muffle hood and a supply of charcoal at the ready. The Jewellery object held by tongs is moved in and out of the fire for the controlling of appropriate temperatures. Additional broad heat is achieved with the reed blow pipe with the metal tipped tuyère. The goldsmith seated at the fire identifies complex and extended duration for the firing of gold works.

See Appendix B.



Figure 13. An assaying laboratory, showing balances, muffle furnace for cupeling, ingot mould, etc.

Figure 2.14. After *The Pirotechnica of Vannoccio Biringuccio, The Classic Sixteenth Century Treatise on Metals and Metallurgy*. Translated and edited by Cyril Stanley Smith and Martha Teach Genudi. Fig.13 p.140 Book 3

Alloys

The researcher Jack Ogden has indicated that purity of gold in the Bronze Age and Early Iron Age varies from 75% to 90%. Higher purities than this quite often indicates gold refining which is believed not to predate 600-500 BC. The presence of some iron is in keeping with ancient gold alloys and percentages of copper within the 2-3% range suggests the material is native gold. Alloying of copper to gold for stabilising structure and for harder wearing and the making of solder cannot be excluded. The addition of copper to gold certainly dates back to the early Bronze Age.²⁴

Reported metal analysis of Etruscan granulated jewellery²⁵ has shown similar purity ranges. The composition of 65% Au, 32% Ag, and a copper variation between 1.25 and 3.2% was analysed in a serpentine fibula from Marsiliana d'Albegna.²⁶ In another piece, a comb fibula found in the fossa tomb XLI, Banditella di Marsiliana d'Albegna identified an average alloy composition of 68% Au, 30% Ag and 1.3% Cu as identified.²⁷

2.3.The Identification of Ancient Gold Artifacts with the Electron Microprobe

The SEM with X ray analysis facilities offers a window into the study of ancient gold artefacts and the characterising of manufacture by the goldsmith.

Combining the acquired knowledge of the fabric and methodologies of manufacture offers a vantage point for the conservator to identify and authenticate ancient gold artefacts. The investigation of the conservator/researcher to understand antique goldwork increases knowledge of joining processes, manufacture of wire, working of sheet surfaces and the diverse surface methodologies.

The principle heat joining method distinguishing ancient jewellery is the use of a copper salt diffusion bonding system. Chrysocolla,²⁸ malachite combined with an organic glue is painted over the surfaces to be joined. When heat is applied the copper salt converts to a metallic copper, which subsequently diffuses into the gold alloy, thus reducing the melting temperature of the surface, and joining of parts in contact occurs. Identifying this method is difficult as the copper enrichment is low and the diffusion zone is low. Metallographic analysis of sliced cross sections can identify copper migration to the joined contact points.

A secondary system of joining called fusion welding is a surface joining without any additional alloying. There are some gold, silver copper alloys where the crystal boundaries become fluid while the major mass of the object remains solid.

The third method of heat joining is soldering where a lower melting alloy is applied in the contact areas. The solder is enriched with copper and silver.

SEM micrographs, X Ray distribution map of selected elements on very small areas identify the various joining processes in the classical era or iron-age artefacts. SEM micrographs, EDAX and electron microprobe EMP with X Ray distribution map attachment using small samples offer non destructive identification in the field of archaeological research. The detailed observation of artefacts identify ancient or modern manufacturing characteristics. The knowledge offers a position to identify forgeries and the possible linking of forgery to makers or workshops.²⁹

Authenticating procedures had been carried out with specific pieces in the National Gallery of Victoria at the Department of Metallurgy and Mining at RMIT University. In addition to micrographic observations

²⁴ *Ibid* 20.

²⁵ G. Piccardi, S. Bordi, (1953) 353-363. Also of jewellery from the Bernardini tomb at Praeneste see F. von Hase (1976) 226-233.

²⁶ P. Parrini *et al.* (1982) 118-121.

²⁷ *Ibid* 119.

²⁸ Chrysocolla. See references note 7, p.12

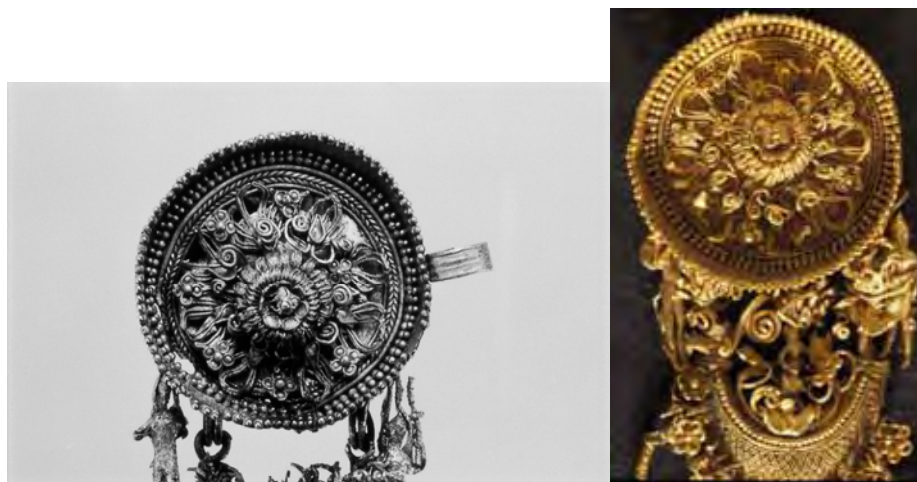
²⁹ Baines R. *et al.* (1989)

quantitative analysis of surfaces of sheet, granules, wires and solder zones detected significant quantities of gold, copper and iron.

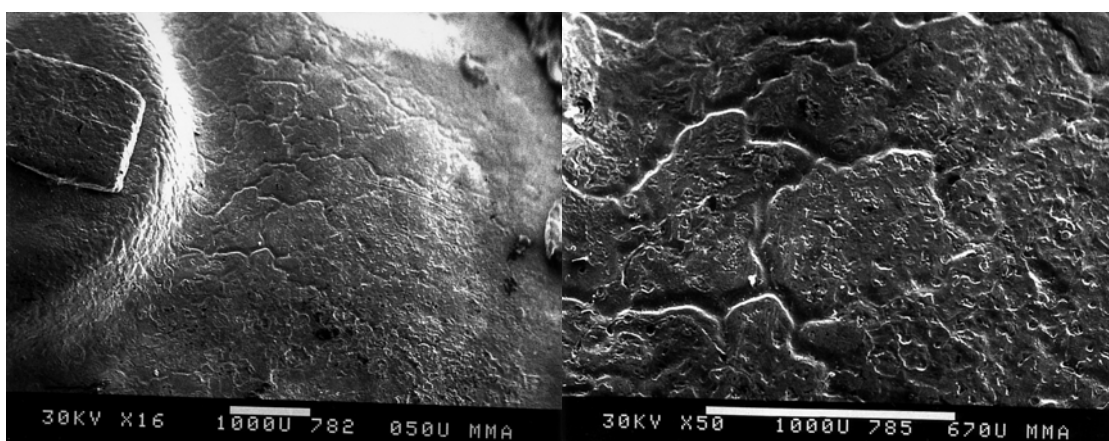
XRF analysis is utilised to determine the amounts of the major components of gold alloys i.e. silver and copper. Minor and trace elements are determined with EDAX. Readings of 8% and 10% iron identified the alloy not to be an ancient alloy. Micrograph observation of wire manufacture and decorative processes identified the piece to be a forgery. A jewellery group in the Metropolitan Museum of Art in New York having the same stylistic mistakes was examined using the same SEM investigation methodologies. The qualitative analysis of surfaces, and observation of manufacture affirmed its status as a forgery. By comparing the SEM documentation it was clearly identified that the mode of manufacture and alloy quality of the two groups proves them to be made by different forgers/workshops.

2.4. Recrystallisation and Grain Growth

Extensive grain growth has been observed over broad surfaces of some ancient gold jewellery (Figs.2.15,16).



Figures 2.15,16. Pair of gold Greek disc and pendant ear ornament. The Metropolitan Museum of Art New York. Roger's Fund, 1906, 1217.11-12. Photo courtesy of the Metropolitan Museum of Art. A swaged hair ring has fused to the wall of the disc indicating high temperatures immediately before the liquid zone and within a reducing atmosphere. Other areas on the object have commenced melting. photo courtesy of the Metropolitan Museum of Art.



Figures 2.17,18. Close up of reverse of ear ornament. MMA 1217.11-12. Even growth of equiaxed grains over a broad area of the sheet. No indication of localised working during the heat joining process. SEM photo courtesy of the Metropolitan Museum of Art.

In specific locations on goldworks recrystallisation is recognised in a clearly tessellated formation (Figs.2.19-21).³⁰



Figure 2.19. Detail. Gold Etruscan *a baule* ear ornament. The Metropolitan Museum of Art New York. Roger's Fund, 95.15.141, 142. SEM photograph of grain growth on concave bowls and substrate of the pediment. SEM photo courtesy of the Metropolitan Museum of Art in NY.



Figures 2.20,21. Detail. Gold Etruscan *a baule* ear ornament., The Metropolitan Museum of Art New York. Roger's Fund, 95.15.141,142. SEM photograph of grain growth on concave bowls and substrate of the pediment. The orientations of the crystal axes in the different grains are grouped closely about a common mean value.³¹ There is a macroscopic segregation of equiaxed solidification. SEM photo courtesy of the Metropolitan Museum of Art NY.

³⁰ Pair of gold Etruscan *a baule* ear ornament. New York, The Metropolitan Museum of Art Rogers Fund, 95.15.141,142. The *a baule* type is described in detail in 3. Examples of Analysis and Reconstruction 2. A Baule Ear Ornament. p.56

³¹ A. Cottrell, (1982) 173. This is described as a preferred orientation.

On other jewellery recrystallising has resulted in the dislocating of individual grains from the gold sheet of the artefact (Figs.2.22, 23).³²

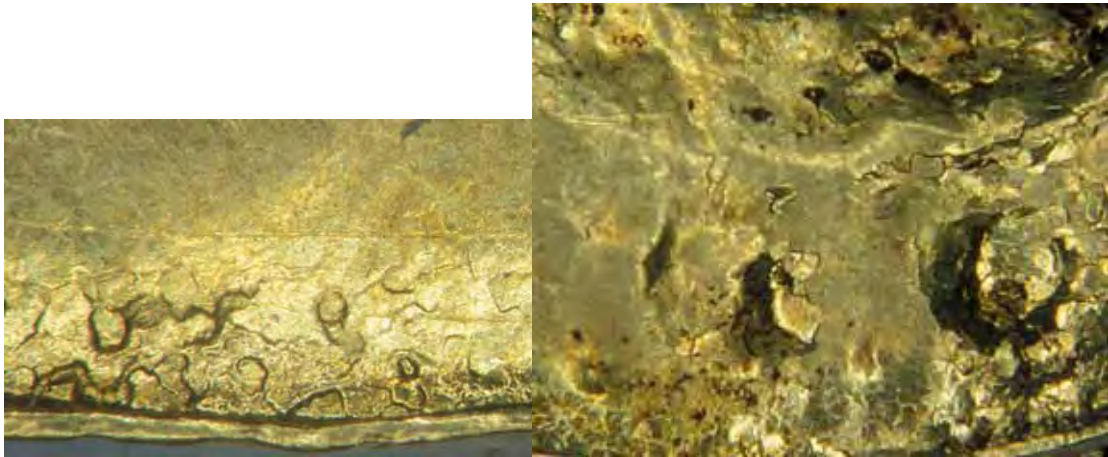


Figure 2.22. Close up of reverse of Etruscan disc ornament. Tessellated crystal region around outer edge of disc, London, British Museum *GR 1881. 5-28.2*. An intercrystalline fracture along the grain boundaries shows sharp ridges and valleys. Photo by Nigel Meeks courtesy Trustees of the British Museum

Figure 2.23. Gold Etruscan disc ornament. Munch, Antikensammlung. *Inv.2477-78*. The centre insert has been overfired and floriottes have melted. On the reverse of *Inv.2478* around the outer edge are twelve clearly defined areas of grain growth and macroscopic segregation. The crystallised areas correspond with the contact points of the fluted bowls on the obverse.

Dislocation of grains following segregation is specific on the reverse side of contact points that are possibly copper salt joined (Fig.2.23).³³

Similar characteristics have also been an outcome on some laboratory reconstruction copies of ancient goldworks using the known manufacturing technology of the same era (Fig.2.24).³⁴

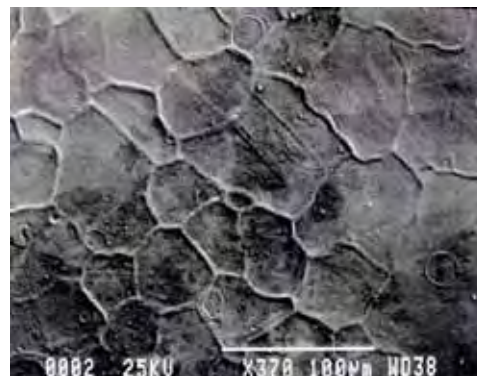


Figure 2.24. Laboratory copy of a *baule* ear ornament *V&A 1856-3347*. Grain growth occurring on the substrate. SEM by Nigel Meeks courtesy of the British Museum.

Test pieces with wire joined on the substrate using a copper salt³⁵ of three different gold alloys were soaked in heat in a non-reducing atmosphere for various durations. This exposure caused a heavy copper oxide layer over the entire surface of the sample and options that would be available for pickling within

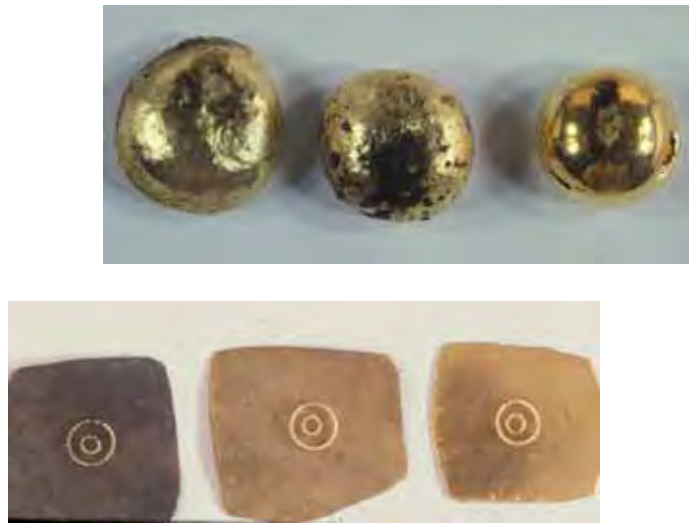
³² Gold Etruscan (ear?) disc *BMCJ 1419*.

³³ *Ibid*, Munich Antikensammlung *Inv.2477-78*.

³⁴ A *baule* ear ornament *V&A 1856-3347*.

³⁵ Copper carbonate. The alloys were representative of Etruscan a *baule* ear ornament analysed at the MMA.

the ancient era were considered.³⁶ Natron, a material known to have been available to ancient workers was applied to surfaces of the heated samples. Viewed under the microscope, these pieces revealed negligible grain growth.



Figures.2.25,26. Test piece no.1, 82% gold, 12% silver, 6% copper. Test piece no.2. 96% gold, 3% silver, 1% copper. Test piece no.3, 100% gold. Photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

Metallic structure in jewellery differs according to particular manufacture. Cast objects have groups of distinctly different crystal configurations compared to wrought rod, wire, and sheet gold.³⁷ Identifying the relative proportion of crystal phases differs in location on cast objects. These phases exist as crystals intermingled in a matrix and in the context of silver dendrite formations can be clearly observed. The rate of cooling of molten metal determines the size of the crystal.

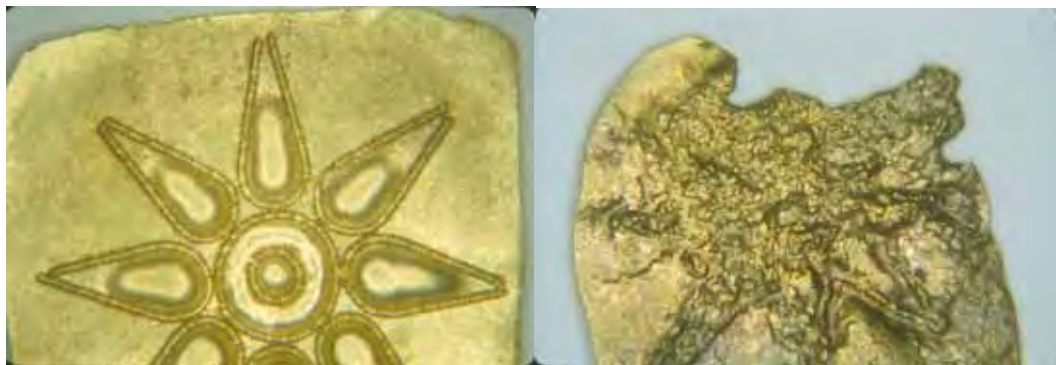
Heavily worked sheet gold is characterised by a different type of crystal and following a number of annealings alloyed gold sheet this results in uniformity in the size of the grains compared to cast metal objects.

Annealing and heat joining occurs with the increasing of temperature and cold worked microstructure becomes more and more unstable. In this first stage of recovery the dislocations introduced during cold working undergo structural rearrangement into more energetically favorable configurations without any significant change in their concentration. This reduces the crystal lattice strain without causing any observable change in the metals microstructure. The second and most important stage of annealing and consequently heat joining is recrystallisation. This stage involves the replacement of the cold worked structure by a new set of strain free grains. These grains are not elongated or deformed as are the cold worked grains, but are approximately equiaxed (i.e. have the same diameter no matter what direction they are measured in).

Recrystallisation is a process which may occur over a range of temperatures. The term 'recrystallisation temperature' should not be regarded as a specific temperature, below which recrystallisation cannot occur. Rather the recrystallisation temperature is a temperature for a given metal at which a highly cold worked structure completely recrystallises over a particular duration. Using the phenomena of recrystallisation in *MMA 1217.11-12*, as a reference experiments were conducted to determine the conditions required to achieve recrystallisation of gold manufactured jewellery.

³⁶ Organic acid such as vinegar combined with salt in a boiling solution would be suitable.

³⁷ D. Scott, (1991)



Figures 2.27,28. Test piece no.1, 82% gold, 12% silver, 6% copper. Square shaped test piece with creased wire joined to the substrate areas. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art NY.



Figure 2.29,30. Test piece no.1. Square shape of the test piece with wire form is severely deformed but discernable. The sample has been heated above its solubility limit, and the grain boundaries released together cause a uniform grain growth. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art NY.

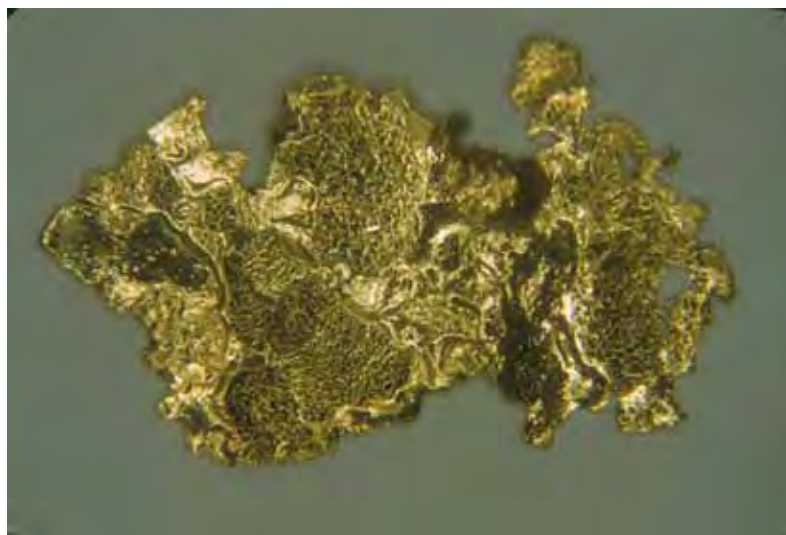


Figure 2.31. Test piece no.2. Square test piece deformed.96% gold, 3% silver, 1% copper. Bright flat facets, variously orientated are produced when the fracture follows crystallographic cleavage planes through the grains. The measured activation energies for grain growth³⁸ in impure metals are often anomalously large because, as the temperature is raised, increased solubility and coarsening of inclusions releases the boundaries for faster movement.

The gold sample showing abnormal grain growth was initially fine grained has been heated almost to the solubility temperature. Normal grain growth was followed by the impure particles dissolving and coarsening. Some boundaries are released and flow through the metal making a very coarse grain size. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

³⁸ *Ibid.* 342

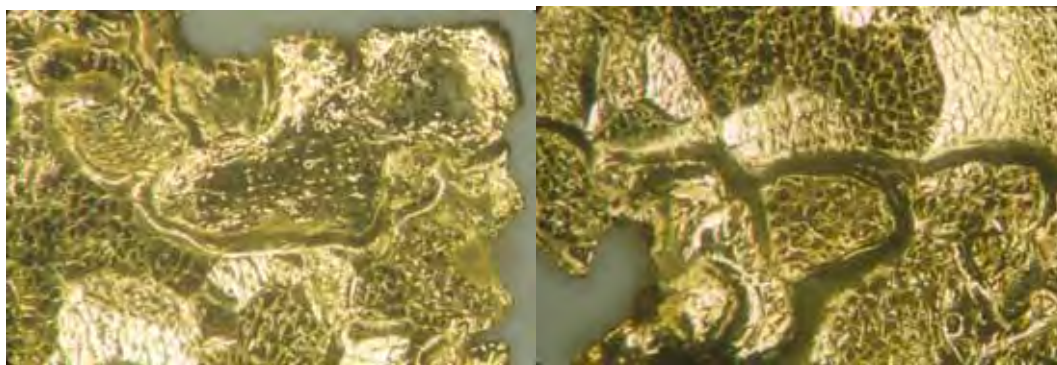


Figure 2.32,33. Test piece no. 4. 96% gold, 3% silver, 1% copper. Square shaped outline of test piece retained but deformed. Immersed in charcoal dust for 3 hours at 1045° Centigrade. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

The amount of cold work determines the amount of energy stored as elastic strain in the material. Because heavily cold worked materials have a greater amount of extra strain energy than lightly cold worked materials, recrystallisation may start at a lower temperature (i.e. requires less energy) and may result in a finer grain size.

Grain growth is the third stage of annealing and heat joining. This involves the growth of recrystallised grains at the expense of surrounding recrystallised grains. The action for grain growth is simply the lowering of energy by decreasing the grain boundary area (i.e. the same as decreasing surface energy). On a gold Etruscan *a baule*³⁹ ear ornament grain growth is evident on the surface of ‘dapped or pressed’ forms that have been placed on the pediment (Fig.2.19). This suggests gold sheet used as the substrate of the *a baule* had an excess perimeter surrounding it during manufacture. During construction of the *a baule* on a flat surface multiple parts are applied and joined. The perimeter sheet will be treated to high temperature close to solubility. This excess sheet would be removed prior to curving up the *a baule*. The remnant sheet extracted with a chisel then becomes available as substrate and source of components for the pediment (Figs.2.19-21).

Usually there is no sharp distinction between recrystallisation and grain growth as grain growth may occur in the parts of the material, which recrystallised first, while other regions are still recrystallising. During the process of heat joining grain growth can occur. Repeated campaigns of heat joining will further extend this growth. This can be identified on the reverse of large Etruscan discs and clearly is a consequence of manufacture. The substrate is the contact point for the multiple joining of a series of concentric rows of iconic forms. The configuration requires successive heat joined contact points extending from the centre to the outer rim of the disc. On the reverse of the disc, the substrate at the outer edge has distinct grain growth, in some locations to the point of separation of individual crystals from the tessellated sheet (Figs.2.22,23).

In addition to being an indicator of sequence of manufacture and strategy of working by the goldsmith as in the *a baule*, it could also offer insight into the duration of firing time to construct goldworks. The extensive growth of crystals resulting in separation and dislodgment from the body of the gold sheet has been observed around the outer edges on the reverse of Etruscan discs of the sixth century B.C.⁴⁰ Acute grain growth has been found on three discs that have a small cut out in the centre. Segregated crystals also occur in regions that correspond with contact points on the obverse (Fig.2.23). These pieces do not have an absent centre and consequently receive extreme heat around their perimeter during joining campaigns.

³⁹ See Fig.2.19

⁴⁰, British Museum *GR 1881. 5-28.2.*

Quenching the hot object following joining campaigns is quite useful in the testing of joins and will impose a second condition on the gold structure. Increased grain structure will be frozen at this point. Subsequently firing will further increase grain growth.

Discs with larger cutouts in the centre would facilitate the heat source being directed to inner and outer perimeters. This would result in a broader and more even distribution of heat alleviating the occurrence of extreme disparities of temperature during heat joining and the eventual grain growth around the outer perimeter.⁴¹

Conclusion

Areas of clearly defined grain growth and macroscopic segregation on the Etruscan discs identify crystallised areas corresponding with the contact points of the fluted bowls on the obverse.⁴² This clear similarity of technical signs on the same jewellery type can suggest working by the same maker. The British Museum disc ornament⁴³ has other significant links with the Munich disc⁴⁴ and also the New York disc⁴⁵ with its quartz insert.⁴⁶

There are still questions remaining. What is the rate of grain growth in ratio to the alloy (gold copper silver)? What impact does a reducing atmosphere during the firing of the work or inverted sheet facing the charcoal block have on a gold piece?

What impact does the inclusion of copper on the surface as a result copper salt diffusion joining affect grain growth? What impact does the quenching following each joining campaign have on grain growth?

2.5. Wire Manufacture

The extensive research into ancient and historical wire has informed me in the authentication of collected jewellery and equipped me to build fine art jewellery. Use of wire to build form in my art making has direct historic derivations, though at times this may appear quite obscure. The knowledge of ancient and historic wire particularly through 'laboratory reconstruction' has been a profound vantage point to apply in a contemporary context. The exploration of primary references in public and private collections has been the basis for interpretation, reinterpretation and further invention for the various contemporary contexts.

I have employed principally two philosophies of wire application for the making of my art works. A major characteristic of the fine art studio based work within this research period is the multiple combinations of the use of wire to build form and surface. Most of the diverse wire construction is simply the combination of one flat and one crimped wire and this was usually in sterling silver for the making of large works.

Fine ribbon twisted and block twisted wire applications, whether open or attached to a substrate of the

⁴¹ R. Baines in D. Williams (1998) 122-124

⁴² L. Burkhalter, (1993) 5-12. A catalogue of published Etruscan gold disc ear ornaments from the sixth to the fifth century B.C. located in major collections in the United States and Europe. To the list should be added Malibu, J. Paul Getty Museum *L.85. AM.72.11*.

⁴³ London, *BMCJ 1419*, diam. 68mm. Acquired 1881.

⁴⁴ Munich, Antikensammlung. Inv. 2477-2478. diam. 60-61mm. From Candelori (Vulci).

⁴⁵ New York, *MMA 40. 11 9*, diam. 61 mm. From Vulci.. The large centre cutout would facilitate an even firing and reduce the likelihood of extreme heat around the outer perimeter.

⁴⁶ The outer border of the Munich pair consists of a folded grooved strip followed by a circular row of hollow balls between fluted bowls, each with a granulated sphere. This sequence of components also occurs as the outer border in other discs from the Metropolitan Museum (*MMA 1913. 225. 30 a-b*. diam. 43mm) and the British Museum (London, *BMCJ 1416*. diam. 61mm). The fluted bowl occurs with its fourteen groove surface on each of the three groups. The recurring of this design element suggests usage of the same tool. The inner rows of the Munich discs have three pressed shapes separated by hollow balls. A vertical bow spiral ornament surfaced with granulation separates a siren and a frog pressed in gold sheet. Both the frog and smiling siren face toward the centre of the disc. The positioning and repetitive sequence of these forms has a similar geometry to the Metropolitan and the British Museum disc in particular. The pressed forms are consistently flat on the top with sides that are almost vertical.

Etruscan and Greek of the High Classical era has been a significant influence on the development of my original studio work and the invention of new wire systems.



Figure 2.34. Etruscan filigree gold bracelets, Firenze Museo Archeologico inv. 11151, 11152 seventh century B.C. Marsiliana d'Albegna dia.5.5 cm. (after M. Cristofani and M.Martelli, 1985).



Figure 2.35. Etruscan silver winding fibula. Roma, Museo Nazionale di Villa Giulia Inv.53614. Cerveteri, Beginning of the seventh century B.C. (after I. Caruso, 1988). length 5.5 cm

The Cellini treatise clearly describes the principles of filigree making with powder solder.⁴⁷ The finest work he describes ‘will make a man’s mouth water’.⁴⁸ The main primary references in developing my personal technique was looking at the Castellani and Giuliano jewellery⁴⁹ and eighteenth and nineteenth century jewellery and the fakes of the nineteenth and early twentieth century. Inspections and investigations leading to accumulated knowledge in the making and joining wire structures gave an informed vantage point in looking at historic jewellery where filigree and Canatille were prominent.

⁴⁷ Cellini, B. (1867), C.R. Ashbee transl. (1979). See Chapter 11.On Filigree Work.

⁴⁸ *Ibid* 10

⁴⁹ Victoria and Albert Museum, also Jewellery at the B.M. Hull Grundy collection, Brooklyn Museum, Philadelphia Art Museum.

Canatille Work

In the first half of the nineteenth century in Europe a popular filigree system was Canatille. Possibly it was most popular due to its resembling embroidered brocades on military uniforms. The various types of techniques are characterized in the contemporary publication, P.Broué, *Traité d'Orfèvrerie, Bijouterie et Joaillerie* (Paris, 1832)

For many years methodologies of wire production have been considered in archaeological literature and the twelfth century treatise by Theophilus has been continually referred to as indicating the mode of manufacture in the Classical era.⁵⁰

There is no evidence that the implements detailed by Theophilus existed within the Greek and Etruscan manufacture in antiquity. There is no archaeological evidence of iron tools (or bronze for that matter) of this type in the Classical era though their non appearance could be attributed to being melted down on becoming redundant due to wear. In the case of iron they possibly disintegrated due to a rust process.

A basis for authenticating ancient goldworks and major criterion in determining mode of manufacture is the observing and counting of creases on wire.⁵¹ There were two systems for making wire in antiquity and the option to block twisting,⁵² is the twisting of strip or ribbon cut from sheet, followed by cross rolling and this method is described in Exodus 39.3.⁵³

The twisting described will again identify helical creases and this technique known as strip twisting involves the twisting of a thin strip to form a regular tube and creating a single helix. Following a sequence of annealing, pulling and further gentle twisting, the helical creasing becomes tighter.⁵⁴ A cross rolling of the wire between two blocks in the same direction of the creasing to minimise metal fatigue will swage the wire into a smooth surface and so diminish the helix. Creasing of wire can be further removed during the fusion heat joining process with molten surfaces flooding fine surface details.

The Making of Beaded Wire

The Organarium

The first of the two instruments described by Theophilus for the making of beaded wire is in Book 3, ch.9.⁵⁵

A copy of the instrument described has been in use by me for some years with one major variation being the absence of the two spikes for the anchoring into a wooden base. It was decided rather to locate the *organarium* in the jaws of a bench vice for more secure working. It quite successfully produces beaded and spool wire⁵⁶ from 0.5 mm.D.⁵⁷

⁵⁰ J. Hawthorne & C. Smith, (1979), Book 3.

⁵¹ For a comprehensive study on ancient wire manufacture see J. Ogden (1991) 95 – 105, N. Whitfield (1998) 82,83

⁵² W. Oddy, (1977) 83

⁵³ “The gold was beaten into thin plates, cut and twisted into braid to be worked by a seamster with violet, purple and scarlet yarn and fine linen.”

⁵⁴ The first publication on the making of ancient wire by twisting was in the catalogue by C.R. Williams, (1924) 43, 140; also pls. 19-20, of an ancient gold jewellery collection of the New York Historical Society.

⁵⁵ *Ibid* 88.

⁵⁶ For spool wire see Hoffman, Davidson (1965) Introduction.

⁵⁷ *Ibid* 90. “The Implement Called the *Organarium* [for Swaging Beaded Wire]”:

“There is also an implement called the *organarium* which consists of two pieces of iron, a lower and an upper one. The lower one has the width and length of the middle finger and is slightly thin, with two spikes which fit into a piece of wood below it. On the upper side above these spikes there project two thick pins which hold the upper piece. The latter is the same width and length as the lower one and has two holes, one at each end, through which the upper parts of the two pins should pass so that the two pieces will fit together. They must be fitted exactly to each other with a file, and [a series of] small grooves should be cut out in both pieces in such a way that holes appear right through the middle.

Then, a long [rod] of gold or silver, hammered evenly round, is pushed into the larger hole and the upper part of the tool is struck hard with a horn hammer while the piece of silver or gold is turned with the other hand. Round beads like beans will then be made; in the second hole they become like peas; in the third, like lentils; and so on smaller.”

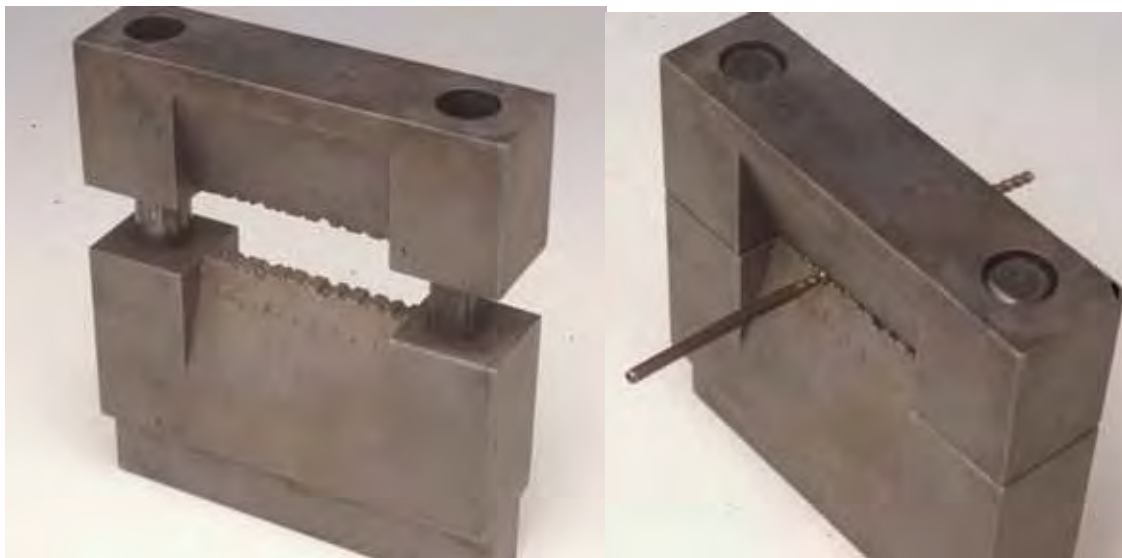


Figure 2.36. *Organarium* based on the Theophilus text for the making of spool and beaded wire. Designed and made by Robert Baines.



Figure 2.37. Test Pieces by Robert Baines. Spool wire made using the *Organarium*.



Figure 2.38. Test Pieces by Robert Baines. Beaded wire made using the *Organarium*

The Beading File

The second iron beading instrument described by Theophilus is in Book 3, ch.10.⁵⁸

The grooved file or *beading file* is trapezoid in cross section, and the wire is placed across its furrowed section. The tool is then rolled over the wire, which is supported underneath by a hardwood block base.

The *beading file* based on the Theophilus description produced successful bead or spool wire. Round wire having been placed on a flat wooden base, the beading tool with its grooved edge was placed across

⁵⁸ “Files Grooved on the Bottom”:

“There are also tools, as thin as a straw, a finger long, and nearly square, but wider on one side. Their tangs, on which handles are put, curve upwards. On the underside a longitudinal strip is dug out and filed like a furrow, and the faces on both sides of this are filed sharp. With these tools both thick and thin wires of gold and silver are filed so that beads appear on them.”

the wire. With a gentle rolling generally in one direction the metal between the grooves is displaced and slowly contracts into a bead form. By moving the tool and locating it in another groove the beginning of another bead begins to appear. This is continued along the wire. The piece needs to be annealed for a second series of rolling to ultimately achieve a “full” beading sequence. It was found that rolling the wire in a single direction alleviated metal fatigue and consequently reduced the number of annealings. The size and shape of the bead and spool varies according to the diameter of the wire and the pressure applied.

Grooved Twisted Wire

Much wire appeared to be twisted but the twist appearance is achieved by the cross rolling of the beading file (fig.2.39).

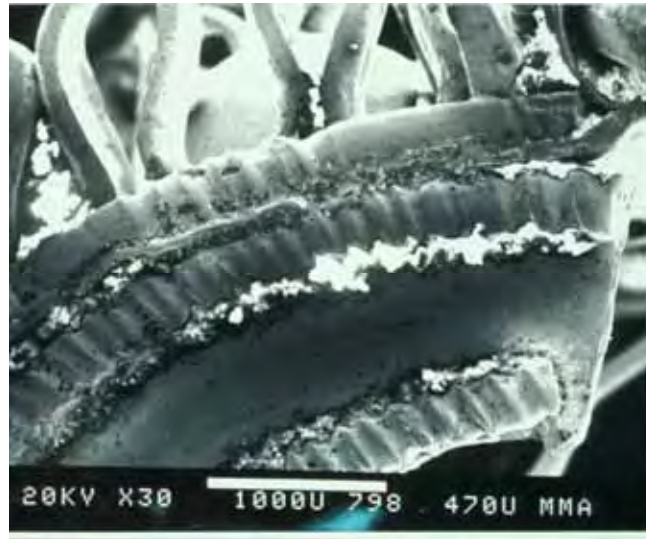


Figure 2.39. Gold *a baule* ear ornament MMA. 95. 15.139 the round wire appears to be twisted but the twist is achieved by the beading file grooved up and down the wire. SEM photo courtesy of the Metropolitan Museum of Art in NY.



Figure 2.40. Gold neckpiece. Melbourne, National Gallery of Victoria. A forgery, said to be second to third century AD, Romano-Egyptian indicating the simulation of beaded wire by the fusion of a row of single granules (after R. Baines *et. al.*, 1989).

The Grooved Block

A long grooved tool not unlike the Theophilus *beading file* is most effective in the displacement of round wire for the making of beaded and spool wire. This *grooved block* was also used in the folding or swaging of wire (Fig.2.41). There are a number of interpretations of decorative wire in Etruscan and Greek goldworks that could possibly have come from the same source tool. A number of wires appear to have an open corrugation from a corrugated tool without further folding. This is then applied directly to a jewellery work. Wire corrugated in the *grooved block* and then folded between the fingers has the accuracy and similarities of Etruscan and Greek wire (Figs.10,11).

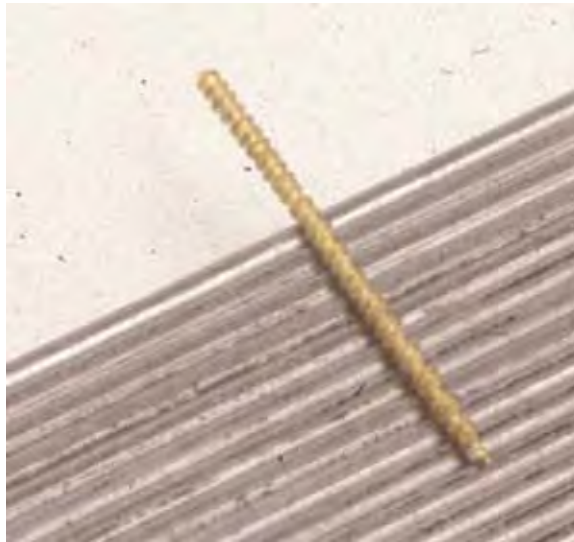


Figure 2.41. Test piece. Beaded wire swaged from a grooved block.

The jewellery works (Figs.2.42,43) show possible exceptions to the use of the grooved tool. The decorative wires were possibly made by the folding of wire around two rows of pegs from a tool which is as yet unrecognized in historical text. The second simpler wire in figure 2.45 shows open corrugated wire with some sections showing the tendency of folding into the closed formation similar to the common folded strip.



Figure 2.44. Etruscan filigree gold spirals, Roma, Museo Nazionale di Villa Giulia *inv.* 53578, 53583 mid seventh century B.C. Cerveteri dia.2.5 cm (after M. Cristofani and M.Martelli, 1985).



Figure 2.45. Etruscan silver bracelet. Roma, Museo Nazionale di Villa Giulia Inv. 57039, Bisenzio, 80 mm. D. First quarter of the eighth century B.C. (after M. Cristofani and M.Martelli, 1985).

The Grooved Strip

A strip reinforced with grooves makes a very stable reinforcement plate for ancient gold of the Classical era with its extremely fine joining and thin sheet gold. Grooved strips are used to reinforce wire joins to a substrate on early third century B.C. Greek disc and pendant ear ornaments. Frequently folded grooved strips serve as a curved border in Etruscan ear disc ornaments of the late seventh and early sixth century B.C. On the Etruscan *a baule* ear ornaments it is also frequently found as a border or a decorative element. When used as a border it is vertical from the substrate and accommodates (and protects) a construction of wires or fluted bowls with granulation.⁵⁹



Figure 2.46. Gold Etruscan fibula. Grooved folded strip. Photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

Wire crimped in a coarse grooved block can leave a straight sided corrugated or crimped wire as in my powder coated studio work, *Neckpiece*, REDLINE 2003. (Fig.2.47).

⁵⁹ *Ibid.*, Fig.2.39.

The same wire folded in the fingers achieves quite a different identity in *Bracelet'Java-la-Grande'*, 2004, 5 (Fig.2.48)



Figure 2.47,48. Folded wire/strip. Wire pressed into a deep *grooved block* producing corrugated wire as in *Neckpiece*, *REDLINE* 2003. This wire can then be followed by folding in the fingers as in *Bracelet'Java-la-Grande'*, 2004, 5. Photos by Garry Sommerfield.

3. Examples of Analysis and Reconstruction

3.1. Preliminary ; ‘Fakes’ and Reproduction

‘The fake is recognised as “historical”, and is thus garbed in authenticity’⁶⁰

Fakery has been present since ancient antiquity. It can quite often be historically positioned by its mode of manufacture and quality of alloy. Nineteenth century forgeries are flawed in that technology current to that era is the mode of manufacture and this can be identified using visual observation and chemical analysis. SEM assists with greater detail. More recently forgers have benefited from new knowledge provided from the SEM. An example of this has been the emergence of forgeries with PGE inclusions in the body alloy of gold artefacts following new research publications of the incidence of platinum in the alloy of ancient gold jewellery.⁶¹

Uncovering the Cover Up

There has been a recent period of arguing the negation of authorial authenticity to the point that authorship was regarded as unimportant. Despite this implied rejection of the relevance of attribution by Derrida and other contemporary theorists⁶², scholars and collectors of historical artefact have continued to pursue the scholarship of establishing historical and material culture authenticity.⁶³ The altering of attribution of an artwork still implies demotion from a “great” to a “secondary” or even “unknown” artist with consequent devaluation not necessarily aesthetically but certainly financially.

Investigations of the fake and the genuine are not alien to archaeology and the study of our cultural history. Objects of suspicious provenance or actual fakes are exhibited in museums or galleries, and published or presented to the world as authentic artefacts. They then become components of our intellectual cultural capital. Inclusion of the bogus into that which is accepted as the standard or primary reference is subversive. Can this be prevented? Is it being nurtured by the publication of research findings? Is it possible to safeguard our cultural history from sabotage? These are personal confronting questions and at the fore particularly in my research at the Metropolitan Museum of Art in New York. Increasingly some curators prefer that I do not publish by written text most of my findings for this reason.

There may be a scrupulous scholarship of attribution and current technology applied to the conservation of artefacts, curators’ grouping and placing of artworks and the detailing of reconstructed historical contexts. All these endeavors can be carried out and yet the absence of a guarantee of authenticity can remain. Attribution in the traditional sense is entirely within the province of the art historian using tools of stylistic analysis and historical documentation. Richard Stone wrote, “Conservators provide evidence of entirely independent origins that lends arguments previously based on stylistic insights alone a new

⁶⁰ U. Eco (1995) 30

⁶¹ W. Young, (1972) 5-13 hypothesised that the Pactolus valley was a major source of gold for manufacture in the Near East. He reported a rare platinum-iridium alloy inclusion in some objects from the Near East such as Early Dynastic dated objects from the Royal Cemetery at Ur, Lydian coins and an Achaemenid earring. It was proposed that the Lydian gold coins made from gold of the Pactolus Valley showed by electron microprobe analysis that the composition of the inclusion was approximately 60% platinum, 40% iridium. Whitmore and Young postulated that due to the apparent frequency of this type of inclusion of Near Eastern gold artefacts, the Pactolus Valley was an important source of gold in antiquity and it was used extensively as early as 2500. B.C.F. Whitmore and W. Young, (1973) 88-95.

Maxwell Hyslop, doubting the theory, suggested gold sources in Western Asia would be closer to Sumer than the Pactolus Valley. K. Maxwell-Hyslop, (1977) 83-86.

N. Meeks and M. Tite carried out analyses of platinum group element inclusions in a range of jewellery and coins from Egyptian, Eastern Mediterranean and the Near East spanning the period from 3200 B.C. to A.D. 300. N. Meeks and M. Tite, (1980) 267-275. Using the energy-dispersive X-ray fluorescent spectrometer attached to the Scanning Electron Microscope they found that “the Iridium-Osmium-Ruthenium alloy inclusion found even within a single object frequently exhibit a wide range of compositions. Although this probably reflects the compositional variations of the PGE inclusions from a single placer deposit rather than implying the use of gold from several placer deposits, it does not mean that the compositions of this type of inclusion do not necessarily provide a basis for characterising the gold source.” *Ibid* 273.

⁶² R. Barthes, (1977)

⁶³ *Ibid*. Particularly in R. Barthes, (1977) ‘The Death of the Author’.

dimension otherwise unobtainable, sometimes helping to avoid the possible danger of circularity in stylistic attribution.”⁶⁴

Provenance and provenience are differentiated by some scholars of historical artifact. It is inferred that provenance is the history of ownership of an artifact and provenience states the actual find spot of the artifact. The looting of tombs in the eighteenth and nineteenth century was the primary source for collectors and antiquarian excavators of that period. Another source for the acquisition of historical artefacts since time immemorial has been the open market, where provenance may be occluded.

Connoisseur is derived from the French word *connaître*, “to know” and the Latin word *cognoscere* is “to learn.” “Connoisseurship involves discrimination and taste; its practitioners make judgments about specific things like authenticity and authorship and about subjective things like beauty and quality.”⁶⁵ Professor Julius Held of Columbia University taught a course in connoisseurship in the 1950’s and 1960’s. Carol Janis writes “Professor Held maintained that the most intriguing part of connoisseurship is that the decision is actually made in an instant. One looks, and-to the experienced eye-a determination comes in an intuitive moment.”⁶⁶ R. Rosenblum described a particular connoisseur’s meeting. ‘The ambience was often like a spiritual séance in which the ghost of Giotto or Giulio Romano might be conjured up to claim authorship or denounce an imposter.”⁶⁷

‘Art historical analysis’ or ‘stylistic analysis’ is I have found a more preferred museological context than connoisseurship. A more informed connoisseurship at its highest investigative point is a rigorous enquiry using analytical skills in the identifying artifact, its material substance, when it was made and who was the author. This investigation then extends the quality and the status of its context.

Not knowing the provenience of an artifact means that its source is unknown. Its historical and cultural context remains hidden. An immediate question is its authenticity. Does the art work have a genuine placing in the historical cultural location from which it appears to emerge or is it of another period? Dating the object is a primary consideration.

Artefact can grow in prestige according to where they are housed or shown and by the distinction of the collection it is in or the group of artworks with which it is shown.

Often the historical object is so much “restored” that its historical status diminishes to the point of it becoming a pastiche. Other works such as jewellery are enhanced or added to, making the piece part authentic but with components of different eras. There is also the reconstruction into a complete object of units scattered in burials in contrived configurations.

Technological factors identify many jewellery fakes as rather obvious, but there is a small but dangerous group of fraudulent jewellery so carefully executed as to prove deceptive to even the most critical eyes. As discussed above, while it is not possible to take readings of fingerprints from ancient gold works, it is possible to see and identify literal marks as indications of the thinking of their makers. Mental processes and planning is evident in some works.

Almost nothing has been written of these expressions of preliminary design thinking, repairs and ‘cover ups.’⁶⁸ This window into the design thinking or strategies of the maker identify methodologies that are principally invisible in the finished object. Scientific research brings its own evidence, though the data is not always reliable and quite often misread. Some accompanying evidence supporting authenticity or the attribution of authorship only appears to be ‘scientific’ and a planned tactic of ‘shifty’ dealers or owners of art works. Curators and art historians are usually ill equipped to make accurate evaluations of technical data and generally operate independently of relevant scientific and technological knowledge.

⁶⁴ R. Stone (2002) 4

⁶⁵ Editors note, *SOURCE Notes in the History of Art* Vol.XXIV No.2, 2005 .1

⁶⁶ C. Janis, (2005) 78

⁶⁷ R. Rosenblum, (2005) 3

⁶⁸ R. Baines, (1992) 43-48. R.Baines, (1993) 39-44. G. Nestler and E. Formigli, (1993) 67.

Quasi technical evidence is found in shadowy X-rays and infrared reflectography when investigating the authorship of some paintings but surface and subsurface analyses of some gold works can be just as misleading. SEM using EDAX providing qualitative analysis of surface and sub surface alloy of gold works is reliable only if the geometry of object and the EMP are in the correct settings. XRF analysis is also utilised to determine the amounts of the major components of gold alloys i.e. silver and copper. Minor and trace elements are determined with EDAX.

Material not Just Manufacture

The development of technical instruments to detect not only synthetic but treated gemstones continues to follow technological advances in the treatment of stones. The most recent is the fracture filling of low quality rubies with a new lead-glass which not only hides the cracks (as it has a refractive index similar to corundum) but also improves the colour of the stone. “Detection at this stage is somewhat difficult for a dealer...Experts in the ruby trade who were deceived by these new glass-filled stones, became suspicious when they were offered stones at relatively cheap prices.”⁶⁹

The significant researcher and publisher on ancient jewellery Jack Ogden,⁷⁰ commenting on his rather sparse description of the ‘wrong’ aspects of a Georgian fake necklet wrote, ‘Too detailed an explanation of where forgers get it wrong simply ensures that the next generation of fakes get it better’.⁷¹ Ogden was writing on the ‘wake of fake goldwork in Greek and Scythian style’ and its appearance at a similar time as the first Russian language description of ancient Greek jewellery technology-“the Russian translation of the exhibition catalogue Greek Gold: Jewellery of the Classical World (D. Williams and J. Ogden, London 1994).”⁷²

Idea, not Material, not Manufacture

Michelangelo’s forgery of a work by his master Domenico Ghirlandaio was a student prank, but the reason for his forgery of Cupid Asleep, which was sold in 1496 as a classical sculpture, may not have been so innocent.⁷³

From the vantage point of a goldsmith/researcher I consider how the formulated heritage is available for reference, questioning and modification. The option to copy, to replicate, or to modify the historic document jewellery is a possibility and new input can verify or engender falsehood.

A shroud of ‘history’ can encompass the object to the satisfaction of the naive connoisseur who wants to believe in its antiquity.⁷⁴ The cultivated instincts of connoisseurs and the subsequent attributions devoid of scientific research or conclusive facts have to be challenged. Where all available technical aspects have been considered without a clear outcome, the final resort is quite often conclusions based on connoisseurship grounds.

Research data identified from the jewellery corpus becomes the basis of knowledge for authentication for curators/conservators/jewellery historians and for diagnostic purposes there is the expectation of an archaeological correctness within the fabric and manufacture of the jewellery document. From the vantage point of a contemporary goldsmith, this has provided me with an arena for artistic interpretation-for ‘play’. Historical jewellery becomes contemporary jewellery forms and the ‘play’ becomes a stumbling block and an upheaval within orthodox classification.

The Castellani Influence.

During the 1980’s I was fortunate to have a number of in-depth study visits to view the Castellani Collection of gold jewellery at the Museo di Villa Giulia Museum in Roma.⁷⁵ The duration of the visits

⁶⁹ H. Levy, (2004) 3-4

⁷⁰ J. Ogden, (1992)

⁷¹ J. Ogden, (2005) 31

⁷² *Ibid*

⁷³ Comments by D. M. Wilson (1990)

⁷⁴ U. Eco (1995) 30

⁷⁵ The Collection of Greek, Italic and Etruscan vases, bronzes, ivories, coins, and ancient and modern Jewellery was donated by Alfredo Castellani to the Italian State in 1919.

when I was able to conduct examination work of the jewellery varied from a couple of days to a week. Ordinarily there was very restricted access to the work so this was a fortunate productive period of examining, drawing, measuring and note taking.

The Castellani family who were antiquarians and goldsmiths in Rome and Naples in the second half of the nineteenth century was very successful in both selling gold antiques and making modern copies simultaneously.

Fortunato Pio Castellani opened his shop in 1815 but from the 1830's his workshop produced 'Etruscan Style' jewellery. This was very much influenced by the designs of Michelangelo Caetani an amateur artist from a princely Roman family. Jewellery designs developed by the 1850's continued to be produced relatively unchanged until closure of the business in 1927. Using detailed steel dies ensured a consistent output of detailed jewellery to the extent of variations of beaded wire and animal motifs. Copying of ancient examples decorative techniques of filigree and granulation and a style called millefiori was highly developed. Building faithful antique jewellery like the 'Cumae' diadem from the Campana Collection became a renowned development of a 'nineteenth century style' later known as 'Italian archaeological jewellery'.

There was great pride in the declaration that Castellani had rediscovered the challenging ancient art of granulation. The two sons Alessandro and Augusto published papers on Etruscan goldsmithing techniques combined with very close copies of Etruscan a baule bulla, diadem and fibulae. The Castellani success in making copies of ancient jewellery influenced a 'Historical Revival' in the nineteenth century and a fashion for Egyptian to medieval to Renaissance jewellery copies and composite jewellery styles.

Alessandro sold a number of pieces to the British Museum in 1872 and on the sale of his estate in 1884 a number of important pieces were purchased by the British Museum and the South Kensington Museum. It is since found that many modern pieces were purchased by public institutions who believed them to be ancient.

On first viewing the Castellani goldwork⁷⁶ and later in the nineteen eighties I considered the work as mostly interpretative. I viewed them as copies explaining the visual meaning of the ancient pieces, making them understandable by translation. They were elucidating or deciphering ancient visual identity while the manufacture was embedded in nineteenth century technology.

The Italian archaeological jewellery and the work of Castellani in particular appear to have been enveloped in an atmosphere of bogus religiosity with the discussion and presentation of the wondrous gold works as though they were holy relics. The craftsmanship is superb as modern examples and their value depends in part on their rarity. This value is affirmed and gauged by the price it fetches on the market.

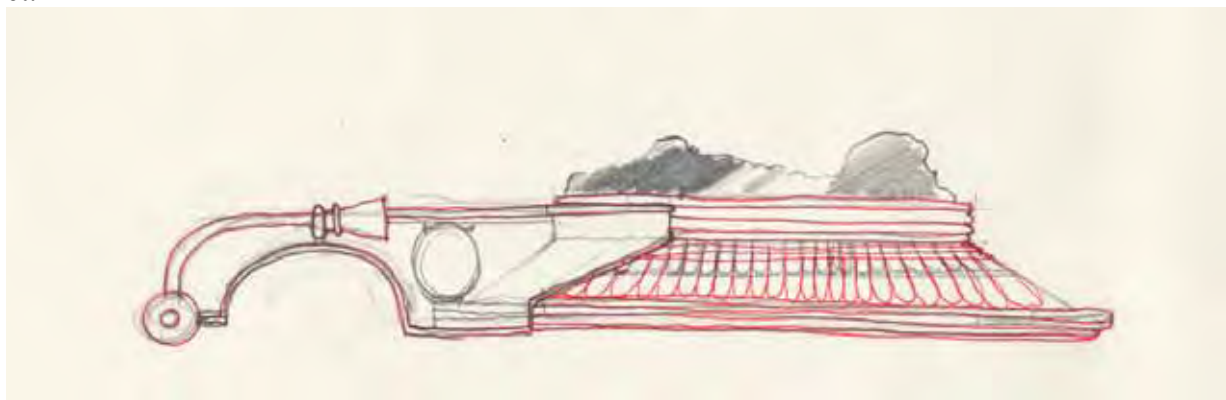


Figure 3.1. Drawing by Robert Baines of Castellani inv. 85268, Museo di Villa Giulia, Roma.

⁷⁶ For a comprehensive list of works see S Weber Soros, S. Walker (eds.), (London, 2004)

3.2. A Baule Ear Ornaments

In 1997 I conducted a Senior Fulbright research project at the Metropolitan Museum of Art in New York in the Sherman Fairchild Center for Objects Conservation. The research was primarily centred on Etruscan and some Greek gold jewellery. This was a critical point for personal discovery due to the very supportive staff at the museum and availability of primary research material.

The availability of a selection of Etruscan jewellery of the same type resulted in a very informed knowledge which overturned a description of manufacture of a baule ear ornament at the colloquium held at the British Museum in 1994 during the special exhibition Greek Gold. The presentation I made was published.⁷⁷ The paper, I now know, includes two incorrect statements. This Ph.D research has overturned the requirement and description of a secondary heat source for the manufacture of sixth century Etruscan discs.⁷⁸ Research on the possibilities of heat sources in ancient antiquity for the manufacture of gold jewellery objects was intensely investigated during the Andrew Mellon research study in 2003 at the Metropolitan Museum of Art in New York. The same publication explains with drawings what is now regarded as incorrect the sequential manufacture of a baule Etruscan ear ornament. The most complex example of a baule from the Victoria and Albert Museum in South Kensington⁷⁹ was built in 1994 using copper salt diffusion and this was my first attempt at laboratory reconstruction of ancient gold jewellery. It was conducted in my studio in Melbourne. The measurements of the jewellery piece were made at the Victoria and Albert Museum in South Kensington in England. The series of SEM images were made of the laboratory copies at the Department of Metallurgy and Mining at Royal Melbourne Institute of Technology. Parallel imaging was not conducted of the Victoria and Albert original for comparative analysis.

Naive as it was, the sequence of manufacture and basic strategy of working I now know has no relation with the ancient example. This is a change of thinking due to the findings brought about in this PhD research.



Figure 3.2. Gold Etruscan a baule ear ornament. South Kensington, Victoria and Albert Museum no. 1856-3347. Photo courtesy of Victoria and Albert Museum, South Kensington.

⁷⁷ R. Baines (1998) 122-126

⁷⁸ *Ibid* 122-124

⁷⁹ Gold Etruscan *a baule* ear ornament. South Kensington, Victoria and Albert Museum no. 1856-3347.



Figure 3.3. Robert Baines first attempt at laboratory reconstruction of ancient gold jewellery using copper salt diffusion 1994. Copy of Gold Etruscan a baule V&A no. 1856-3347. Photograph by Garry Sommerfield.

Studio Art and the Practise Based Research

Regarded by Reynold Higgins as an Etruscan invention,⁸⁰ a baule ear ornaments, of the mid sixth century B.C. tend to have configuration of design elements around an absent centre.⁸¹ This is a consequence of the conditions of heat and mass. Copper salt diffusion joining requires strategies of reinforcement and quite often a surface strata-joining system in order to secure or reinforce the minute diverse parts. It shifts heat joined contact points from the not always accessible substrate to the more manageable surface.⁸² There is a building from the outer perimeter towards the centre and this calls for a design solution to cover the central vacant area with round, square and rectangular plaques (Fig.3.4).

Baule Structures

Generally this ear type consists of a sheet curved around and terminating in a two knuckled hinge attached at each end. A hoop is suspended from the front hinge and caught at the back hinge.⁸³ Connected on the front hinge is often a pediment. In some types the curved round strips are covered in by the attachment of side plates.

Plates occur on both sides of some types and this then becomes a structurally very strong hollow construction. Placing a plate on one side of the ear ornament designates the object to be worn specifically on the left or right side of the face. The outside plate would be viewed on the wearer and this was a design decision by the goldsmith. While it conveys the appearance of being solid there is an economy of material in the use of only one side plate. The other open side facing the body of the wearer remains unseen.

The ear ornaments of the early fourth century have elements heat-joined on both sides of the disc.⁸⁴ The substrate on the side plates has wire and granule configurations with some surface sheet chiseled away creating open spaces. Edges of the cut gold sheet is quite often irregular and the shape of the extracted area does not always conform to what appears to be a predetermined area of the substrate leaving excess goldsheet. This irregularity is inconsistent with the controlled and accurate worked manner within the remainder of the piece where sequences of granulation patterning, multiple rows of wire and their controlled placing suggest a paradoxical philosophy of working by the goldsmith. In addition there is an excess of gold sheet remaining. This is not due to any awkward positioning of the

⁸⁰ R. Higgins (1980) 139. The Italian name *a baule* is due to its similarity to the Italian hand bag or valise.

⁸¹ Later *a baule* of the fifth and the fourth century are less complex. There are less multiple layers and intricate components. On *a baule* earrings see I. Caruso, (1988) 25, 27, 30, nos. 36-41; M. Scarpignato, (1985) 41-50, nos. 34-45; M Cristofani and M. Martelli, (1983) nos. 123, 136, 142-7, p. 161, 165-9; R.Higgins.139, pl. 32c; Hadaczek.(1903) 56ff. *BMCJ* nos. 1286-1306

⁸² R. Baines, (1988) 122-126

⁸³ It is usual in *a baule* ornaments to find the hoop absent. Richard E. Stone states that the pins for the hinges may have been wood.

⁸⁴ D. Williams and J. Ogden, (1994) nos. 49-50, 63, 70, 88-89

chisel on the sheet but appears to be a conscious decision by the goldsmith to retain an irregular edge and excess of surface as integral to the conclusion of the work. This may be due to ensuring all the gold supplied to the goldsmith was used or possibly concluding the manufacture of the piece at a predetermined or mutually agreed weight.⁸⁵



Figure 3.4. Gold laboratory reproduction by Robert Baines of a baule ear ornament. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

Wire

The twisted wire appearance is consistently found on each of the jewellery examined to be either right hand or left hand twisted and this indicates wire manufacture from a single source and by either a right or left handed goldsmith. A combination of left and right twisted wire within one piece does not occur. The only exception is when a double wire occurs where a left and a right twisted braid are placed together usually on the border of pediments and side plates of a baule ear ornaments.⁸⁶ The placing of single or rows of wire at edges increases mass and stabilises the plate structurally and reduces the possibility of edges melting before joining in areas not immediately near the outer perimeter. In the a baule group examined only MMA.95.15.146 has beaded wire.

Beaded wire does not seem to occur before the seventh century BC. When beaded wire does finally appear it is quite prolific throughout the areas of Phoenician influence.⁸⁷

⁸⁵ Discussion with Richard E Stone.

⁸⁶ Double braided wire has been joined on the top of folded strip in a *baule* MMA. 95.15.142. Not confined to being reinforcement this defined a geometric lattice.

⁸⁷ J. Ogden, (1998) 16

Gold a baule ear ornament MMA. 95. 15.138

Figs. 3.4-12.

There is an absent hoop and two missing hinge pins

The ear ornament has a pediment and two side plates. A centre rosette of eight sections of four tapering strips curve toward the substrate and four curved sections join a sphere in each corner occupying the main section. There is a fifth sphere centrally placed in the rosette. The left side of the ear ornament has been slightly crushed and repair work in the reverse of the object. The ornament has been constructed with its various assemblages on a flat substrate. Following assembling of the construction folding/creasing on the inside attests that the object was curved up prior to the addition of the side plates.

Granulation

Three different sized granules define the design. The triangular granulation formations are irregular in their placement on the spheres. A group of poorly formed granules are concealed under the lower right curved floriote (Figs.3.10,11). The shape of the poorly formed granules suggests round wire was the initial stock. Some of the granules have retained their primary wire identity and clearly have received very little melting. They have obviously been positioned in the centre of the receptacle during the firing process and have not been fully soaked in the required temperature for the melting into the granule form.

Wire

There are two wire types. Both 'twisted'⁸⁸ and round wire are consistently right hand twisted (Fig.3.9). Round wire is not prevalent and has been applied in only two places, first as a single large form on the pediment and second as flat open coils on the two side plates. Over the long length of the coil varying thickness in the round wire is visible. Rolling the wire between a block and flat base using irregular pressure has caused this.

Generally there are three different sized 'twisted' wires occurring on the pediment with the finest at the top and increasing to the largest diameters on the eight-part centre rosette. The twisted wire rings around the meeting point of the two hemispheres have not been joined prior to positioning on the spheres (Figs.3.9, 12).

Hinge

The hinge being an extension of the substrate is cut with a chisel and rolled up in an anti clockwise direction. The knuckles of the hinge then become the connecting point for the pediment.

Surface Depletion

An enrichment of surface has come about with the reduction of copper and silver.⁸⁹ Modern repair work has been carried out and rectangular plates have been applied as patches and powder soldered. Pickling with an acid solution would have followed this addition consequently altering or destroying the ancient surface.

Laboratory Reconstruction

The a baule was constructed based on drawings suggesting a sequence of manufacture using a diffusion joining process (Figs.3.6-8). The gold alloy for the construction is included in the MMA report. The museum piece has burnt out areas on its side spheres and particularly the hemispheres underneath. This indicates a direction of the heat source and the prior firing to join the hemispheres to the substrate. The difficulty in directing the heat is further identified by what appears to be an inaccurately positioned side plate (Fig.3.5). As a final sequence of the heat assemblage the side plates are joined to each side of the object. The connecting edges remain exposed in order to be accessible for heating for the joining process. On the laboratory sample surfaces became oxidised following the heat joining campaigns.⁹⁰ To restore a gold colour to the surface the laboratory samples were brought to the boil in a solution of vinegar and salt which removed any visible copper oxide.

⁸⁸ See N. Whitfield, (1998), The 'twisted' wire is described by Whitfield as a spiral-beaded wire, which has oblique (rather than right angled) 'beads' separated by spiral grooves running round the wire in the manner of a screw thread (although not as continuous). For Etruscan examples see fig.34, fig.54. For examples of 'twisted' wire on a *baule* of the second half of the sixth century see Christofani and Martelli nos.143,144 and a *baule* of the mid fifth century BC., no.145.

⁸⁹ See P. Craddock *et al*, (1988) 112

⁹⁰ see Fig. 3.22

On completion the weight of the two laboratory constructed pieces were almost twice the weight of the a baule from the Greek and Roman Department. The size of the samples with their wires and granules match the dimensions of the museum piece but being twice the weight illustrates the delicate quality of the original. The wires, granules and sheet which became the substrate were too thick. Two factors confront the researcher in determining the thickness of sheet. It is difficult to gain an adequate vantage point to actually measure the sheet which forms hemispheres and substrate are not accessible. The second reveals the extremely delicate quality of the work in that the sheet the goldsmith commenced with had been reduced to an acute thinness that renders it quite fragile and susceptible to distortion in the fingers and during joining campaigns in the fire.

The pediment on the ear ornament is connected to the tube/hinge, which has been rolled up from the substrate. Granules reinforce this long contact point to the pediment.

Similar burnout on the substrate of the spheres and floriottes occurred in both the laboratory construction and the museum piece. It was found that particles of copper carbonate not completely dissolved were suspended in the solution of water and tragacanth gum. If painted on to the gold surfaces for joining the ultimate concentration of copper became a burnout point.



Figures 3.4,5. Etruscan gold a baule ear ornament MMA. 95. 15.138 Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.



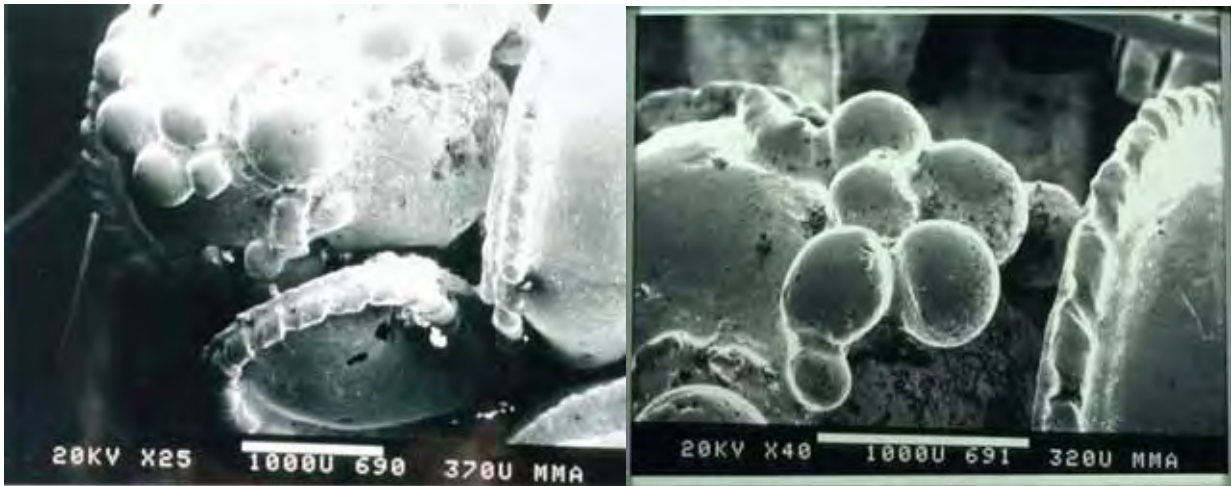
Figure 3.6. Gold laboratory reproduction by Robert Baines of gold a baule ear ornament MMA. 95. 15.138 Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.



Figures 3.7,8. Gold laboratory reproduction by Robert Baines of gold a baule ear ornament MMA. 95. 15.138. Oxide on surface as an outcome of the copper salt joining process. Grooved wire having the appearance of twisted on the pediment. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum in NY.



Figure 3.9. Etruscan gold a baule ear ornament MMA. 95.15138. SEM by Mark Wypyski photo courtesy of the Metropolitan Museum of Art in NY.



Figures 3.10,11. Etruscan gold a baule ear ornament MMA. 95. 15.138 A group of poorly formed granules are concealed by the goldsmith. The shape of the poorly formed granules suggests round wire was the initial stock. SEM by Mark Wypyski photo courtesy of the Metropolitan Museum of Art in NY.

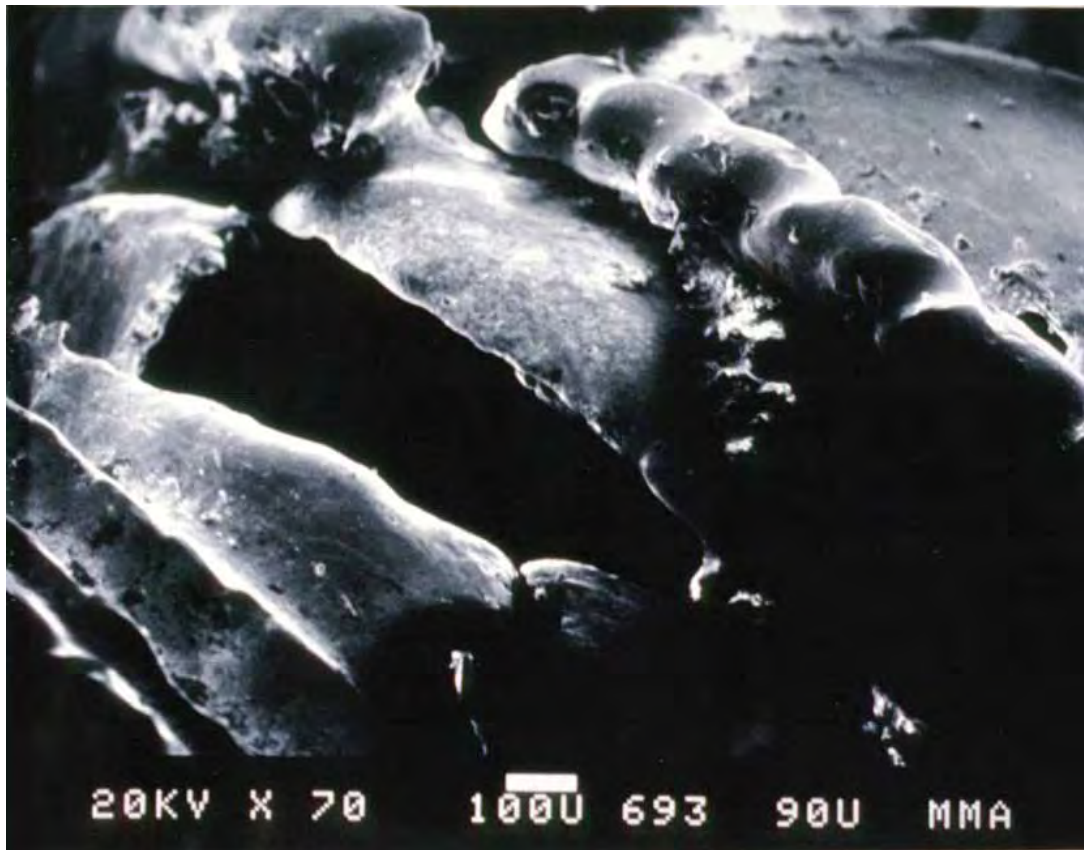


Figure 3.12. Etruscan gold a baule ear ornament MMA. 95. 15.138 SEM by Mark Wypyski photo courtesy of the Metropolitan Museum of Art in NY.

2. Gold a baule ear ornament MMA.95.15.139

Figs. 3.13-19.

The ear ornament has a pediment and two side plates which would have allowed it to be worn on the left or right ear. The main section is occupied by three rows of domes with each having three granules topped with a centre granule.⁹¹ Bordering on either side of the domes is a grooved folded strip and the second inner row has lifted from the substrate at the top left. This allowed a vantage point for the SEM to photograph preliminary marking out on the substrate by the goldsmith (Figs.3.15,16). The substrate surface has flowed during heat joining but insufficiently covering the scribed line. This is signage of the maker. The preliminary marking out of spatial intervals for the placing of design components reveals design thinking by the goldsmith and part of this strategy was the scribing would be covered over by the flow of the molten surface due to both the fusion process and the grooved folded strip placement. The SEM image reveals incomplete joins on the base of some domes and this is typical of diffusion bonding. The domes also have crimped edges which are an outcome of the thin gold sheet folding and not being hammered tightly into a dapping form.⁹²

The ear ornament has been constructed on a flat substrate and curved round prior to the side plates being attached as resultant creasing is clearly visible inside the ornament.

Granulation

The granules on the domes are repeated in groups of three and one on the top in the centre. They are consistently the same size.

Wire

All the wires on the artefact have left hand creasing and imply they were wrought by a left handed goldworker (Figs.3.18,19).

Varying in diameter from 0.2 - 0.4 mm. the wire appears to be block twisted and on the right-hand side plate is a wire border the SEM identified as round (Fig.3.18). Clearly the wire has been manufactured initially round in section followed by helical grooves worked up and down the wire using a grooved tool by the goldsmith. The wire has been held in the left hand and the tool is run up and down the wire.

The grooved folded strip is typically flat on the underside with consistent flat sides and uniform width (Fig.3.18). The ridge at the underside edge is a result of the folded strip having been hammered lightly on its edge. The strip is strategically placed both as a protective border and as a reinforcement at the joins of the domes to the substrate. This is a particularly important component in the strategy of reinforcement by the goldsmith. The SEM illustrates the incomplete joins to the substrate (Figs.3.15,16).

Hinge

The hinge has been chisel cut from the substrate and rolled up into a tube anti clockwise.

Surface Depletion

No reduction of copper in the surface analysis indicates surface depletion has occurred as the copper salt diffusion joining campaign would have added copper to the surface. The 8 % reduction of silver and corresponding increase of gold endorses the theory that a leaching action has produced surface enrichment.

Laboratory Reconstruction

The copy was constructed using the alloy 92% Au, 6% Ag, 2% Cu. A drawing was made of a suggested sequence of assemblage based on the diffusion bonding joining system. Substrate, domes, grooved folded strip, side plates, pediment, granules and wire are all components illustrated plotting the sequence of their assemblage.

In the construction of the replica a double grooved iron tool was successfully used to create the twisted appearance on the wire.⁹³

⁹¹ see note 9

⁹³ Ibid, note 17



Figure 3.13. Gold laboratory reproduction by Robert Baines left and right gold a baule ear ornament MMA. 95. 15.139. Bordering on either side of the domes is a grooved folded strip and the second inner row has lifted from the substrate at the top left. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.



Figure 3.14. Gold laboratory reproduction by Robert Baines of gold a baule ear ornament MMA. 95.15.139 Red comb identifies the fine scale of the work.



Figures 3.15,16. Gold a baule ear ornament MMA. 95.15.139 The grooved folded strip in the second inner row has lifted to reveal marking out on the substrate. The grooved folded strip is typically flat on the underside with consistent flat sides and uniform width. The ridge at the underside edge is a result of the folded strip having been hammered lightly on its edge. SEM by Mark Wypyski photo courtesy of the Metropolitan Museum of Art in NY.



Figure 3.17. Detail. Gold a baule ear ornament MMA. 95.15.139. SEM by Mark Wypyski photo courtesy of the Metropolitan Museum of Art in NY.



Figure 3.18. Gold a baule ear ornament MMA. 95.15.139 Grooved folded strip. SEM by Mark Wypyski photo courtesy of the Metropolitan Museum of Art in NY.



Figure 3.19. Gold a baule ear ornament MMA. 95.15.139 Pediment with chisel cut edges and grooved wire made by a left handed worker. SEM by Mark Wypyski photo courtesy of the Metropolitan Museum of Art in NY.

3. Gold a baule ear ornament MMA.95.15.146

Figs.3.20-25

The ear ornament has no pediment or side plates. It has two rows of six domes topped by beaded wire jump rings with a singular solid ball/granule (Figs.3.20,21). The perimeter of the domes and granules configuration is a beaded wire terminating at each end in a swaged sheet hinge. The excess substrate at the sides has been burnished around the beaded wire border.

Granulation

The granules are consistently 0.7 mm. diameter and have smooth surface. Granules are located on tops of beaded wire jump rings and adjoining domes. Connecting the components together would increase the structural strength, particularly during the curving up from the flat substrate stage to the annular a baule form.

Wire

There are two types of beaded wire made from block twisted wire. The small beaded wire as a ring supports granules on the top and between the domes. This provides an increased contact point. The beads are irregular in size on the small wire.

Hinge

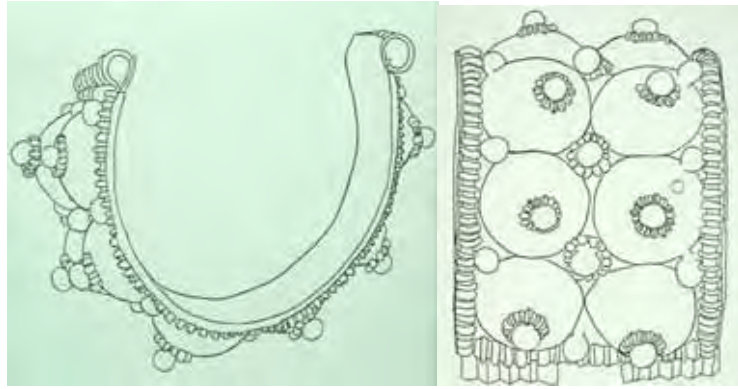
The hinge is constructed as a separate swaged tube. A more coarse and angular tool has been used in this instance than that for the beaded wire. The swaged hinge has been constructed independently of the ornament and joined to the extended substrate.

Surface Depletion

No analysis

Laboratory Reconstruction

The laboratory sample was constructed on a flat substrate and then curved up (Figs.3.22,23). Creases on the reverse are similar to the museum piece. Surface analysis of the laboratory sample found that copper increased from 1.3% to 3.9%.



Figures 3.20,21. Gold a baule ear ornament MMA.95.15.146 Photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.



Figure 3.22. Gold laboratory reproduction by Robert Baines of gold a baule ear ornament MMA. 95.15.146 Oxide on surface as an outcome of the copper salt joining process on the left and the other boiled in salt and vinegar. Photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

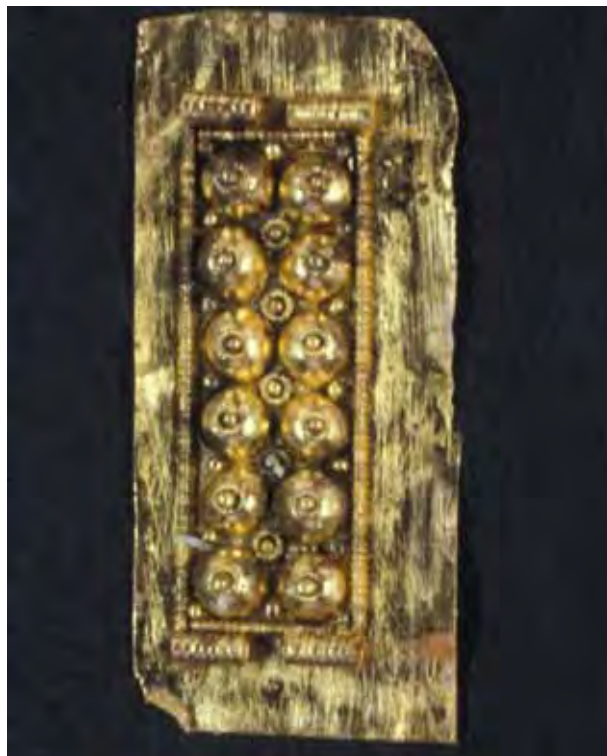


Figure 3.23. Gold laboratory reproduction by Robert Baines of gold a baule ear ornament MMA. 95 15.146. The structure is applied to a flat substrate and finally curved up forming the hoop shape. Photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

4. Gold a baule ear ornament MMA.95.15.141, 142.

The ear ornament has a pediment and two side plates.

Grain Growth

On the substrate of the pediment and in the two concave bowls of MMA.95.15.141 recrystallisation has occurred during manufacture and individual grain boundaries are evident.

There is grain growth on the surface of the concave bowls and a twisted wire appears to have been overfired on being joined to the substrate of the bowl. The centre ball has in contrast a pristine surface suggesting its placement and joining to the substrate as a later sequence in assembling.

The sheet used to construct the bowls is possibly a remnant of previous construction. This may have been part of the substrate of the main section and have received a duration of heat and hence grain growth.

A suggested sequence of fabrication based on the signs of manufacture indicates the dapping of a disc, which is then domed or made concave. The wire once joined to the perimeter is joined to the substrate of the pediment. At this point the granulation is rendered over the surface of the centre losenge. Following this extensive firing the ball is placed and joined to the centre of the adjoining concave bowls.

Recrystallisation

Recrystallisation is evident on the substrate in the centre of the side plate.⁹⁴ When the present composition of alloy is to be compared to its original composition, proof is necessary that no component element has since been extracted from the alloy. This may have occurred via soils from its archaeological site, by some inappropriate cleaning or undue “enhancement” process following excavation.

The question of surface depletion as a final part of the sequence of manufacture consciously applied by the goldsmith has to be considered in the research.

Conclusion

Constructing a baule by diffusion bonding with a copper salt results in a copper enriched surface. Compositional changes to surface alloys as a result of the application of copper during the heat joining process became an issue for reconsideration. The relevance of flux as a reduction agent of copper oxide on heat joined gold alloy became a major consideration as the interference of copper oxide on surfaces proved quite problematic during ongoing joining campaigns. Drawing copper oxide to the surface during the heat process also led to burnout of surfaces. Burnout holes were caused by particles of copper carbonate not fully dissolved into the joining solution of water, gum and copper salt.

I have found that there is a general theory within museums by scholars and conservators that all the design elements/iconography are located on the construction and held intact by the organic glue and this is followed by one firing using a copper salt. Through many demonstrations I have shown that this is quite false.

Flux

Following discussion with Dick Stone it was decided that flux would not be used in the heat joining process due to the understanding that there were no fluorates or borates in the Etruscan period.⁹⁵ A mixture of water, copper-carbonate and tragacanth gum would be the solution applied to the gold alloys. The heat source was low-pressure gas with the injection of air by way of mouth.

In the Etruscan context there is an absence of chemicals that parallel contemporary fluxes such as sodium fluorate or sodium borate.

The chemicals suitable for making faience were of course available, and based on this a natron was made up in the anhydrous form consisting of two parts sodium carbonate, one part sodium chloride and sodium sulphate.⁹⁶ Making of test pieces identified the following results.

⁹⁴ See 2 Historical Background :4 Recrystallisation and Grain Growth.p.30

⁹⁵ See note 7 for full reference

⁹⁶ *Ibid*

First, as a flux for the joining of objects of small mass as in granulation and fine wires the joining was unsuccessful. The small objects tend to be displaced by the viscous action of the flux. However for the metallic soldering of objects pressed together where objects cannot be displaced by the flux it would prove an excellent flux due its condition to withstand sustained high temperature firing. Second, the solution when heated very effectively dissolved the copper oxide on the gold surfaces. Third, dissolving the lump form on flat gold sheet is very effective as the viscous material spreads throughout the piece over a broad area. This is most beneficial in the removal of copper oxide from sheetworked gold. For the structural three-dimensional objects it tends to flow away from the highpoints exposing the material to the atmosphere resulting in surface oxidation. Fourth, the natron is very easily removed from the object by washing of surfaces with water.

The subsurface copper level on the tested a baule ranged from 4%-4.6%

An accumulation of copper on some samples suggests there could have been a conscious depleting of surfaces as the final sequence of manufacture. A solution of vinegar and salt was considered as a possible pickling agent and this was applied on the laboratory sample. The treated surfaces were observed and analysed with the SEM. The initial non use of a flux in the constructing of replicas and test pieces caused some difficulties with multiple joining due to the copper build up. The natron was used in later samples as a flux agent for heat joining, and also for the making of button ingots. Surface treatment with the natron material for the reduction of copper oxide proved quite effective. Microscopy identified surfaces as not being 'typically ancient' however, and in later more heavily oxidised samples a more positive result was achieved. Further investigations of surface treatment of gold alloys were conducted using various proportions of iron sulphate and the natron material.

Grain Growth

Extensive grain growth was observed on sections of the a baule MMA 95.15.141,142 and this could be an indicator of sequence of manufacture. Three test pieces of typical gold alloys were soaked in an exposed atmosphere for various duration and temperatures. The results produced were unsatisfactory. The application of copper in a non oxidising situation could be the contributing factor required. The removal of the heavy copper oxide with multiple firings using the natron material achieved relevant surfaces for the study of ancient goldworks.

3.3. A Greek Disc and Pendant Ear Ornament

In the first quarter of the fourth century BC at Madytos on the north side of the Hellespont opposite Abydos was found a pair of Greek gold ear ornaments⁹⁷(Figs.3.24-26). Interference by fire on the gold surfaces of the pieces indicates funerary pyre origins of the jewellery pieces.

This complex disc and pendant jewellery type with its multiple wire configurations in concentric formation in the pan shaped disc has connected to wires, spikey-leaved palmettes, spirals, trefoils, quatrefoils and pear shaped blocks (Fig.3.26).⁹⁸ The disc/pan is outlined within the corrugated border by a series of wires joined to the substrate. In less complex types from Kyme⁹⁹ patterned wire in concentric placing extend over broader surface areas employing fewer three dimensional motifs which are cold fastened to the centre.¹⁰⁰ Centrally placed in the pendant is a boat/leech hollow form and on the front is finely granulated patterning.

Above the suspended boat shape is a muse playing a lyre and on either side is an elongated winged figure, possibly an Eros. Surrounding iconography is diverse: acanthus leaves, spikey-leaved palmettes, quatrefoils, tiered rosettes and protomes of the winged horse Pegasos. Further pendants of quatrefoils, swaddled women, plain and grooved seed hang from hoops and tight 'loop in loop' chains.¹⁰¹

Strategies of Working

The ear ornaments show that the goldsmith had an intimate feeling for the material. A tacit knowledge, an interaction between ideas and real matter happened not unlike the interchange between scientific theory and experiment-attractive at first but only a tentative idea. Technique rarely controls the major tangible outlines of gold objects in ancient antiquity. Intangible quality is strongly influenced by the properties of gold alloy, its internal or surface reaction with heat and atmosphere, and its ability to acquire liquid state or gradients of shape both on a near microscopic scale or in the clearly visible. The goldsmith cannot avoid being intimately and sensually aware of this relationship as he works, even though he may not have intellectualised it from the beginning.

Shaping of metal on a large scale can be arbitrarily done but on a very fine scale the goldsmith has little latitude. On the scale just visible to our senses there is balance and the intricate granulation and wirework of the complex gold in the Madytos (?) pieces lie in that balance with complex granulation and wire configurations.

Under close examination, the minute effects due to the gold and heat are seen to be just as dependent upon the relations between parts and wholes as the aesthetic quality of the entire work on the scale at which they are intended to be viewed. Both are ultimately structural, but the relevant structure of the gold is on a scale that is not resolved by the naked eye, or only marginally so. It may be a structure on a microcrystalline level as in the texture of metal.

Microscopy

The ear ornament was examined using light and electron microscopy. The disc and pendant MMA 06.1217.11 was selected and a series of drawings were made of the disc depicting possible sequence of

⁹⁷ Pair of gold Greek disc and pendant ear ornament. New York, The Metropolitan Museum of Art, Rogers Fund, 1906, 1217.11-12. Higgins *GRJ*², pl.25A. Pfrommer, (1990), pls.26, 14 and 31,14 (a chart suggesting the development of the type). Ear ornaments from Crete, *BMCJ* 1655-66; from Derveni, Tomb z8, *Search for Alexander*, no.1138; from Trebizond (Dallas, Schimmel collection), Deppert Lippitz (1985), fig.130; Williams and Ogden, (1994) 110,111

⁹⁸ Working strategies can be characterised by a consistent use of the same iconographic structures observed on a number of jewellery pieces. The complex disc and pendant ear ornaments of the late fourth century BC show a consistent structural configuration in their manufacture. The repetitive use of double corrugated strip, concentric wire patterning on the outer perimeter of the discs and the same system of cold fastening of the wire structures in the centre all identify a common characteristic of surface and structure.

⁹⁹ The Kyme Treasure, bibliography: *BMCJ*, p. xxxviii; Segall, 28; Higgins *GRJ*², 156 and 160; I. Ondrejova in J. Bouzek *et al. The Results of the Czechoslovak Expedition: Kyme II* (1980) 125-6; Pfrommer, 241, FK 71; D. Williams in A. Calinescu and W. Rudolph (eds.), (1991) 117-129.

¹⁰⁰ For the Kyme earrings see D. Williams and J. Ogden, (1994) nos. 49-50 and A. Greifenhagen (1960) II pl. 40, 1-2

¹⁰¹ For a detailed description see Williams and Ogden, (1994) 110, 111

assemblage and these were also used as maps for SEM observation. Markings and structures indicating manufacture of the decorative components were observed and photographed. This visual information on surfaces can reveal sequence of assemblage and goldworking methods. Varying evidence of reticulation, burnout and grain growth on surface adds further information particularly of the firing activities of the maker.

The complex disc with its diverse wire configurations, sheet and granulation is an assemblage of prefabricated layers. They are connected by a central tube, which is concealed by a rosette cap (Fig.3.28).

The background to the complex network is the polished gold surface of the bowl. This has been achieved by concentric burnishing inside of the border of one round wire and two braided wires joined to the substrate.

Alloy

Compositional analysis of surface and sub surface using EDS was carried out and the relative weight percentages are taken from single readings on the surface and sub-surface, and no analyses of heat joined zones were conducted. The ear ornament has been manufactured from a relatively pure alloy with very slight gold variation of 0.05% could still suggest surface depletion has occurred. Whether this was a conscious process implemented by the goldsmith is questionable. Multiple firing campaigns using a copper salt diffusion joining system has as an outcome a copper enriched surface, and depleting with an acid solution as a final sequence of manufacture could have been carried out.¹⁰²

Depletion of the gold surface could have resulted from having been buried in a leaching soil environment. Other possibilities being the piece could have received some cleaning or chemical enhancement treatment on the surface as part of its history.

Hot and Cold Joining

The complex network of fine wires and granules together with all heat joined parts are all diffusion bonded with a copper salt. The reverse identifies typical joining contexts for copper salt diffusion followed by fusion of the parts. The maximizing of contact points and strategies of reinforcement are continual policies implemented by the goldsmith.

The high temperature atmosphere of the fire quickly melts the parts of very little mass¹⁰³ and particularly when they are not connected to a substrate. Much of the complex iconography in the disc is 'in the air' and to connect these fine structures to the broad mass of wire and sheet in the disc using a high temperature fusion process would result in melting of the fine parts prior to the joining process.

To overcome this dilemma the complex structure in the disc is a series of simplified structures built as layers each fabricated separately and safely away from the complex firing of the object. Once prefabricated independently, each layer is located over the centre tube in the disc and a cap fused at the top of the tube locking the layers on. The partly melted quatrefoil cap (Fig.3.28) identifies the difficulty of the final joining sequence. Following that joining, a ball was added to the centre of the quatrefoil. The cap has received intense heat and has been partly destroyed while the ball has received negligible surface interference from the heat and the initial dendrites crystal lattice on the gold surface remains clearly visible on the surface of the ball and attests to a further or final firing.¹⁰⁴ This sequence of construction is evident on the trefoils and quatrefoils (Figs.3.28,29).

¹⁰² Slight increases in copper as traces of diffusion bonding have been observed in an early Etruscan bow fibula. Analysis by emission spectroscopy was carried out by P. Parrini *et al.* (1982) 118-121. A sample was taken from the catch plate. The average composition of the alloy sample was found to be 65% gold, 32% silver; the copper content varied from 1.25 to 3.2% moving from the centre of the grain to the lamella. The copper content increases in the neck of the joint by as much as 5%.

¹⁰³ Figs.3.33,34. The design element of wire and substrate is stabilised by the added mass of a second thicker substrate.

¹⁰⁴ When solidification of the balls (granules) start, it does from a few isolated points in the melt, usually from impurity particles in the alloy or within the surrounding charcoal dust during manufacture. This is called *nucleation*, see M. Grimwade (1995) 66,67. "Nucleation occurs when a small piece of solid forms from the liquid. The solid must achieve a certain minimum critical size before it is stable", D. Askeland, (1990) 218-251

Recrystallisation and Grain Growth

The condition on the gold surface suggests funerary pyre origins and this is characterised in recrystallising grain growth of the gold (Figs.3.31,32). Visible tessellated grain growth over the entire piece suggests the fragile piece has been saturated in heat for an extended duration. It is quite likely that the jewellery was immersed in a reducing atmosphere of hot ashes for a number of days.¹⁰⁵

The reverse of the ear ornament identifies tessellated grain growth has not resulted from heat as an outcome of manufacture of the beaten sheet and worked wire. Heavily worked sheet gold is characterised by a different type of crystal compared to cast metal objects and following a number of annealing alloyed gold sheet results in a uniformity in the size of the grains. The reconfiguring of the crystal structure of the gold in the Madytos (?) piece has resulted from a duration of heat during cremation and subsequent period in ash.

As discussed above, during manufacture, annealing and heat joining causes increased temperature and the cold worked microstructure of the gold becomes more and more unstable.¹⁰⁶ In this first stage of recovery the dislocations introduced during cold working undergo structural rearrangement into more energetically favorable configurations without any significant change in their concentration. This reduces the crystal lattice strain without causing any observable change in the metals microstructure and not visible on a jewellery piece. The second and most important stage of annealing and consequently heat joining is recrystallisation.¹⁰⁷ This stage involves the replacement of the cold worked structure by a new set of strain free grains. These grains are not elongated or deformed as are the cold worked grains, but are approximately equiaxed.¹⁰⁸

In the Madytos (?) ear ornaments recrystallisation has occurred in the funerary fire rather than by manufacture as grain growth is the third stage of annealing and heat joining. This involves the growth of recrystallised grains at the expense of surrounding recrystallised grains. During the process of heat joining grain growth can occur and repeated campaigns of heat joining will further extend this growth. Usually there is no sharp distinction between recrystallisation and grain growth as grain growth may occur in the parts of the material which recrystallised first, while other regions are still recrystallising. The Madytos (?) pieces have an even tessellation over the surface suggesting a general as opposed to, localising heating and for a long duration.

Chisel Cutting

Gold when wrought to acute fine dimensions using such a high temperature joining system indicates the ancient goldsmith as one who worked 'at the edge.' Using a singular material (gold), the working is direct. That is, it is not labored over with a litany of processes such as the refining of surfaces by abrasion or returning to correct minor differences. There is honesty in the working - what is applied is observed. A chisel piercing the substrate or chopping a wire creates no residue or wastage of gold. The mark of the chisel action leaves a profile identifying the shape and angle of the cutting face and faceted edges from some cuts can become part of the aesthetic of the worked surfaces (Fig.3.34).

Wire

The goldsmith who made the wire was right handed. All the wire is consistently right hand twisted resulting from holding the wire in the left hand and rolling a flat block in a forward direction across the wire. This causes a helix on the upper left going down to the lower right of the wire. The complex network of fine wires and minute iconography on the ear ornament is consistently of right hand twisted wire suggesting that the manufacture has been carried out by a single maker.

¹⁰⁵ Williams and Ogden, (1994) 108, "A tubular loop from the back of one of the rosettes has become fused to the disc of one of the earrings. The earrings and the flowers were therefore evidently close together on the corpse as the funeral pyre was lit; owing to the slightness of the damage it seems likely that they were quickly removed or the flames were speedily quenched." This scenario would not facilitate the extensive grain growth clearly evident on the pieces.

¹⁰⁶ For the effects of increasing annealing temperature on the properties of precious metal see M. Grimwade (1985) 80-82

¹⁰⁷ D. Askeland, (1984) 213, "The recrystallization temperature is not a constant for a material but depends on the amount of cold work, the annealing time, and other factors."

¹⁰⁸ The same diameter no matter what direction they are measured in.

The spikey leaved palmettes are the finest network of wires in the disc and measuring 0.15 mm. diameter are of the ribbon twisted type. They are placed in the air and so are stabilised by being joined to a substrate. This facilitates a fineness of appearance and fulfills the technical necessity of stabilising and strengthening the wire construction. It also allows a more angular bending of the wire construction once stabilised on the substrate (Fig.3.36). The wire is a ribbon twisted type, though the broken hoop (Fig.3.27 Detail) is of a larger twisted strip. The option of a block twisted wire would seem stronger and practical for forging the end and making a taper.

Laboratory Reconstruction

The complex prefabricated system of construction for the decorative components in the disc is evidence of the dilemma of high temperature joining. This sequence of building components could be regarded as a logical outcome using a metallic soldering process, but the extreme fine detail and hence fine joins clearly point to copper diffusion followed by fusion as the joining system. The non-appearance of 'flooding' at the contact points and adjoining areas further indicates the absence of solder. The evidence of burnout on the substrate further indicates protracted fusing of the surface.

The laboratory reconstruction of the disc and its components was carried out based on the known technology of the era of the piece (first quarter of the fourth century BC) (Fig.3.37). Copper salt diffusion followed by fusion was the heat joining system carried out. Copper carbonate was combined with gum tragacanth and water for the holding in place and the diffusion process. By confining usage to the known and understood processes of the period specific parameters were established. The primary objective was to test the possibilities of construction of intricate detail within the complex structure of the disc/dish (Fig.3.37).

Following inspection using a low powered stereo microscope signs of manufacture were observed. Further study of the jewellery was enhanced by practical experimentation in a goldsmith's workstation using a similar gold alloy.

Using the SEM, observations of signs of manufacture and drawings were constructed to record descriptions of process. The sequence of manufacture of the various components once established was constructed requiring the heat joining process. The various intricate parts are then each cold assembled over the central tube (Fig.3.37). The gold once beaten into sheet was cut into a disc and dished up around the edge. In the central flat a smaller flat dish was sunk. This was the location for the heat joining of the central tube.

In making the cross-corrugated border, a strip was cut from the sheet and using a multi-grooved anvil latitudinal creases were made along the strip. Grooves crossing the latitudinal grooves were worked into the sheet by locating a previous streak into the groove of the anvil, and making a sequence of longitudinal grooved strip.

Conclusion

In the gold disc ear ornaments the diffusion bonding system can be demonstrated to have employed a copper salt as the chemical joining agent simply by the design configuration of the decorative components. In considering the Greek disc and pendant ear ornaments of the fourth century BC structural identity and configuration of the design elements suggests a sequence of construction. Within the disc/pan component of the ear ornaments itself is a sequence of 'building' which can be compared with the Etruscan disc and a baule ear ornaments of the sixth and early fifth centuries BC. Diffusion bonding is characterised on the reverse of the discs by the increased surface contact that maximises the joined surfaces.

The ear ornaments of the early fourth century have elements heat-joined on both sides of the disc. Copper salt diffusion bonding facilitates this design opportunity due to a fundamental condition. The join does

not remelt (as in soldering) and this ensures a stable bonding during subsequent firing for even the smallest complex parts that had been joined previously.

The double corrugated strip follows and increases the outer circular border accommodates and protects the fragile three-dimensional structures on the front. The multi-layered rosettes, palmettes and wire constructions are cold-fixed to the centre of the disc. There is a recessed centre that is a dome on the reverse. The vertical tube joined to the centre becomes a central fixing point on the front. Decorative elements are pre-fabricated and placed over the central tube to be trapped by a rosette cap.

This is the technical configuration principally used in all disc ear ornament types. Prior to the cold assembly of the pre-fabricated parts in the centre there is an open central area on the substrate. This broad space facilitates a general heating and, therefore, reveals a high temperature joining system such as diffusion bonding.

The solution of cold-fixing complex elements that protrude out from the elevated central area is, in fact, a highly practical one which simultaneously conforms to expectations of Greek aesthetics.

The laboratory reconstruction based on the building parameters of the known technology of the era confirmed other determining factors. It became quite evident having built three layers using such theoretical methodologies of making that fine complex structure of the disc/pan type can be constructed accurately with efficiency and minimum danger to the jewellery piece. The laboratory-constructed sample was placed in the SEM (Figs 3.38-40) and images were compared with the piece from the Metropolitan Museum of Art in NY.

The decorative wire in the disc/pan, chain wires and in the hoop is all consistently right hand twisted and this consistency of the many intricate parts, the complexity of structure and acute focus required in the construction attests to a single maker.

Following manufacture of the copy in the laboratory the sample resulted in a slightly oxidised appearance. The copper oxide on the surface was a response to the multiple applications of the copper salt during the heat joining campaigns.

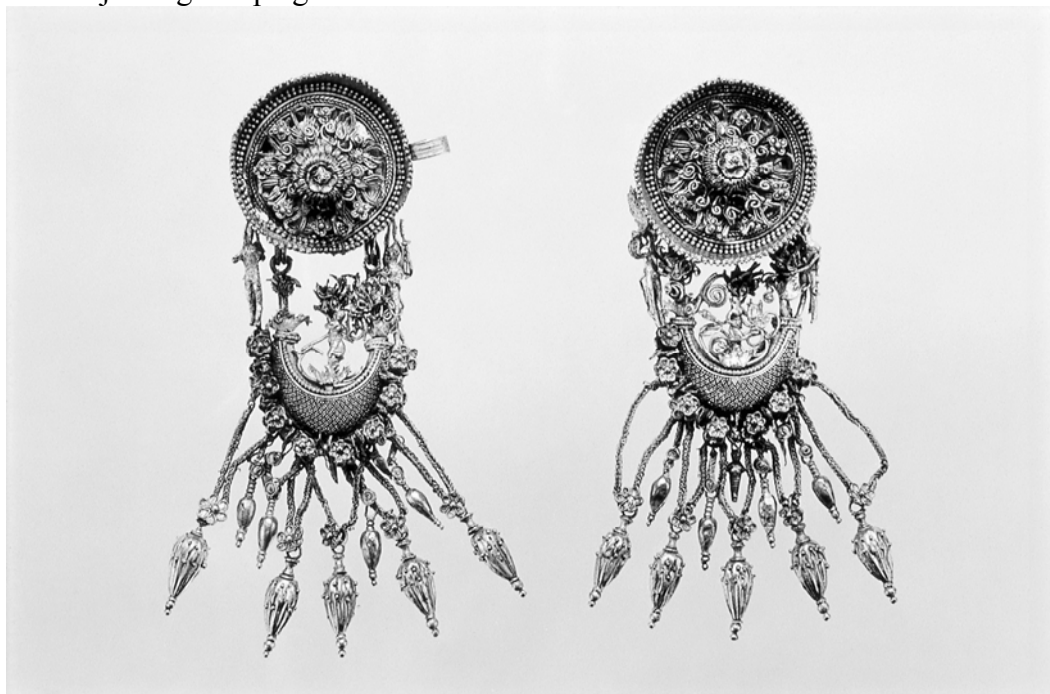


Figure 3.24. Pair of gold Greek disc and pendant ear ornament. MMA 06. 1217.11-12. Photo courtesy of the Metropolitan Museum of Art in NY.



Figures 3.25,26. Detail. A swaged gold hair ring has fused to the wall of the disc as a consequence of high temperatures within a reducing atmosphere. MMA 06.1217.12. photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

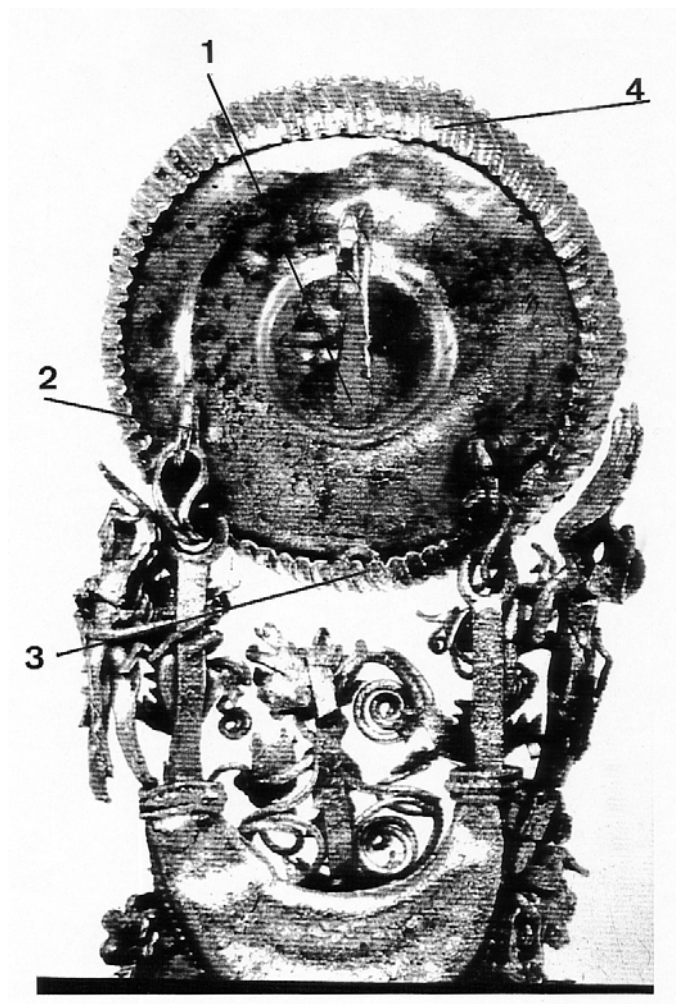
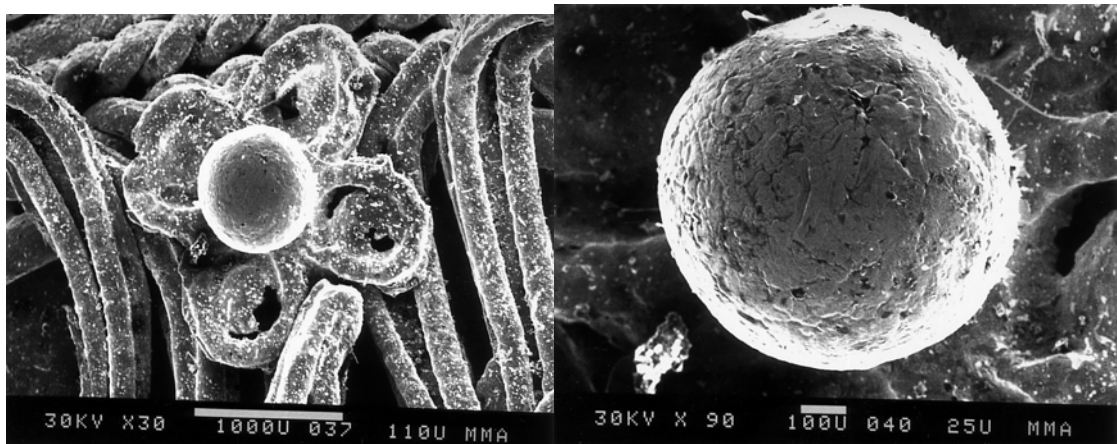


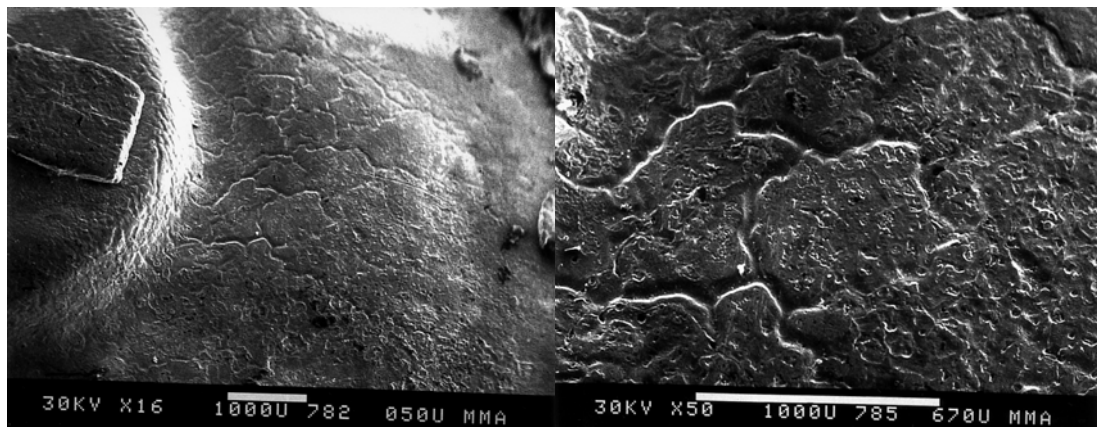
Figure 3.27. Reverse detail. Diffusion bonded joints characterised by increased contact points. 1-Broadened contact point of suspension hook. 2-Overlapped joints of jump ring. 3-Overlapped join of corrugation strip. 4-Attachment of corrugation strip over the broad curve of the disc/pan.



Figure 3.28. Centre rosette cap partly melted. MMA 06.1217.11 SEM by Mark Wypyski photo courtesy of the Metropolitan Museum of Art in NY.



Figures 3.29,30. Centre granule in a pristine condition joined to burnt out substrate. MMA 06.1217.11 SEM by Mark Wypyski photo courtesy of the Metropolitan Museum of Art in NY.



Figures 3.31,32. Close up of reverse of ear ornament. Growth of recrystallised grains. MMA 06.1217.11 SEM by Mark Wypyski photo courtesy of the Metropolitan Museum of Art in NY.



Figure 3.3. Misplaced chisel mark in the extraction of the substrate. MMA 06.1217.11 SEM by Mark Wypyski photo courtesy of the Metropolitan Museum of Art in NY.

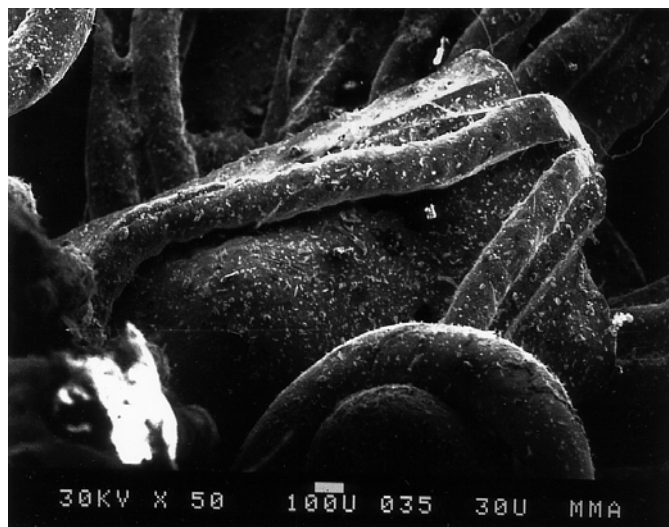
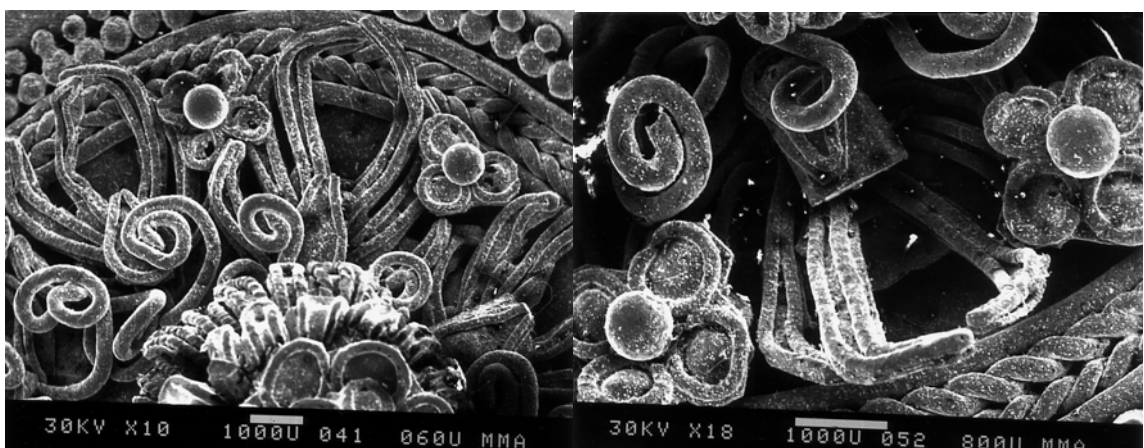


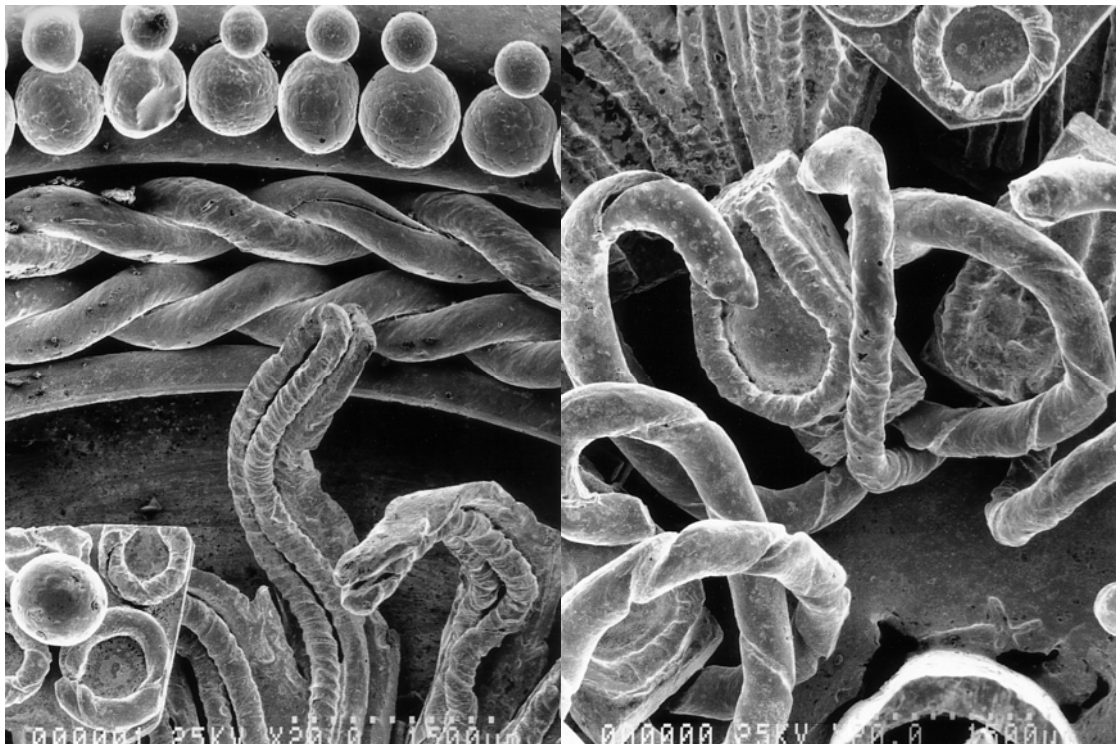
Figure 3.4. Faceted edge of chisel cut of thick substrate. MMA 06.1217.11 SEM by Mark Wypyski photo courtesy of the Metropolitan Museum of Art in NY.



Figures 3.35,36. MMA 06.1217.11 SEM by Mark Wypyski photo courtesy of the Metropolitan Museum of Art in NY.



Figure 3.37. Test piece by Robert Baines Detail, Disc MMA 06.1217.11. Photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.



Figures 3.38,39. Test piece by Robert Baines Detail, Disc MMA 06.1217.11 SEM photo by Safa Shawan courtesy of RMIT.



Figure 3.40. Test piece by Robert Baines Detail, Disc MMA 06.1217.11 SEM photo by Safa Shawan courtesy of RMIT.

3.4. A Group of Egyptian Boxes. Necklace Beads (?)

The eight pendant beads are box forms derived from Egyptian seals that became amuletic beads of faience and steatite.¹⁰⁹ They are vertical hanging also but not having as much volume as the amuletic beads (Figs.3.40,41).

Shaped like square boxes, human heads in relief occur on the front and obverse surrounded by rows of inverted triangular patterned granulation. The sides of the boxes are of rows of alternating domes and granulation with openings for stringing. The boxes have been filled with plaster to stabilize the piece for wearing. There is an absence of repoussed heads on the beads MMA 23.2.46-49.¹¹⁰ This factor combined with the material quality and manufacture characteristics categorises the eight beads into two groups. Further reference will be Group 1, MMA. 23.2.42-45 and Group 2, MMA. 23.2.46-49.¹¹¹

Construction

In Group 1 each of the four walls of the boxes is one strip and terminating with an overlapped end. There is no consistent order in the group of where this seam occurs (Fig.3.42).

Group 1-The perimeter frame is made from two elbow right angle pieces placed together with mitred joins. Some have a gap, eg. MMA. 23.2.42-obverse, appears that it is possibly a three sided strip joined to one single side (Fig. 3.43). MMA. 23.2.43-obverse, MMA. 23.2.44-obverse and reverse, the gap is filled with granules.

There is no overlapped sheet evident in Group 2 and there appears to be one sheet making up the walls and terminating at a corner.

The border frame has slipped chisel marks on the strip (Fig.3.48) and is frequently cracked at corners.

Group 2-The frame is made from two elbows meeting to make a square join, unlike the mitred corners of the other group. MMA. 23.2.49- reverse the strip has three corner bends.

Centre Portrait Niche

Group 1 the recessed niche on the obverse and reverse has been burnished in from the gold sheet.

Group1 frame terminates consistently to the left except for the reverse of MMA. 23.2.42 and the reverse of MMA. 23.2.42. (Fig.3.43)

Group 2 the recessed niche on the obverse and reverse is constructed from fabricated sheet and heat joining.

Group 2 frame appears to terminate inconsistently at either the right or the left.

The strip bent on a sharp corner has broken at that corner indicating from the time of forging there was no prior annealing to make the niche frame.

The portrait niches are positioned consistently in the same direction as the string hole. The exception to this is the reverse of MMA. 23.2.47.

Portrait

Repoussed and chased portrait heads with necks occur on the obverse and reverse of Group 1. The hollow constructed forms have been crushed and though severely damaged due to wear the figures appear not to be Pharaonic in style, but possibly Greek. Chased lines indicate hair parted in the middle suggesting the heads are female. Distortion damage inhibits a clear reading of characteristics though there appears to be Venus rings on the neck (Figs.3.45, 46).¹¹²

¹⁰⁹ Gold box beads. New York, The Metropolitan Museum of Art, 1923, 2.42-49. Provenance unknown.

¹¹⁰ There is no visible evidence of joining indicating repoussed inserts ever existed.

¹¹¹ MMA Bull.(1928) 250, fig.3

¹¹² See S. Walker, (2000) Figs. 56,60,68

Granulation

Granulation on the obverse/reverse is of parallel rows in continuous triangular sequence. That is, there are two granules placed against the three and then one against the two. An additional one is placed to fill a space on the obverse of MMA. 23.2.46. The rows of granules have been applied commencing at the bottom and working towards the top. There is consistently a starting from the left and moving to the right to compile each row. Sometimes gaps occur and 'filling' is carried out. Therefore gaps occur at the completion at the end of the row on the right hand side. There are 21 rows of triangles from the left hand side.

Granules are of a uniform size which is necessary to continue the sequence of equally sized triangles.

Billets resembling round wire occur amidst the triangle rows of granulation in two places. They are found on side one and the obverse of MMA. 23.2.48. This indicates the granules are formed from round wire stock.

A line of granules occur around the perimeter in MMA. 23.2.42-45 and only at the ends of MMA. 23.2.46-49.

MMA. 23.2.42, MMA. 23.2.45-Consistent single row around perimeter.

MMA. 23.2.43, MMA. 23.2.44-triangular border and single row at the ends.

MMA. 23.2.46, 47, 48, 49 triangular border and single row at the ends.

Wire :Niche frames

(Figs.3.47,48)

MMA. 23.2.44 slipped chisel cuts are evident.

1. At end of strips of niche frame (reverse side)

2. On outer frame (reverse side)

MMA. 23.2.45 strips of niche frame appears to be forged wire.

MMA. 23.2.46 left hand twisted obverse

MMA. 23.2.48 left hand twisted obverse

String hole

Group 1 beads have a creased wire ring around the string hole. The helical creasing on the wire is consistently right hand twisted (Fig.3.49). The ring is missing from MMA. 23.2.44 as a result of underfiring during the joining campaign.

Group 2 beads have a wire ring around the string hole and there is no evidence of creasing.

Domes on the sides¹¹³

There are four rows of (?) domes on the sides of the boxes in Group 1.

There are three rows of domes on the sides of the boxes in Group 2 (Fig.3.53).

Domed up from square cut sheet and trimmed with a chisel reveal the original blank was not circular. There is an appearance that the domes have been flattened due to wear. There are signs of wear on the pieces with granules having worn flat faces and corners and edges are worn down. More than half of some granules are worn away.

There is also evidence that the flattening occurred prior to their positioning on the surface of the sheet. This would achieve a flattening out of the base to make a broad contact point with the substrate. This maximising of the base is extreme on side 4, of MMA. 23.2.46 (Figs.3.50-52).

There is an absent dome on side 4, of MMA. 23.2.49 that appears to have fallen from the piece following firing. There was a single fused contact point with the substrate and proving to be an inadequate contact join.

Group 1, domes have been squashed on side 3, of MMA. 23.2.45 and also side 3 of MMA. 23.2.44 in order to provide space for the ring around the string hole. On side 1, of MMA. 23.2.44 some domes

¹¹³ In the technical notes not published in this exegesis the sides are numbered from the corner that has been inscribed with the accession number.

overlap to fit in the space around the wire ring of the string hole. A folded dome occurs (Fig. 3.50). It appears to be as a consequence of lifting on one side a decision to bend it over onto the side that has remained fused to the base.

Alloy

Quantitative analysis of worn surfaces on two beads from each of the two Groups was carried out.

Platinoid inclusions

The box beads were examined through the microscope and visible platinoid inclusions were plotted on drawings for further observation in the SEM (Fig.3.54).¹¹⁴

Those that appeared to be platinoid inclusions in Group 1 were analysed as collected and entrapped dirt which renders Group 1 absent of any platinoid inclusions. Clearly there is a spread of inclusions throughout group 2. Inclusions were identified on the frame strips, wire rings at the string hole and on the domes (Fig.3.53). There is also a scattering of inclusions identified in the granules on the obverse and reverse of all the beads in this group (Fig.3.53). A selection of possible platinoid inclusions were analysed on MMA. 23.2.46,49 and these were all consistently found to be osmium iridium ruthenium group.¹¹⁵

Repairs

Group 1, In the side frames the strip has an insert due to under calculating the correct length of the strip, side 3 of MMA. 23.2.42, side 1 of MMA. 23.2.43, side 1 of MMA. 23.2.45. At the obverse of MMA. 23.2.44 of the niche frame is a corner insert (Figs.3.55,56). On the frame at the same side, the goldsmith has filled a gap with granules.

Rectangular patches have been fused to the portrait head and neck on the reverse of MMA. 23.2.43.

Burnout on the Substrate

There are generally two types of burnout. Over firing is the main cause of burnout particularly with an excess of copper salt. Burnout that appears as a neat hole is the outcome of a concentration of a small lump of copper salt has been applied to the surface and evidence that it was not a completely dissolved solution.

Group 1. There is burnout on the substrate at the overlapped seam in MMA. 23.2.42, 44, and 45. There is no burnt out condition on the overlapped seam of MMA. 23.2.43 and absent granules indicate there has been an underfiring, which saves the surface of the gold sheet of the substrate from burn out but does not assure adequate joining.

MMA. 23.2.42, 43, 44, 45. There is severe burnout damage on at least one of the portrait sides

¹¹⁵ Osmiridium inclusions have been observed in a number of ancient gold jewellery. J. Ogden, (1977) 57, N. Meeks and M.S.Tite, (1980) 267-275. N. Meeks and M. Tite carried out analyses of platinum group element inclusions in a range of jewellery and coins from Egyptian, Eastern Mediterranean and the Near East spanning the period from 3200 B.C. to A.D. 300. Using the energy-dispersive X-ray fluorescent spectrometer attached to the Scanning Electron Microscope it was found that PGE inclusions occur fairly frequently in jewellery and that gold from placer deposits was extensively used in antiquity. Some 310 inclusions were found. All the PGE inclusions analysed were of the Iridium-Osmium-Ruthenium alloy type. No platiniridium inclusions were found. They found that "the Iridium-Osmium-Ruthenium alloy inclusion found even within a single object frequently exhibit a wide range of compositions. Although this probably reflects the compositional variations of the PGE inclusions from a single placer deposit rather than implying the use of gold from several placer deposits, it does not mean that the compositions of this type of inclusion do not necessarily provide a basis for characterising the gold source." J. Ogden, (1977) 53-72, Some Egyptian pieces could be an exception to this. Jewellery of the VIth Dynasty to 1st Intermediate period (25-40%) as compared to works of the XIIth Dynasty onwards (<25%). This could reflect the change from the exploitation of gold sources in the Eastern Desert to those in the Nile Region north of the 18th parallel. See also J. Ogden, (1976) 142-143. N. Meeks and M. Tite (1980) 273 observed in some Sargonid jewellery from Brak inclusions containing broadly similar concentrations of at least one component of the alloy with some other objects.

Laboratory Reconstruction

Testing theoretical methodologies and challenging assumptions of manufacture can be done by laboratory reconstruction using known technology of the same era of the artefact. There is in this testing the methodology a developing experience of the subject and further refinement of the methodology.

Developing a familiarity with the piece by drawing gives an understanding of the object. Constructing the object using same materials and technology brings a knowing, a learning of contexts of working with the intrusion of repairs along the way.

The reproduction of an Egyptian bead is based on the example of MMA. 23.2.42 (Figs.3.61,62). The sides were made from a single strip with an overlapped join and the niche frame was fixed to the obverse and reverse surfaces prior to attachment to the four sided frame (Figs.3.63,64).

Granulation

Using shears to cut strips is inadequate for making the required size granules. Making the granules from a 0.3mm round wire found the granules still not small enough to replicate the granulation in the museum bead.

A given space – 21 rows, requires specific sized granules of uniform size. Using a smaller size granule has to be followed by a compensatory larger one.

The gum must not be too watery so that once dry the placing of later granules does not dissolve the previous positioned work.

There must be some sifting/grading system. The size and uniformity is so critical. Peeling the ribbon from the sheet having scored it with a chisel produced very fine ribbons for making the round wire for the making the granules.

No preliminary marking out for the placement of the granules was required on the substrate.

The gum tragacanth which is not completely soluble (unlike gum Arabic) formed globules of tragacanth, which displaced the granules during their placement and positioning on the gold substrate.

Substrate

The substrate of the laboratory sample was too heavy at 0.17 mm. Thinner sheet at 0.07 mm was more suitable.

Chisel Cutting

Chisel cutting, scoring and peeling, uniform widths.

Making the frames (strips) was achieved by rolling the chisel along and then relocating it and continuing to cut through along the way. There is variation in the width and pressure which has to be exerted to cut while simultaneously moving through the material. There is no visual evidence of this in the Museum pieces. Alternatively by using the chisel as a scoring tool against a straight edge long strips of equal width can be achieved in abundance within a relatively short time. There is too much drag on the chisel to cut and direct the tool through the gold sheet. By using the chisel to score the line rather than cut the line the scribing needs to break through the sheet at the start. This allows a starting point for the peeling away from the scored line of the sheet. Providing the scored lines are parallel there is a strip of equal width achieved.

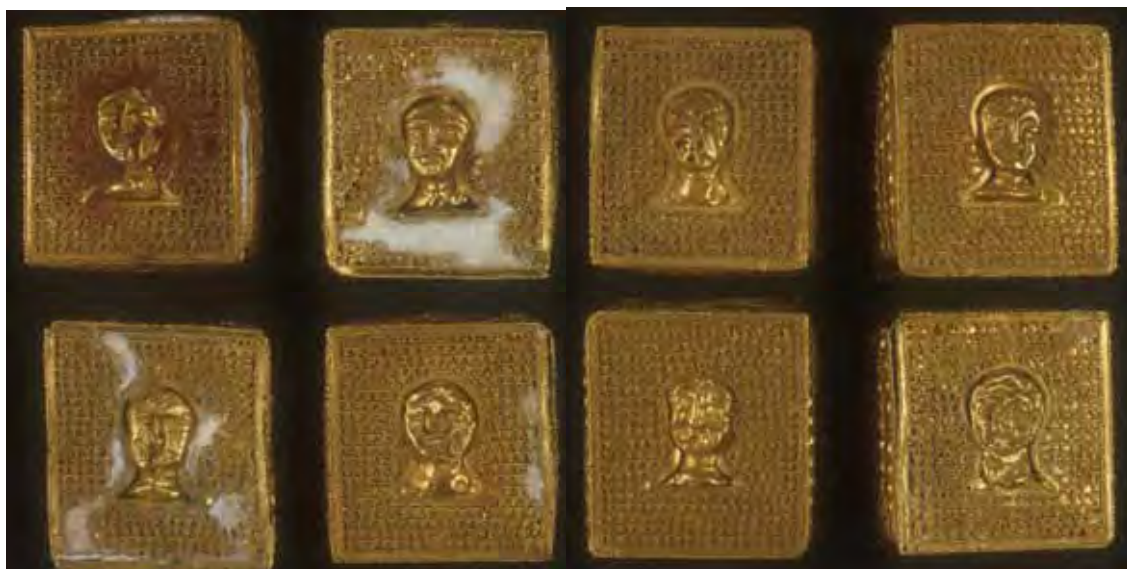
Domes

The chisel cuts are too few making a too angular base. The sheet is also too thick. The sheet was taken from that used to make the outer frame and not from the same sheet as the substrate. The frame strips are thicker than the substrate to increase the mass at the edges.

Conclusion

There is no indication that the portrait heads existed in Group 2. Why would one make the niche on the obverse and obverse of the beads if they are not to accommodate the portrait figures as in Group 1 beads? The absence of the overlapped seam in the Group 2 beads and yet overlapped joins are common modes of heat joining with copper salt diffusion followed by fusion in Bronze Age goldworks.

There is no burnout on substrate of Group 2. Both these factors indicate the heat joining process is accomplished gold working.



Figures 3.40,41. Gold box beads. New York, The Metropolitan Museum of Art, 1923, 2.42-49. Provenance unknown. Group 1, MMA. 23.2.42-45 (upper) and Group 2, MMA. 23.2.46-49 (lower). Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

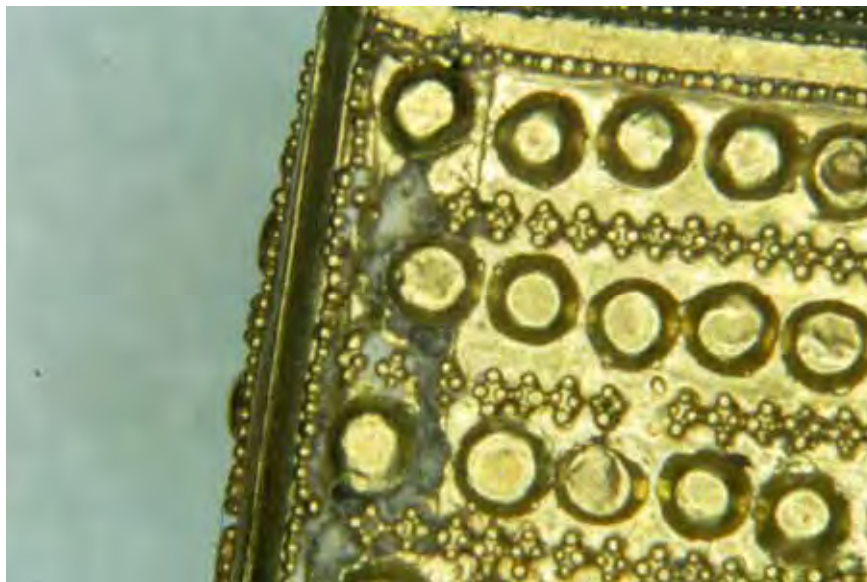


Figure 3.42. Detail Group 1. Overlapped seam over fired. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.



Figures 3.43,44. Detail. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.



Figures 3.45,46. Detail. Repoussé and chased portrait heads with necks occur on the obverse and reverse of Group 1. They are absent in Group 2. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.



Figure 3.47. Detail. Evidence of niche frame is forged from round wire. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

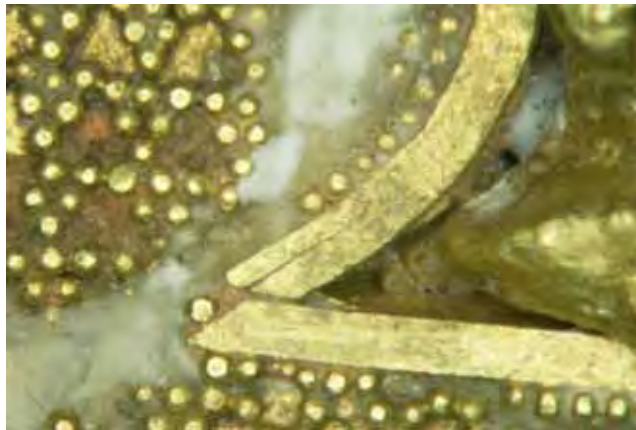


Figure 3.48. Detail. Signs of slipped chisel cut. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

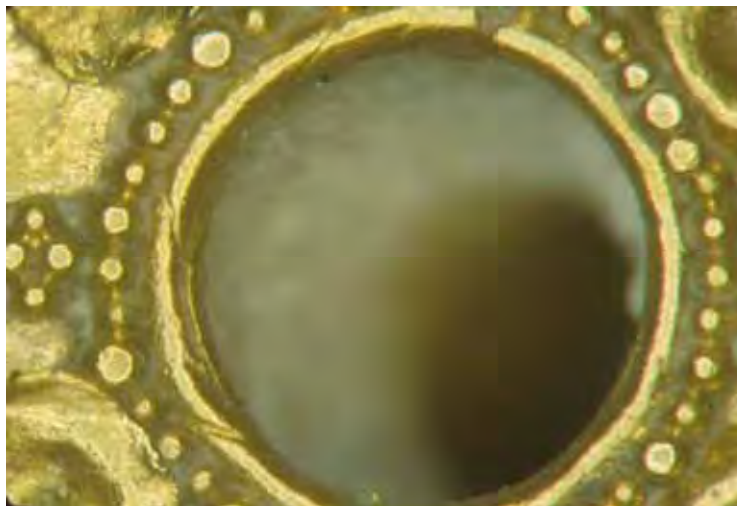


Figure 3.49. Detail. Right hand twisted wire ring at the stringhole. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

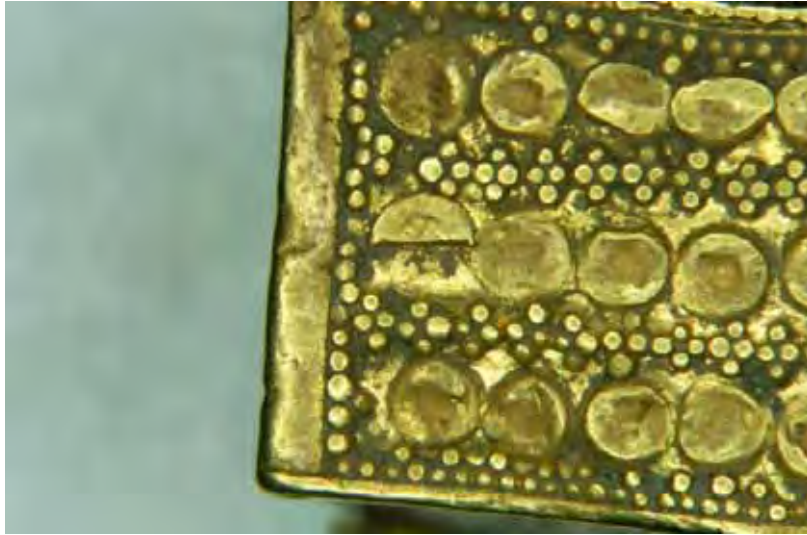
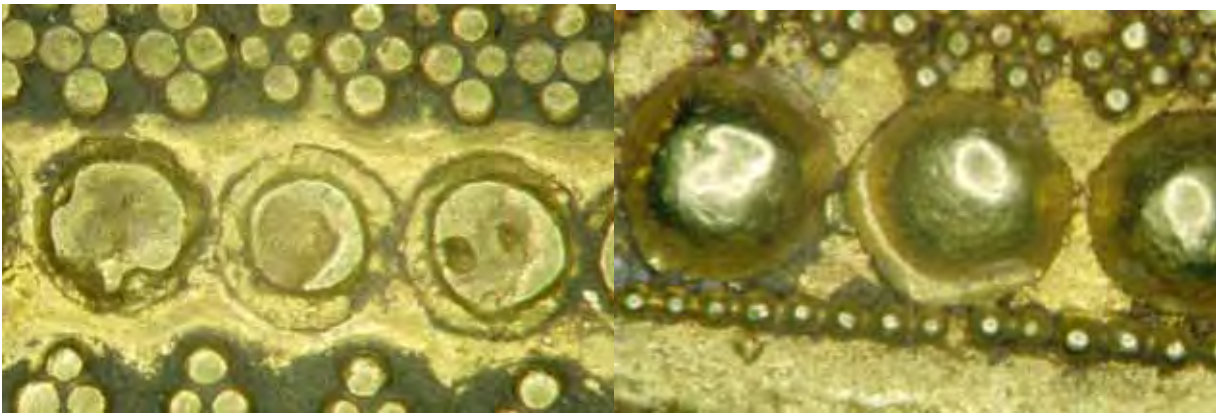


Figure 3.50. Detail. There is an appearance that the domes have been flattened due to wear. There are signs of wear on the pieces with granules having worn flat faces and corners and edges are worn down. More than half of some granules are worn away. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.



Figures 3.51,52. Detail. Appearance that the domes have been flattened due to wear. There is also evidence that the flattening occurred prior to their positioning on the surface of the sheet. This would achieve a flattening out of the base to make a broad contact point with the substrate. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.

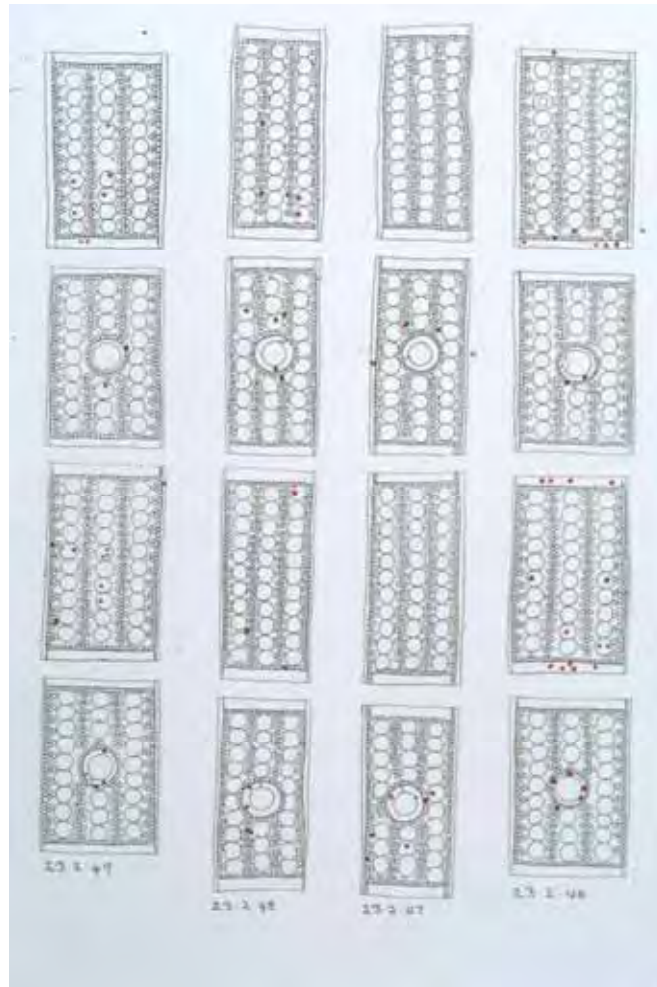


Figure 3.53. Schematic drawing of walls of boxes and also plotting positions of suspected platinoid inclusions for SEM examination. Drawing by Robert Baines.

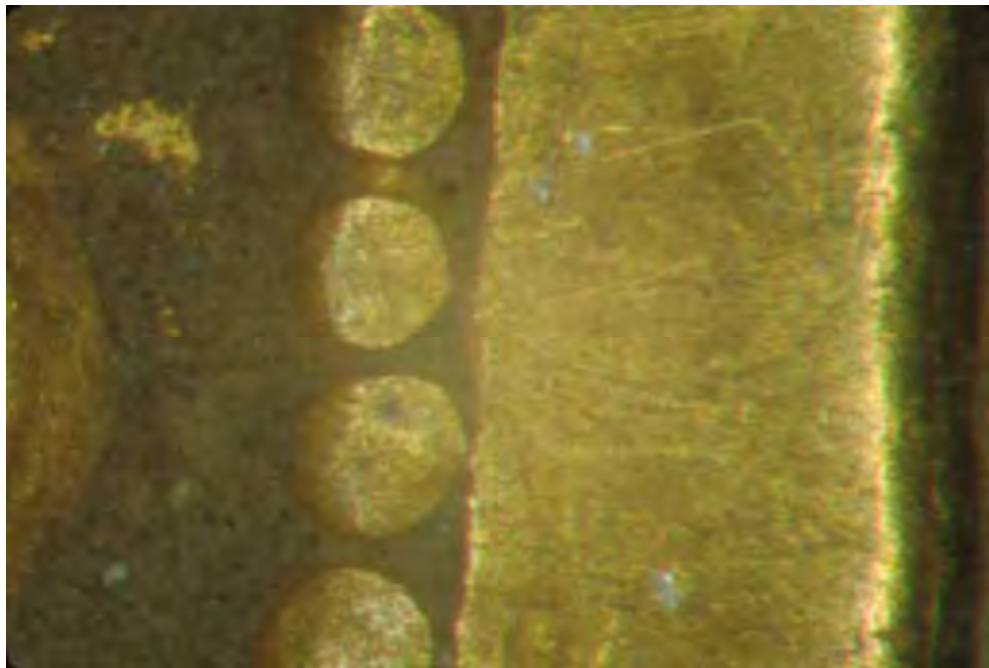
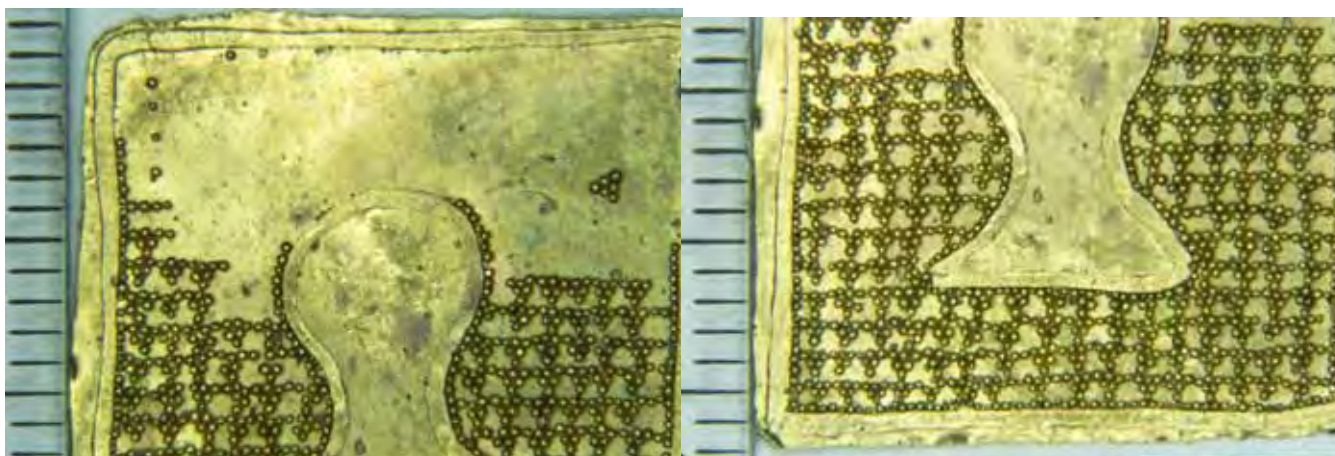


Figure 3.54. Detail. Of platinoid inclusions. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.



Figures 3.55,56. Detail. Repair work showing insert from miscalculated length of the strip, Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.



Figures 3.57,58. Laboratory reproduction of an Egyptian bead is based on the example of MMA.23.2.42. Detail. Millimetre calibrations at side. Stereo microscope photo by Robert Baines courtesy of the Metropolitan Museum of Art in NY.



Figures 3.59,60. Laboratory reproduction of an Egyptian bead is based on the example of MMA.23.2.42 at The Sherman Fairchild Center for Objects Conservation at the Metropolitan Museum of Art in NY.

4. Development of Original Work

4.1. A Personal Vantage Point

Jewellery offers a view into history, of cultural descriptions of stylistic, chemical and methodological correctness. The research data identified from the jewellery corpus becomes the basis for authentication for curators/conservators/jewellery historians. For diagnostic purposes there is the expectation of an archaeological correctness within the fabric and manufacture of the jewellery object.

From the vantage point of a contemporary goldsmith, this has provided me with an arena for artistic interpretation-for 'play'. Historical jewellery becomes contemporary jewellery forms and the 'play' functions as a stumbling block and an upheaval within orthodox classification of authenticity. There is in this disturbance an intervention with contemporary ephemeral materials into the jewellery artefact in which I manufacture a semblance of an identified "correctness".

4.2. Jewellery and its Preservation

Jewellery remains in a better state of preservation when hidden or concealed- not exposed. The jewellery object once surfaced, discovered, excavated or plundered or even worn becomes available for reworking. It is not confined to its authentic past and becomes part of our time for reworking. Knowledge and applications of technology become the vehicle for scrutinizing these objects.

We live in an era where the ancient and the recent, the authentic and the bogus, have begun to mingle and interbreed in the corridors of hyperspace. Television stages Xena the Warrior Princess encountering the young Buddha in the entourage of King Arthur.¹¹⁶

'The fake is recognised as "historical" and is thus garbed in authenticity'.¹¹⁷ A shroud of 'history' can encompass the object to the satisfaction of the naive connoisseur who wants to believe, wants to believe, wants to believe, wants to believe..... Jewellery as document is available for interpretation-for 'play'. There is potential to return to an imaginary history where fictional detail has been confused with historic fact and this can be both intentional and unintentional.

Jewellery of the past therefore exists in the present and the jewellery artefact becomes available for evaluation and for 'play'. In the analysing and categorizing of type, jewellery as vehicle conveying the past can become a mixture of one's own inventions and cultural inheritance.

From the vantage point of a goldsmith, I am considering how formulated heritage is available for reference, questioning and modification. The option to copy, to replicate, or to modify the historic document jewellery is a possibility and new input can verify authenticity or engender falsehood through the artistic reinterpretation.

The accuracy of the copy can engender perceptions of the authentic. "In semiotics, a sign that resembles what it represents is called an 'icon', and the special feature of an icon is that it also signifies itself."¹¹⁸

Appropriate materials and processes in the context of a specific style depiction are paramount to manufacturing an accurate recreation. In particular examples of ancient gold jewellery, the decorative configurations that accumulatively mark their style as has been argued earlier, can also be regarded as a consequence of technology resulting in a symmetry of technical factors and a consequent visual genre. The placement of iconography and relationship of parts to each other is a testimony to the joining technology carried out by the goldsmith.

The limited authenticated historical jewellery corpus available for reference means a restricted body of primary research material is available for consideration. A restrictive primary reference need not be a

¹¹⁶ S. Maloney (2000) "Robin Hood tries to solve the mystery of JFK's assassination with the help of the Man of Steel"

¹¹⁷ U. Eco, (1995) 30

¹¹⁸ C. Morris, (1938) 134

confinement to creative embellishment, “for it shares, through resemblance, some traits with whatever it signifies. Art is therefore a sign that points both outside itself and toward itself.”¹¹⁹

Making jewellery expands the cultural content, and ‘to make it new’ does not mean to erase the past, but to transport the work of the past into the present. The jewellery object generates symmetry with historical objects through an asymmetrical approach.

4.3. A Formulated History

At the start of Peter Carey’s book, *True History of the Kelly Gang*, William Faulkner quotes “The past is not dead. The past is not even past.” Falsification has a certain justification in that you will no longer feel any need for the original writes Umberto Eco.¹²⁰ Enhancement makes it “more real”. The Palace of Living Arts in Beuna Park, Los Angeles has the philosophy, “We are giving you the reproduction so you will no longer feel any need for the original.”¹²¹

The sanitising of Enid Blyton’s books shows another altering of the historical document to the point of being morally absurd. The replacement of the golliwog, one of Blyton’s favorite characters, with a teddy bear in a republished edition is an exercise in political correctness. Gilbert the Golliwog has disappeared, while Noddy no longer feels ‘queer’ or climbs into bed with his pal Big Ears.

Further altering of the literary work and the originality of the writer’s creation is the changing of Dame Slap to Dame Snap. Though Dame Slap is not an abuser in the text current thinking believes it is possible to read the name as a reference to child abuse.

In *Black Beauty*, Bessie, out of fear that her name had connotations of black slavery, now has the name Bess. Fannie and Dick have become Frannie and Rick. The word ‘girls’ have been deleted from Mother’s instruction, “You girls can put up a little bed for him.” Clearly this is an over reaction in the endeavour to be politically correct but the altering of written text challenges the preserve of the historical document.

Given or Taken-Appropriating the Authentic

“Authenticity is an interesting concept. It’s a kind of virtue isn’t it? Authentic – it’s also a judgement we use on work that comes from tribal communities. ‘This is authentic Maori/Aboriginal work.’ Who or what determines that authenticity? If it is the user that determines authenticity, then I believe the jewellery we made was authentic – an expression of a small section of urban, white tribes people, but no less authentic for that reason.”¹²²

D. Skinner responding to an *Object* article by Douglas Lloyd-Jenkins¹²³ ‘...it’s not a crime, not on the statute books of late 20th Century art practice that he uses. And in the case of New Zealand, a country attempting to create a bi-cultural society, I would maintain a society that is bi-cultural must be culturally appropriative.’¹²⁴

Dr. John Macarthur describes the National Museum of Art in Canberra as “a coded but dangerously frank discourse on the national (Australian) identity”.¹²⁵ Predicting an architect’s reaction to the use of controversial architectural references, “Elements of buildings by Le Corbusier, Walter Burley Griffin, Daniel Liebeskind, Eero Saarinen, James Stirling, and Jørn Utson are more or less visible in the design.”¹²⁶

Ashton Raggatt McDougall, the architects of the Museum are noted for the appropriating of architectural references and a criticism has been that this mocks the client and lay visitor. The building is coded and

¹¹⁹ W. Steiner, (1995) 76

¹²⁰ *Ibid* 19

¹²¹ *Ibid* 19

¹²² D. Skinner, (2004) 74,

¹²³ Douglas Lloyd-Jenkins described Freeman’s Jewellery from the 1980s as ‘culturally appropriative in the way it plundered the Pacific for materials and forms’. A Wilkinson, (1997) 14

¹²⁴ *Ibid* 13,75

¹²⁵ J. Macarthur, (2001) 52

¹²⁶ *Ibid*, 56 Macarthur regards the Main Hall as the most dramatic and memorable space and can be “read as a built commentary on the Sydney Opera House”. Forming an end to one wing of the Institute of Aboriginal and Torres Strait Islander Studies is a full scale replica of the Villa Savoye except that it is coloured black.

“an architectural education is required to make the identifications and get the joke.”¹²⁷ Macarthur’s retort to the criticism is “If anyone is being mocked by the architectural references it is architects who think that the meaning of buildings can be self-evident and exist without interpretation.”¹²⁸

4.4. REDEVENT-The Intervention of Red

THE INTERVENTION OF RED (into historical and cultural locations) is a jewellery “account”. Jewellery, the document in question, offers a view into cultural descriptions of history. These descriptions are the stylistic configuration of iconography. Each jewellery piece has its own historical/cultural location. They have a visual genre with a chemical and methodological correctness. The stylistic and material data of each jewellery work identified becomes the basis for authentication by curators/conservators/jewellery historians. In the diagnostic purpose there is the expectation of an archaeological correctness within the fabric and manufacture.

This paradigm is upset in THE INTERVENTION OF RED by the intrusion-inclusion-interruption of the colour red, and furthermore by the possibility of its substance. The inclusion becomes an impediment and an upheaval within the orthodoxy of the classifier. A perceived genre or style is challenged. The substance of the red has no specificity to the time location. The material condition of red is not located within any historical period. Substances of glass, plastic, foil, paint and found objects become a confrontation and a vehicle for colour, offering new vantages for signage for what preexists.

Rather than being drawn to the preciousness of some gemset jewel but rather to the intrusion into something that was previously correct the observer is called to a new preciousness- the richness of plastic, glass - Coca-cola. Rather than questions of clarity, faceting and cut, one asks “Is that Coca-Cola?” (The Real Thing?)

This is a confrontation of what is initially perceived as alien which then leads to an accommodation bringing a new configuration. A rearrangement with changed structures occurs in order to comply with what was once an impediment. Surviving history becomes a vehicle for the contemporary planting of a new ideal from another time, and this places the past within the reach of a vicarious now.

A pseudo history this is not and neither is it the formulating of a new myth, but it does ask the question “what if”? There is a new instruction with “what if”. The invasive red changes the form of the object as it contorts in order to house the red. With the implant comes exaggeration.

The history remains, but played with. Making a new jewellery is expansive, and ‘to make it new’ does not mean to erase the past, but to transport the work of the present back into the past.

This work was first shown at Galerie Biró in Munch in 1997.

The Vehicle of the Car Bracelet

The bracelet as a jewellery type by its scale facilitates the making of a large piece. I have been able to examine large very substantial bracelets in major public collections during my research activities. I see such forms as potentially vehicle to build a large virtuoso piece with a substantial presence stylistically linking a contemporary jewellery piece with a historical or cultural location. The first large bracelet Bracelet with Fire Car, circa.? (Intervention of Red), 2001 was an interpretation of a Chinese bracelet circa.1910 and was widely published internationally. The central car chosen was a 1953 Buick ‘Fire Chief’.

¹²⁷ *Ibid* 56

¹²⁸ *Ibid* 56

4.4.1 The Intervention of Red. FERLINI'S SECRET

The enclosed pin from the “Micromegas”¹²⁹ exhibition is one that Ferlini ‘missed’ or possibly secreted away at the excavation site at Meroe.¹³⁰ Stylistically the pin (Fig.4.1) is very similar to the tops of the “shield rings”(Figs.4.2,3) in the Munich Staatliche Sammlung Ägyptischer Kunst.¹³¹ The rings are the part of the personal jewellery of Queen Amanishakheto and the work of goldsmiths of the Meroitic period after 300B.C. and though they are Kushite, they are profoundly Egyptian. The jewellery appears just as free with its Greek influence as in Egypt at the same time. Maybe there were Greek goldsmiths working at Meroe?

The granulation rows with adjoining wire borders on the aegis of the pin match the Meroe shield-rings. The chiseled rhomboid plates between the rows are also very similar to the Meroe gold work.

It could be a lost piece from the jewellery treasure from the kingdom of Kush at Meroe in the upper Sudan!

The iconography though, of the pig with its pink plastic condition is curious though it does appear to be a happy pig resplendent with a fine gold wire necklace. It has been said that Egyptians banned swine herds from the temples for fear that their pigs carried leprosy. But schwein were happier in Germany as they were revered as a Mother Earth character feted for their fecundity. Maybe the pig's finely made necklace of ribbon twisted gold wire is signage of the adoration. Certainly in Munich the celebration of the pig has followed through into the beer halls and restaurants. I'm not so keen on the hackepeter and I can't stomach the pfaelzer saumagen or the schlachtplatte and beuscherl essentially doesn't miss an oink. Certainly my favourite in Munich (Münchner Spezialitäten vom Schwein) is the 1/2 hintere Schweinshaxe ausgelöst mit geribenem Kartoffelknödel und hausgemachtem warmen Kartoffelsalat (Figs.4.4,5).

The connection with Munich is intriguing!! The schwein confirms it!

A further curiosity about the piece is the fine wirework seemingly representing letters of the alphabet¹³². These are located on the chiseled rhomboid plates. The wire letters identified are A, L, E, S, S, I (Figs.4.6-8). There are also wire constructions resembling ancient \$ signs hanging as pendants.

Could this be the earliest ALESSI piece? Does the first ALESSI piece occur in the first millennium B.C.? The SEM imaging clearly identifies the manufacture as Bronze Age goldworking—granules, wire, sheet, joining are all correct.¹³³ The characterizing of the process of making is typical of Greek manufacture of the fourth and third century B.C.

Curiously, four additional 'seal rings' were bought from Ferlini's heirs in 1913 and are now in the Munich Staatliche Sammlung Ägyptischer Kunst.¹³⁴ The obvious question is did Ferlini's descendants withhold the pin and under what circumstances did it surface at the Munich Staatliche Sammlung Ägyptischer Kunst? Did Otto Kunzli make a visit to the family home and receive the jewellery at that point? We know that this is what he did in preparation to building 'The Wedding Ring.'¹³⁵

¹²⁹The annotation in the Micromegas catalogue (Galerie für Angewandte Kunst of the Bayerischer-Verein) has a typographical error and reads, "Ferlini's Secret from Merde."

¹³⁰Having retired in 1834 as a military doctor in the service of the Egyptian army of occupation he excavated the ruins of Meroe in Upper Nubia. Ferlini published an account of his work and a catalogue of his finds in Bologna in 1837 and in a French translation in Rome in 1838. He doubtless wrote it to call attention to the treasure in his possession. Ludwig I of Bavaria purchased a portion of the cache in 1840, adding ninety objects to royal antiquarian, now the Staatliche Sammlung Ägyptischer Kunst, Munich. The remaining portion was still in the hands of an agent in London in 1842.

¹³¹H. Schäfer (1910) 92-188

¹³²The wire is ribbon twisted with visible right hand helical creasing measuring .03mm. in diameter.

¹³³R. Lepsius was convinced of the importance of the pieces of jewellery and especially of their authenticity, which many had doubted. Scholars continued to express doubt for some time. Lepsius's own stay in Meroe finally proved how unfounded such doubts really were. Karl-Heinz Priese, (1993)

¹³⁴The remaining portion was still in the hands of an agent in London in 1842, and it was there that R. Lepsius got to know it as he was preparing for his now-famous expedition into the valley of the Nile commissioned by the Prussian government (1842-45). The second portion of the find was acquired for the Berlin Museums in late 1844. Four additional 'seal rings' were bought from Ferlini's heirs in 1913.

¹³⁵Otto Kunzli, 'The Wedding Ring', chain of gold wedding rings, 1985-86, Munich

The misspelling of its findspot further veils the surprising appearance of the Bronze Age pin in the Micromegas exhibition that is a contemporary jewellery collection, not a collection of antiquities. The possibility of other pieces existing should be considered and in fact, I suspect others will surface within the near future.



Figure 4.1. After 'Micromegas', catalogue of exhibition by Galerie für angewandte Kunst of the Bayerischer Kunstgewerbe-Verein, Munich, 2001



Figures 4.2,3. After Karl-Heinz Priese, The Gold of Meroe, Mainz, 1992, pl.30,32



Figures 4.4,5. After Bayerischer Donisl am Marienplatz zu München

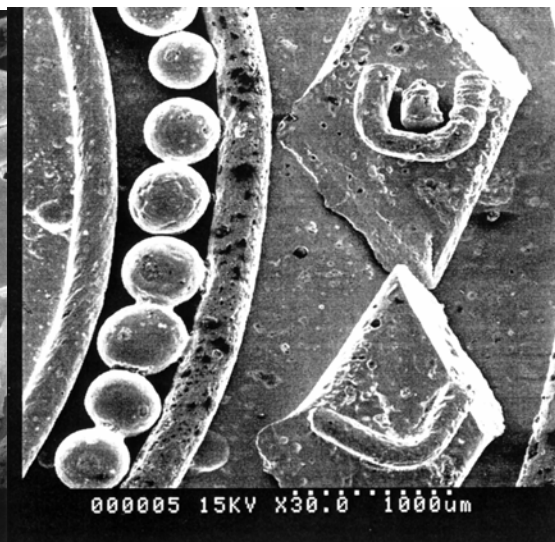
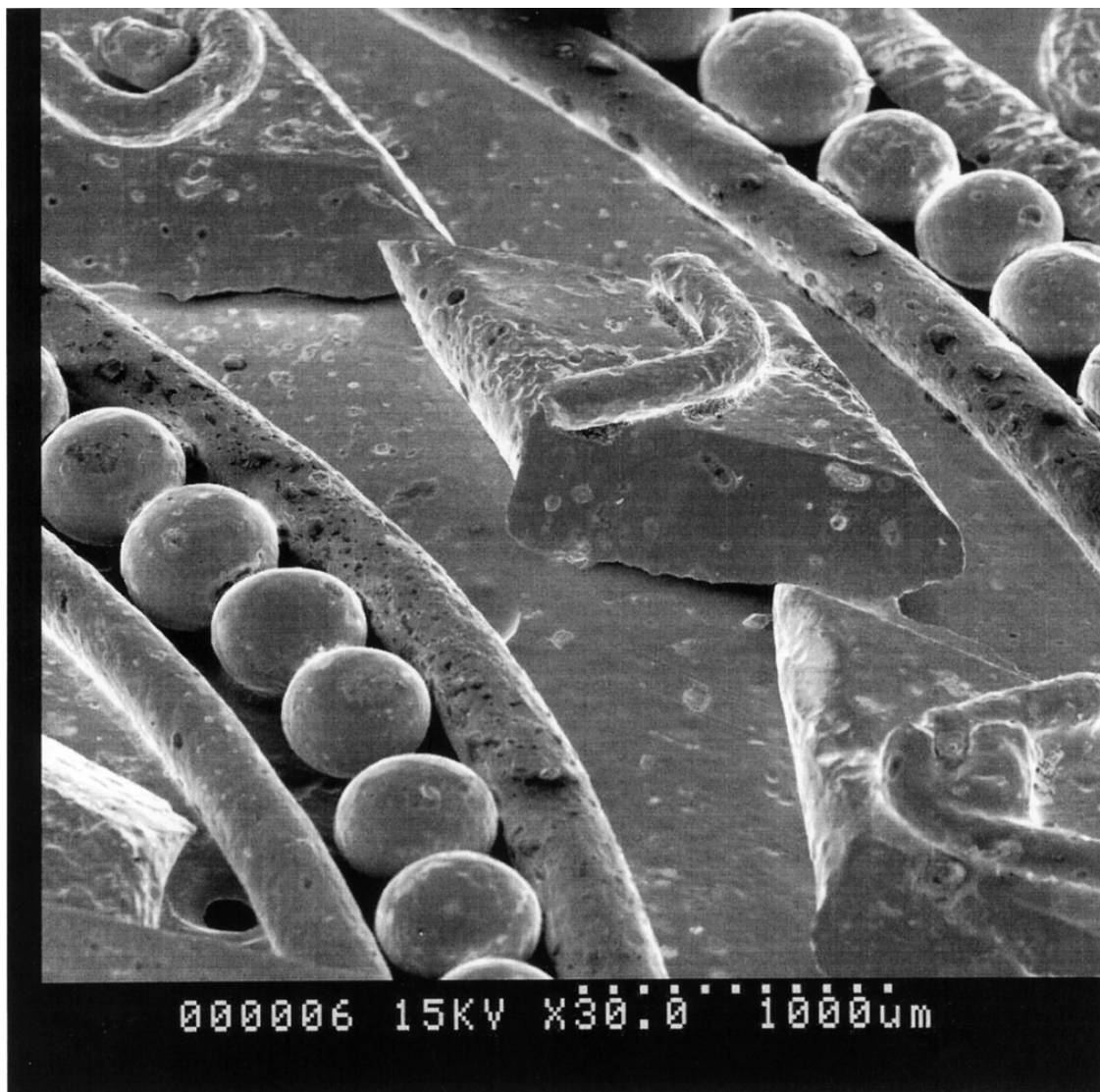


Figure 4.6-8. Detail SEM photography by Safa Shawan and Robert Baines courtesy of RMIT.

4.4.2 The Intervention of Red. THE SAAREMAA BROOCH

(A new jewellery group from the Baltic?)

In 1277 the last ancient Estonian county-Saaremaa surrendered to the German crusaders. The biggest part of the county was allied to the Saare-Lääne (Oesel-Wiek) bishopric, the center of which was Haapsalu and the Castle of Kuressaare was formed as a bishop's foothold, to rule over his territory on the little island of Saaremaa in the Baltic Sea.

Close by the medieval fortress, which is now a museum¹³⁶ is a bric a brac antique shop at Saaremaa. This is where I found the silver filigree brooch. It was made entirely of wire with a variety of skills applied producing intricate structures and predominantly from one wire type. It is a well-crafted piece of accurately made constructions and finely soldered joints though it was probably a production piece. A fertile pasture for my research I decided to purchase it for 400 Estonian Kroons.

The find spot, my excavation site was an antique shop at Saaremaa in the Baltic Sea in the northern hemisphere. Not located at a significant ancient site in some damp tomb isolated and buried in centuries of sediment and unnoticed by tomb plunderers. The brooch lay amidst other jewellery pieces from diverse eras and cultural locations. The 'tomb' was a flat glass encasement of once varnished timber frame and within, the jewellery relics lay on a black velvet bed. It doubled as a counter – a meeting point for visitors and the proprietor. It was the negotiation point, the place where transactions of exchange and the ritual of wrapping was carried out. Connected to each jewellery item by a cotton thread was a paper tag and on this label were faded pencilled numbers. This was not evidence of some museological inventory system or accession number. It was simply the price devoid of denomination but understood to be Estonian Kroons. On payment my new jewellery reference was wrapped in previously used old white tissue paper followed by layers of the local newspaper and then placed in a saved pink plastic shopping bag for its journey to Australia in the southern hemisphere.

The wire brooch once relocated in my studio in Melbourne was available for examination. Not having the facility of an electron microscope or even a stereomicroscope, measurements were recorded and the piece photographed and drawn. The reference document, now more fully understood awaited copying,

¹³⁶ The possessor of the castle of Kuressaare is the Saaremaa Museum founded in 1865. It exhibits a survey of the history of the island Saaremaa since prehistoric time up to 1940. It has many temporary exhibitions and concerts throughout the year.

replication and interpretation-the birthing of a new jewellery group from Saaremaa.



Figure 4.9. Five Brooches from Saaremaa (?) 2003, silver, gold, plastic, 54 x 36 x 8mm (each brooch)



Figure 4.10. A Brooch from Saaremaa? Bracelet from Saaremaa (?) 2004, gold, plastic car, metal car 75 x 47 x 62mm



Figure 4.11. A Brooch from Saaremaa? Bracelet from Saaremaa (?) 2002 silver, gold, metal car, plastic 105 x 75 x 68 mm

4.4.3 The Intervention of Red. BRACELET 'JAVA-LA-GRANDE'

There is a belief that in the early sixteenth century the Portuguese discovered and mapped Australia's eastern coastline. This perception is based on the existence of several French charts known as the Dieppe maps based on Portuguese information of the mid –sixteenth century showing a large continent, called 'Java-la-Grande' south of what we know as Indonesia.

Vasco da Gama in 1498 sailed the first Portuguese ships to India, from which he returned with quantities of spices, woods and "jewels". Did all the ships return or did some continue further east and to return later with even more "jewels"? Was one of these jewels brought back to Lisboa the Bracelet 'Java-la-Grande'?



Figure 4.12. Bracelet 'Java-la-Grande' India, Goa (Indo-Portuguese) (?) Circa. Second quarter of the 16th century, Silver-gilt, iron, plastic, wood, 99 x 74 x 89mm

The History

The 129th meridian running from the North Pole south is the continuation of the Line of Demarcation as arranged between Spain and Portugal in the Treaty of Tordesillas.¹³⁷ The line includes Timor on the Portuguese side, and skirts Australia's Bathurst and Melville Islands, leaving them with New Guinea on the Spanish side. Disputes over the demarcation continued and in 1522 the evidence is that the Mendonça and the Portuguese voyage of discovery down the eastern and southern coastline of Australia questioning the Line of Demarcation.

Some scholars consider that Gomes de Sequiera in 1525 sailed from Tarnate and found northern Australia and New Guinea. Others attribute the first European discovery of Australia to Cristovao de Mendonça, who sailed out of Malacca with three ships in 1522.

¹³⁷ McIntyre, K. (1977) 86 ".....the Portuguese were deterred by the Treaty of Tordesillas. The Treaty contained explicit provisions forbidding trespassing across the Line into the territory of the other nation, and to be caught in the act would put the Treaty itself in jeopardy. As the weaker military power of the two, Portugal relied on the sanctity of the Treaty, and upheld it in every way".

A “policy of secrecy” explains the silences together with the destruction of records in the Lisboa earthquake of 1755.¹³⁸

The Australian discovery by the Portuguese is quite possible and various findings and fragments support this.¹³⁹ There is evidence of a Portuguese caravel wrecked on Australia’s most rugged southern coastline a hundred miles west of Cape Otway in Victoria. A shipwreck locally named the Mahogany ship was a familiar sight to the few who visited the wild isolated coastline from 1836 to the 1880’s. By the 1880’s sand had fully covered the wreck and elderly local aborigines said that it had existed a long time before. There were reliable sightings by editors of the local paper and a retired harbour master. The wreck was reported to be 300 – 400 yards above the high water mark. The Mahogany Ship could have been one of three Portuguese ships secretly charting Australia in 1522 led by Cristovao de Mendonça and lost at that point where Rotz’s coast comes to an end.

If the Mahogany ship is Portuguese the first European landing could predate Captain Cook’s landing by 250 years.

The Bracelet

The bracelet¹⁴⁰ is material evidence of the Portuguese discovery of the eastern and south eastern coastline of Australia in the sixteenth century. The substantial bracelet appears to be gold but is silver-gilt and has a large top and strap connected by a three knuckle hinge and barrel catch. The centre top has a steel Portuguese key set into a plinth like form with two straps locking it in to its reliquary like housing.

Seated majestically and looking out from four corners at the base of the reliquary plinth are almost sphinx like red kangaroos. Their intriguing character appears mysterious. Are these red sphinxes like kangaroos the daughters of the Chimaera protecting the ‘lost Geelong Key’ and in their crouching position ready to devour every traveller who could not answer her riddle? Could this riddle be related to the missing now found-‘Geelong Key’, evidence of the Portuguese discovery of Australia’s eastern and southern coastline? Between the two red kangaroos on either side of the ‘key reliquary’ is wood from the Mahogany Ship. The weathered round shaped wood has a cruciform cut at the top and appears to have a pediment as its bezel. The standing the wood is given in its gem setting signifies it as a precious and rare material.

The construction of all the forms and surfaces is very fine goldsmithing techniques of filigree and granulation. The technical analysis identifies the wire and granulation work to be atypical of sixteenth century Indo-European goldsmithing. The filigree systems of construction and their various cartouche sections with borders of multi rows of beaded and twisted wires are very similar to other early sixteenth century filigree reliquaries and jewellery in the Nacional Museu de Arte Antiga in Lisboa, Portugal.

Other Examples in the Nacional Museu de Arte Antiga in Lisboa

There are two sixteenth century very substantial filigree artworks, Cofre-Relicario (early 16th century) Inv.no.114 and the Tabernacle (late 16th century) Inv. No.577 in the collection of Nacional Museu de Arte Antiga in Lisboa and the Bracelet ‘Java-la-Grande’ is very similar stylistically to both works.

¹³⁸ In 1508 King Manoel I decreed that “.....all Portuguese navigators engaged in voyages beyond the Cape of Good Hope must, on return to Lisbon, immediately hand over to the Maritime Archivist in the Casa da India all maps, charts, logbooks and journals, on pain of death”. *Ibid* 87

¹³⁹ *Ibid.* 84 When Captain Phillip Parker King was exploring in Melville Island in 1818 he came across some aborigines who apparently knew some words of Portuguese. See McIntyre (1977) Chapter 7 note 1.

¹⁴⁰ I was invited to make a special jewellery piece ‘to interact and establish a dialogue with the collection of the Museu Nacional de Arte Antiga in Lisboa’. The exhibition *Closer, Interventions from the MNAA Collections* was shown during X Symposium ARS ORNATA EUROPEANA in July –September 2005 in Lisboa Portugal.

In correspondence with the curator Luisa Panelva there was discussion about the location of the Bracelet in the exhibition at the Museu Nacional de Arte Antiga. The preferable placement of *Bracelet’ Java-la-Grande’* would be in the midst of Cofre-Relicario (early 16th century) Inv.no.114 and the Tabernacle (late

16th century) Inv. No.577. The bracelet will stand vertically without aid.



Figure 4.13. Tabernacle, India, Goa (Indo Portuguese), last quarter of 16th century, gold and enamel 14 x 19.5 x 9.6 cm, Convento da Graça, Lisboa, inv. No.577. Photo courtesy of MNAA, Lisboa.

Authenticating the Manufacture

Beaded wire in Bracelet 'Java-la-Grande' is swaged wire and this conforms to the descriptions of manufacture in the twelfth century AD treatise of Theophilus, *On Divers Arts*, *The Medieval Treatise on Painting, Glassmaking, and Metalwork*.

Two systems of making beaded wire are described in the chapters titled *Beading File*, Ch. 9, and *The Organarium* in Ch. 10.

SEM photography of Bracelet 'Java-la-Grande' shows powder solder flooded granulation typical of the sixteenth century era. The soldering of filigree is described in Cellini (1500-1571), *The Treatise of Benvenuto Cellini on Goldsmithing and Sculpture* includes *Soldering Silver* in Ch. 31 and *Applying the Solder to Gold* in Ch.52.

The Cellini treatise clearly describes the principles of filigree making with powder solder.¹⁴¹ The finest work he describes 'will make a man's mouth water'.¹⁴²

For many years methodologies of wire production have been considered in archaeological literature and the twelfth century treatise by Theophilus has been continually referred to as indicating the mode of manufacture even in the Classical era.¹⁴³

A basis for authenticating ancient goldworks and major criterion in determining mode of manufacture is the observing and counting of creases on wire. This is of wire prior to the sixth Century AD, with the absence of the drawplate.¹⁴⁴ Other than the draw plate, there were two systems for making wire in antiquity and the option to block twisting,¹⁴⁵ is the twisting of strip or ribbon cut from sheet, followed by cross rolling.¹⁴⁶

¹⁴¹ Cellini, B. (1867), C.R. Ashbee transl. (1898), reprinted, (1979). See Chapter 11. *On Filigree Work*.

¹⁴² *Ibid* p.10

¹⁴³ J. Hawthorne & C. Smith, (1979), Book 3.

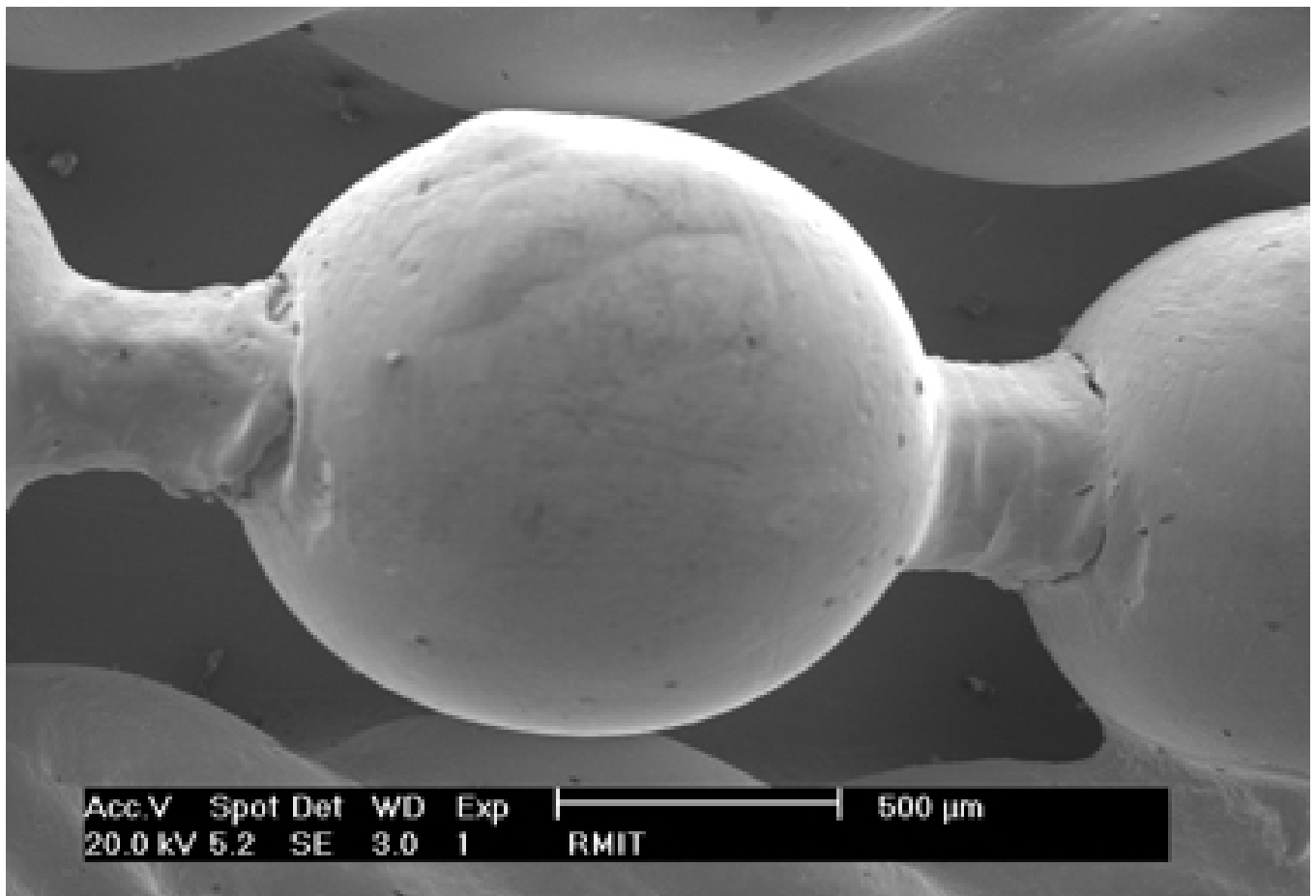
¹⁴⁴ For a comprehensive study on ancient and medieval wire manufacture see J. Ogden (1991) 95 – 105, N. Whitfield (1998) 82,83

¹⁴⁵ W. Oddy, (1977) 83

¹⁴⁶ See above p.39. "The gold was beaten into thin plates, cut and twisted into braid to be worked by a seamster with violet,

The twisting described will again identify helical creases and this technique known as strip twisting involves the twisting of a thin strip to form a regular tube and creating a single helix. Following a sequence of annealing, pulling and further gentle twisting, the helical creasing becomes tighter.¹⁴⁷ A cross rolling of the wire between two blocks in the same direction of the creasing to minimise metal fatigue will swage the wire into a smooth surface and so diminish the helix. Creasing of wire can be further removed during the fusion heat joining process with molten surfaces flooding fine surface details.

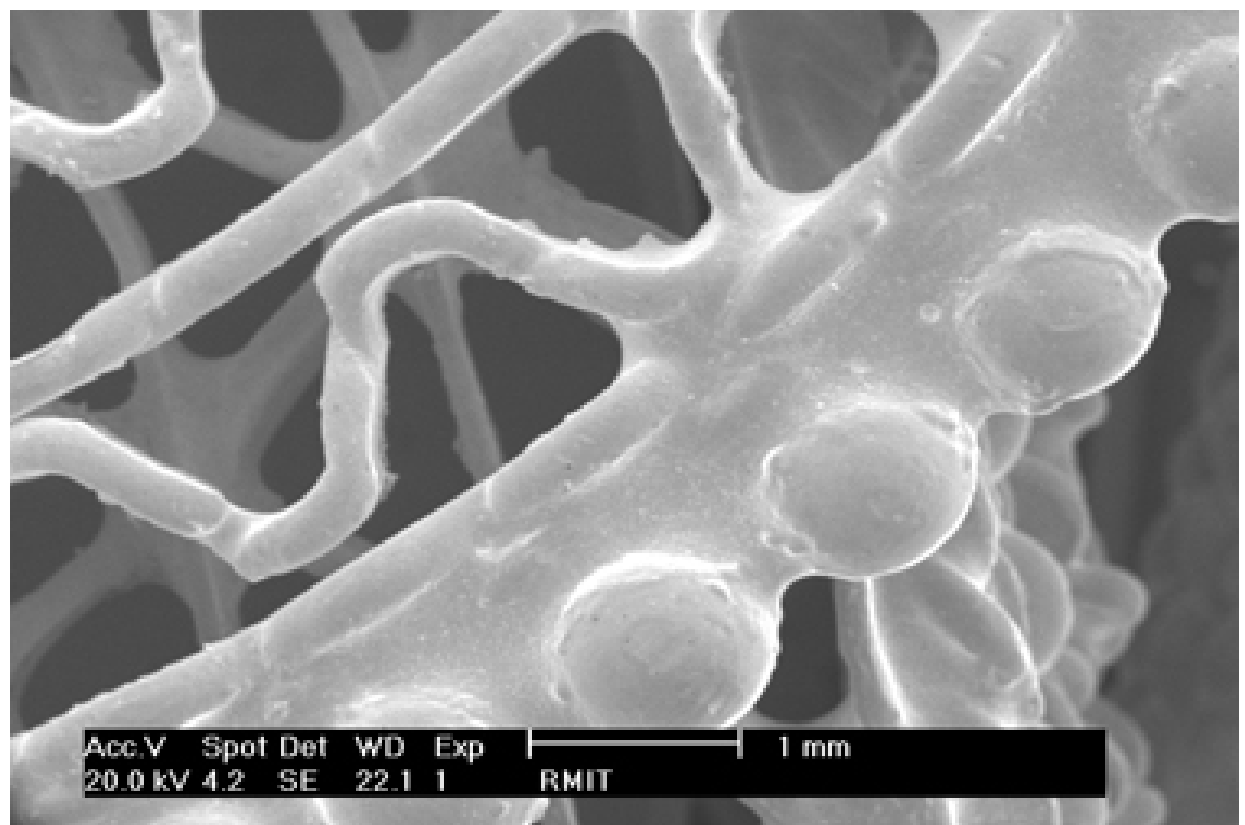
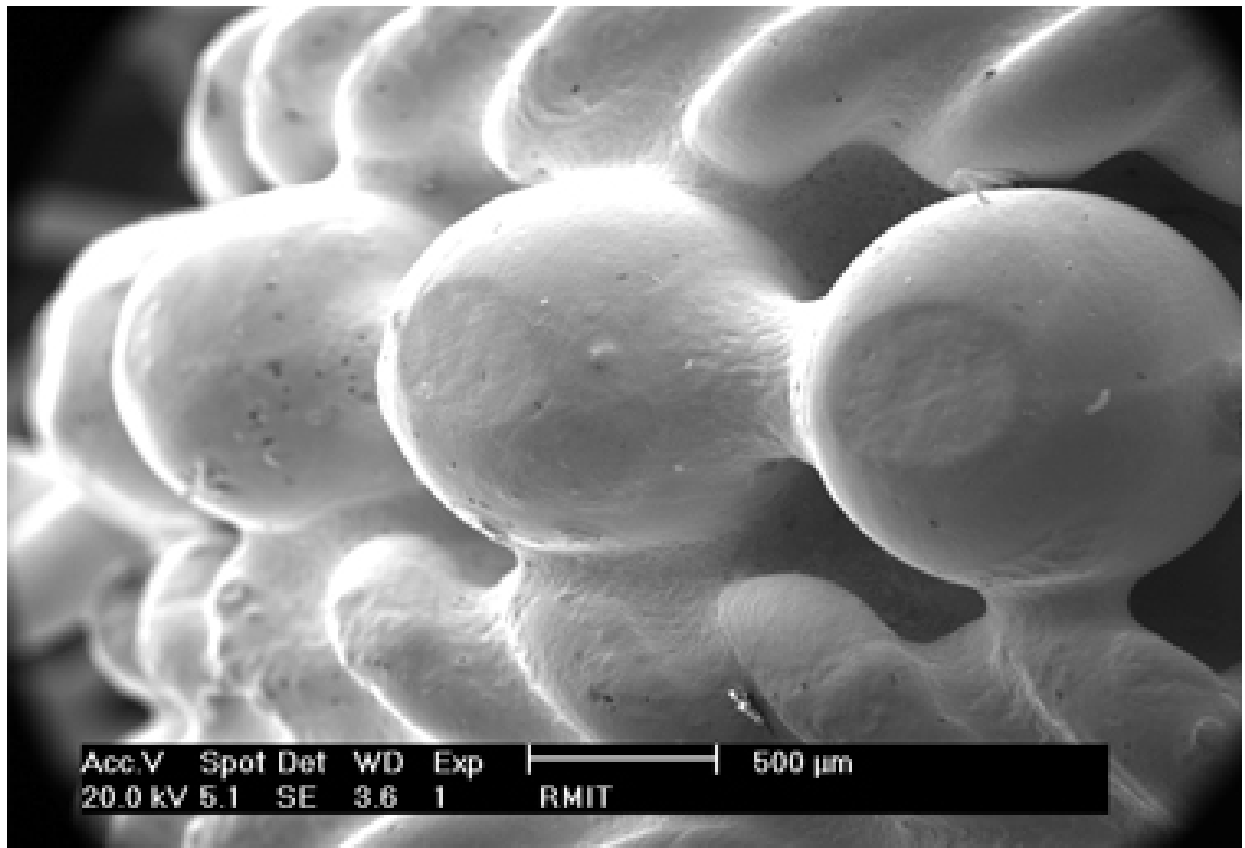
The wire in Bracelet 'Java-la-Grande' has clearly been drawn—that is, pulled and reduced through an iron drawplate.¹⁴⁸

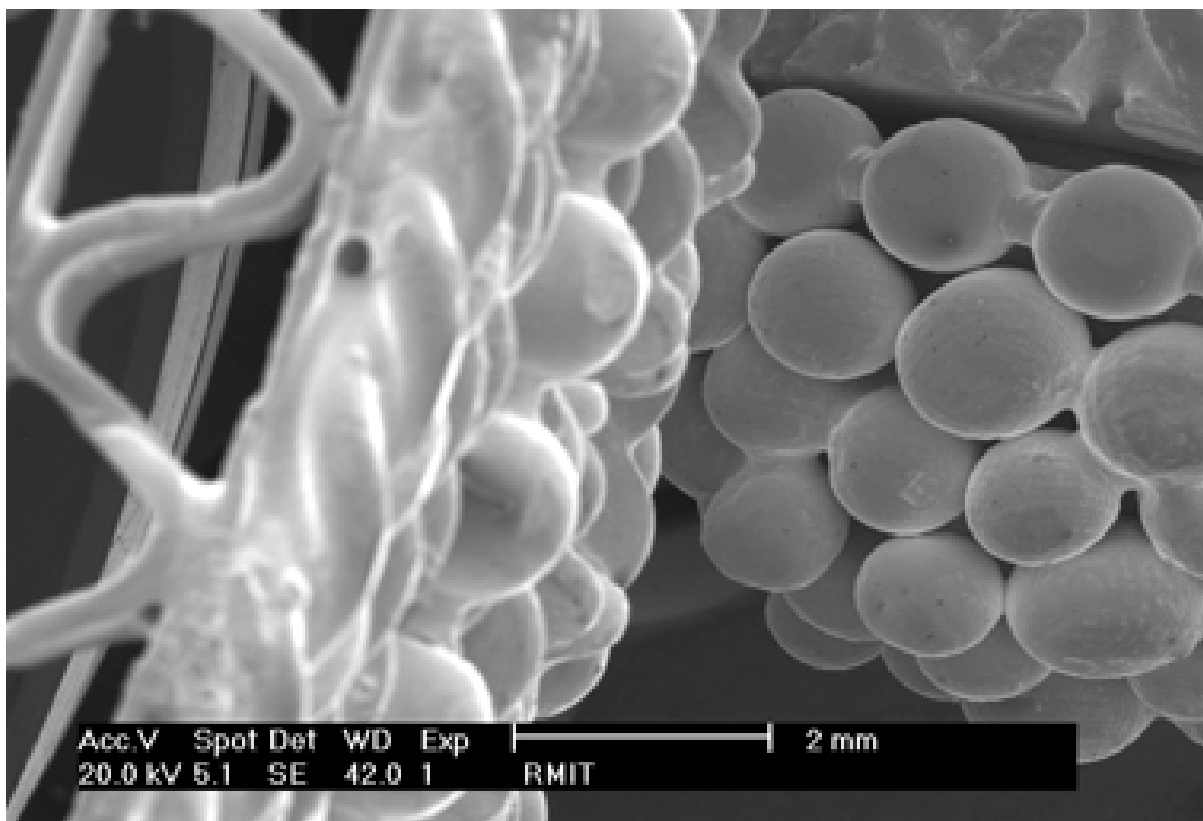
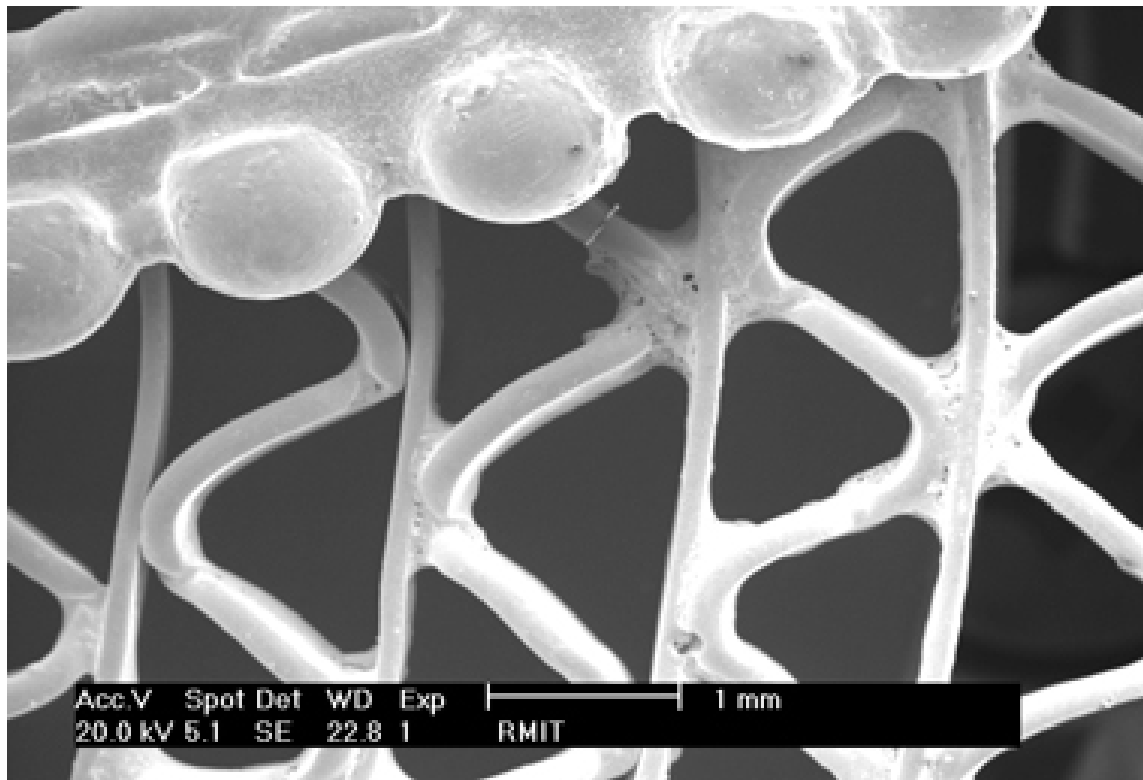


purple and scarlet yarn and fine linen.”

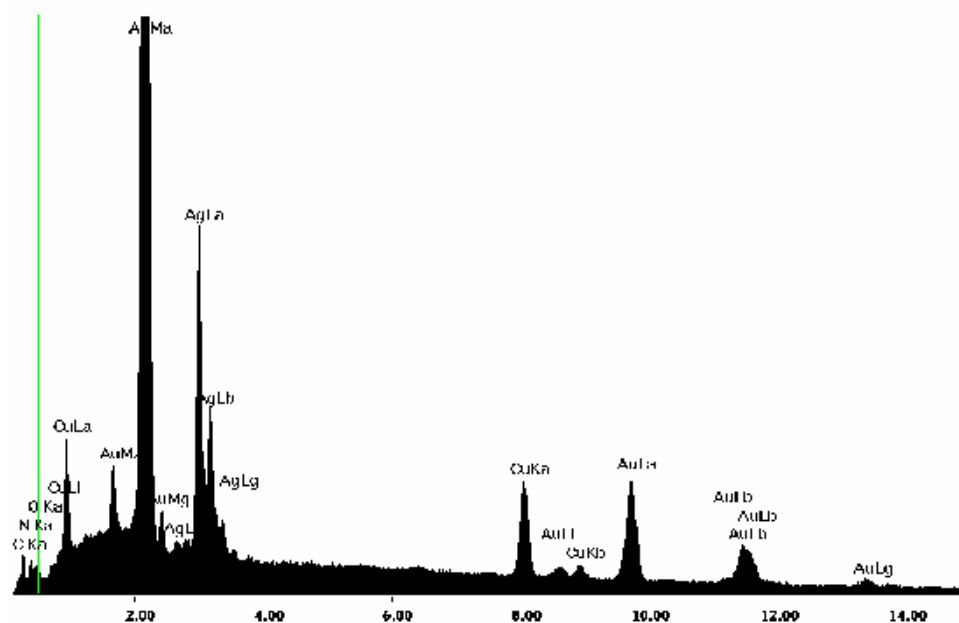
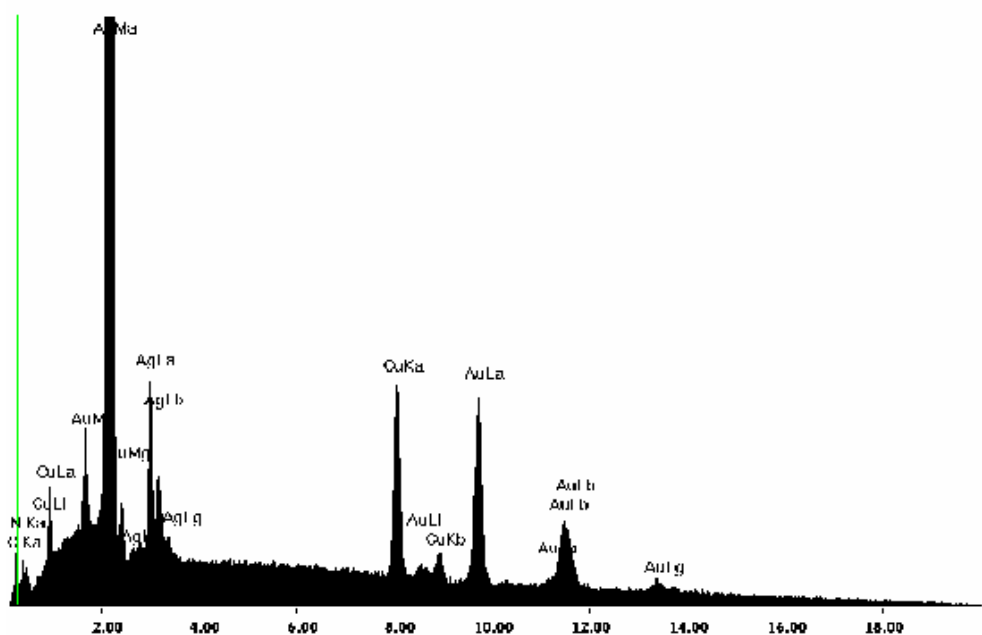
¹⁴⁷ The first publication on the making of ancient wire by twisting was in the catalogue by C.R. Williams, (1924) 43, 140; also pls. 19-20, of an ancient gold jewellery collection of the New York Historical Society.

¹⁴⁸ J. Hawthorne & C. Smith, (1979), Book III, Chapter 8. Iron [Plates] through Which Wires Are Drawn.





Figures 4.14-18. Bracelet 'Java-la-Grande'. Beaded wire, swaged wire conforms to the descriptions of manufacture in the twelfth century AD treatise of Theophilus, *On Divers Arts*, *The Medieval Treatise on Painting, Glassmaking, and Metalwork*. Two systems of making beaded wire. SEM photograph shows powder solder flooded granules typical of the sixteenth century era. The soldering of filigree is described in Cellini (1500-1571), *The Treatise of Benvenuto Cellini on Goldsmithing and Sculpture*. SEM photo by Gerry Biddle and Robert Baines courtesy of RMIT.



Label :Bracelet'Java-la-Grande' Spectrum 1

Acquisition Time: 10:22:09 Date: 11-May-2005

EDAX ZAF Quantification (Standardless)

Element Normalized

SEC Table: Default

Elem	Wt %	At %	K-Ratio	Z	A	F

C K	5.17	29.46	0.0121	1.2951	0.1809	1.0001
N K	5.88	28.75	0.0125	1.2831	0.1655	1.0001
AgL	7.72	4.91	0.0491	0.9996	0.6361	1.0000
CuK	11.81	12.73	0.1331	1.1106	0.9562	1.0616
AuL	69.42	24.14	0.6129	0.8808	1.0023	1.0000
Total	100.00	100.00				

Element Net Inte. Backgrd Inte. Error P/B

C K	5.87	0.79	2.08	7.40
N K	4.95	0.94	2.36	5.26
AgL	38.00	12.95	0.94	2.93
CuK	58.26	11.52	0.69	5.06
AuL	63.74	9.53	0.64	6.69

kV: 19.99 Tilt: 0.70 Take-off: 35.49 Tc: 35.0
 Det Type:UTW, Sapphire Res: 130.75 Lsec: 500

Label : Bracelet' Java-la-Grande' Spectrum 2

Acquisition Time: 10:57:59 Date: 11-May-2005

EDAX ZAF Quantification (Standardless)

Element Normalized

SEC Table : Default

Elem	Wt %	At %	K-Ratio	Z	A	F

C K	4.32	27.81	0.0111	1.3046	0.1963	1.0001
N K	3.52	19.44	0.0083	1.2924	0.1813	1.0001
O K	0.42	2.02	0.0008	1.2812	0.1446	1.0001
AgL	21.19	15.18	0.1424	1.0067	0.6675	1.0000
CuK	9.58	11.65	0.1073	1.1171	0.9523	1.0527
AuL	60.96	23.91	0.5406	0.8852	1.0018	1.0000
Total	100.00	100.00				

Element Net Inte. Backgrd Inte. Error P/B

C K	5.89	3.40	2.70	1.73
N K	3.59	4.08	4.27	0.88
O K	1.08	4.89	13.64	0.22
AgL	120.91	20.39	0.47	5.93
CuK	51.55	14.42	0.78	3.58
AuL	61.73	10.96	0.66	5.63

kV: 20.00 Tilt: 0.50 Take-off: 35.47 Tc: 35.0
 Det Type:UTW, Sapphire Res: 130.75 Lsec: 500

The Bracelet and Portuguese History

There is some evidence indicating Bracelet 'Java-la-Grande' has been in Portugal since the first half of the seventeenth century. Its depiction in one of the most significant Portuguese portrait paintings is astounding occurring on the right arm of the famous figure titled, Portrait of a Lady, c. 1620-40. (Fig. 4.19).¹⁴⁹

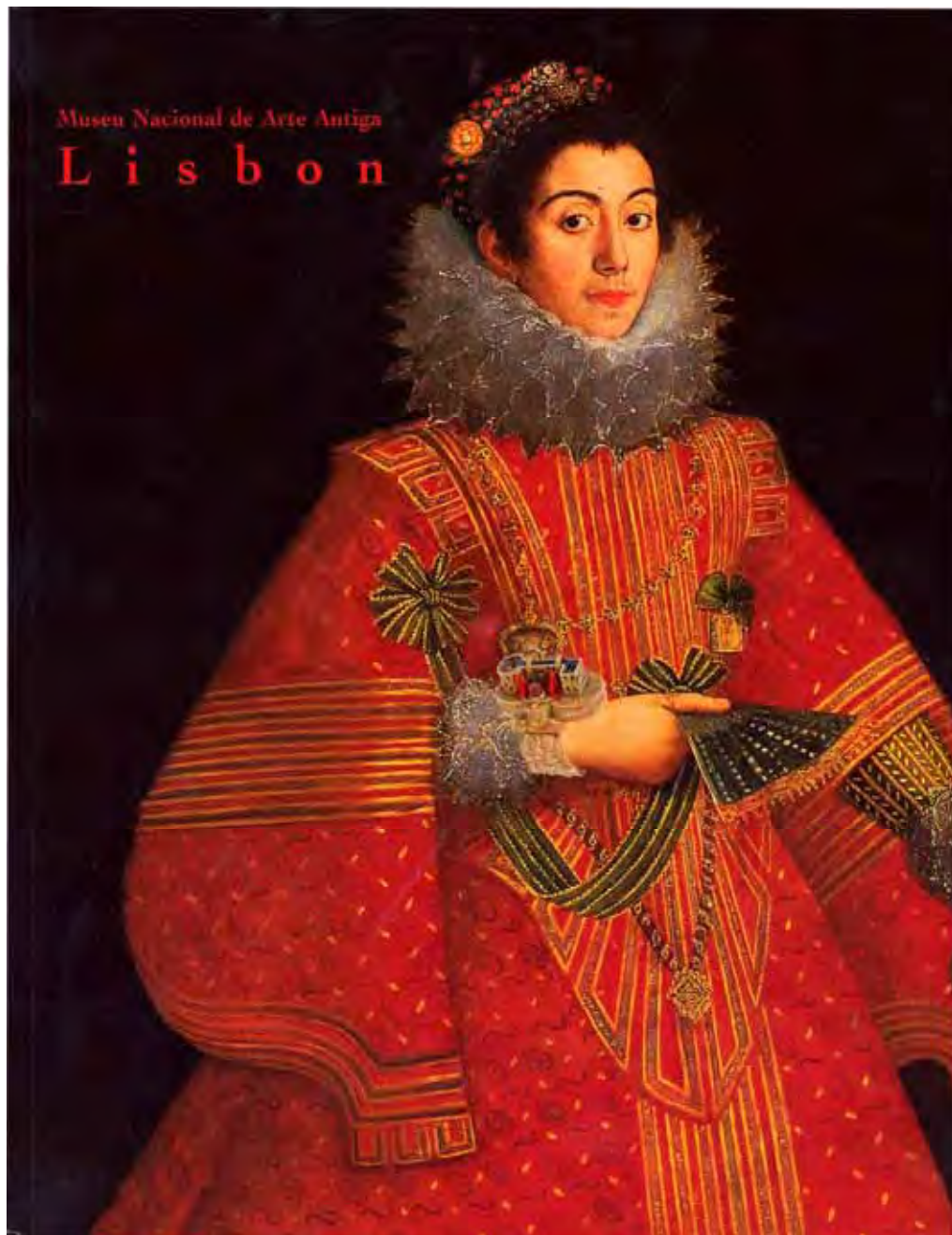


Figure 4.19. Portrait of a Lady, c. 1620-40, Front cover of Catalogue, Museu Nacional de Arte Antiga, Lisbon, 2003.

¹⁴⁹ Luisa Penalva (MNAA) has written in a forthcoming publication, "In the "hallucinating" lecture made during the symposium, Robert Baines presented the audience with a profoundly ironical theory, in which this object, the bracelet would rise out from the mist of several moments of Portuguese history. In order to properly document this conjecture, the author showed a number of iconic paintings that testify different important moments of Portuguese history, as well as amusing photographs from the beginning of the last century picturing different moments of the bracelet's life. In order to do so, Baines even "dared" to digitally introduce the object itself within the photographs. Against all odds, *Bracelet "Java la Grande"* survived time and historical distresses to remain a witness of the arrival of the Portuguese in Australia during the 16th century."

Questions

Did Captain Cook have one of the Dieppe Maps?¹⁵⁰ What is the significance of him naming Botany Bay (Coste des Herbaiges:Dieppe Map)?

Did the Lisbon authorities deliberately conceal the discovery of the east coast by Mendonça?

How does the Mendonça voyage involving the winter camp at Bittangabee Bay, the lost keys at Geelong and the Mahogany shipwreck at Warnambool connect with the Bracelet'Java-la-Grande'?

Is the hardness and redness of the wood in the Bracelet 'Java-la-Grande' in accord with the characteristics of Portuguese Oak which is what the hulls of the Portuguese caravels were made of?

Does relocating the Bracelet'Java-la-Grande' with other Indo-Portuguese artefact in the Nacional Museu de Arte Antiga in Lisboa provide the missing link? Does the mid-sixteenth century manufacture of the Bracelet'Java-la-Grande' identify same authorship with the Cofre-Relicario (early 16th century) Inv.no.114 and the Tabernacle (late 16th century) Inv. No.577. If this is so should the Tabernacle manufacture be dated earlier?

Does the iconography of the filigree work and its stylistic configuration in the Bracelet'Java-la-Grande' identify same maker/workshop or is it the use of same stylistic references by the maker?

Are the found objects located in the Bracelet'Java-la-Grande' material evidence of a voyage of discovery of Australia (Java-la-Grande) in the sixteenth century?

Finally, the bracelet connects Portuguese and Australian history together.

¹⁵⁰ There is evidence that the first arrival to the East Indies in 1595 by the Dutch under Frederick Houtman 'had on board certain Portuguese maps which had been clandestinely obtained in Lisbon'. *Ibid* 86 'Tasman himself was carrying Portuguese charts, quite probably obtained as clandestinely as those on Houtman's ship'. *Ibid* 87

4.5. REDEVENT -REDLINE

The work titled REDLINE further extends the meaning and experience of red. In this instance REDLINE is a construct for small jewellery forms that are built entirely of line. That is, sterling silver wire, powder coated. The coloured wire becomes a network of red lines, which makes a planar surface occur of variable patterning, with a repetition of line and space. The small structural forms evolve from the surface and offer the viewer new vantage points to examine the multi line surfaces.

The objects in REDLINE do not pursue a formal, recognisable identity in their structure. There are no conscious historical references. They pursue other purposes. Their identity of structure is pre-empted by the multi rows of red wires suggesting a symbolism rather than mere playing with cubes, cylinders or scrolls. The REDLINE objects have their own iconic values being simple readings of the multiple row surfaces; the object becomes suggestive of multiple layered or structured values. These forms are principally abstractions of linear space with pre-eminence of red.

4.6 REDEVENT- A Vesseled History

A group of five objects built during a Senior Fulbright research project at the Metropolitan Museum of Art in New York. This considered the placing of red into a personal reading of the history of vessels and this work won The Colin and Cicely Rigg Award (\$30,000) [the richest craft prize in Australia.]

.4.7 REDEVENT- BLOODIER THAN BLACK, 4.8 MEANER THAN YELLOW, 4.9 WHITER THAN RED

This work was commenced during the building of the Seppelt Art Award work and was mainly influenced by the statement on the condition of red by Claus Oldenburg:

‘I have just had an insight
red is redder than green, meaner than yellow,
and bloodier than black’¹⁵¹

Combining prefabricated powdercoated components on coloured silver structures with additional colouring, the spray can use brought single and multi colour variations. Further activities were the use of pigment to fill the filigree openings.

¹⁵¹ Claes Oldenburg, Notes, New York, 1961

5. Conclusion

5.1. Evaluation of Work in Relation to the Research Questions

In what ancient jewellery types is style or placement of iconographic forms as much a consequence of technology as the stylistic genre of the day?

The research described above provides evidence that a diverse range of jewellery types from a variety of periods and locations demonstrate the fundamental role played by the technology in the final form of the piece.

Copper salt diffusion as a system of joining facilitates the finest of joins. It is also a very stable join in that diffusion ensures that the join will not remelt. An important factor though is that in its most refined state it is quite fragile and not always a reliable join. This is overcome by a continuous strategy of reinforcement by the ancient goldsmith. This creates a recognisable character in the work that can be identified as Bronze Age goldsmithing.

A governing factor in all these considerations of manufacture is that copper salt diffusion joining is precariously close to the melting temperature of the gold... The joining temperature is so close to the destruction of the object. I think this is part of the wonder that has been universally appreciated, that very fine components with wires the thickness of a hair and granulation surfaces ‘the complexion of a peach’¹⁵² are joined in a charcoal fire at ‘near destruction’ temperatures.

What new knowledge of technology and modification of current theories can be gleaned from laboratory reconstruction of historical goldworks?

Scholarship as artist goldsmith in studio practice is the integration of this new knowledge and its application to build new creative works. The dating of ancient jewellery is given by the archaeological context. Technology applied by the ancient goldsmith is traceable through archaeometallurgy. Innovation in the understanding of the research in archaeometallurgy led me to a new methodology of scholarship and when published was an internationally recognised ‘breakthrough’ within the research community. A particular pursuit has been to gain an understanding of the thinking and character of the ancient goldsmith. This new knowledge has its own standing to authenticate historical jewellery and is also available to be synthesized in “fictitious” fine art jewellery or jewellery groups.

Is it possible to construct artefacts that are stylistically, chemically and methodologically conformable to ancient examples?

Both the possibilities and pitfalls of the reconstructive process have been demonstrated above. Many questions remain to be investigated, and it will probably remain impossible to achieve absolute certainty- though with a high degree of probability- on certain points.

The multi disciplinary research is comprised of three areas; first in archaeometallurgy, second as an artist goldsmith and third in publishing text or commentary. Each has its community of researchers and validity in the quest for new knowledge. Within my scholarship intellectual functions are tied inseparably and are also interrelated and influential to each other. Not confined to being a knowledge source the synthesized research offers methodologies for strategies of learning and vantage points for further considerations.

Archaeometallurgy is the synthesis of dissimilar disciplines principally directed toward Bronze Age gold technology and jewellery history. This interdisciplinary understanding of material science of metallurgy and chemistry is combined with the social and material history.

New applications of existing knowledge inform us of ancient and historical goldwork that makes up our material culture. This use of existing and integration of new knowledge informs us about artifact and the construction of artefact. It increases our knowledge of jewellery collections. This informed position facilitates the building and the ‘playing’ with the authenticated (sic) laboratory constructed artworks and identifying fakes.

¹⁵² I learnt of this wonderfully descriptive phrase as a student though regrettably cannot identify the literary source or give attribution...

How can my work express aspects of the knowledge gained from analysis and reconstruction in contemporary jewellery and object using both historic and current forms and materials?

Resultant laboratory constructions with their historical correctness become available in the making and are a source for reworking to convey a contemporary visual relevance and a statement of history. The results of these analyses and reconstructions form the basis of metalwork objects in which contemporary aesthetics are informed by historical practice, as I build fictitious jewellery groups and references. In addition to building artworks here is a real world issue and within our cultural history synthesized knowledge through scholarship can authenticate artifacts, components of our intellectual cultural capital.

5.2. Summary of Contribution to Original Knowledge

The Presentation and Explanation of the Research

The philosophy and policies that have evolved from the research have personally evolved. This has been alongside and with the guidance of some of the most eminent scholars in the field of archaeometallurgy and contemporary art jewellery.

In the promotion of its research activities, RMIT University publications recognise the prominence of my scholarship. My research output positioned RMIT at the forefront of new information and as a centre of excellence. My activities as a researcher are intrinsic to this status. An outcome of the Senior Fulbright research at the Metropolitan Museum of Art in NY was the invitation from the vice chancellors office to deliver the Innovation Lecture “Gold” at the Celebration of Innovation & Research at RMIT, in Storey Hall, in 1997

Staatliche Antikensammlungen, München 2004

The exhibition of the scientific research of predominantly Etruscan gold jewellery was a personal milestone but also a significant breakthrough. Critical primary research identified in the Senior Fulbright Award, three Senior Research Fellowships at the Metropolitan Museum of Art in New York and ongoing consultation led to exhibition in internationally prominent museums. In 2004 the exhibition of my research, Entdecker der antiken Goldschmiedetechnik, Staatliche Antikensammlungen, München was ground breaking. I was the first living artist to exhibit at what is arguably one of the most important antiquities museums in the world.

Significant awards recognizing my scholarship and research have been both national and international in the areas of archaeometallurgy and as an artist goldsmith. Senior Fulbright Award, three Senior Research Fellowships at the Metropolitan Museum of Art in New York, Cicely and Colin Rigg Craft Award (richest craft Prize in Australia); Seppelt Contemporary Art Award, 2005 Bayerische Staatspreis gold medal, München.

Communicating New Knowledge

Not all new knowledge can be widely communicated.

It has been understood for many years that the sharing of knowledge of the discipline within museums is privileged. It is on this basis that I have had continual access to primary research material and the facilities for research in museums, especially at the Victoria and Albert Museum South Kensington; Antikensammlung Munich; Villa Giulia Rome; British Museum and the Metropolitan Museum of Art in NY. The senior research fellowships conducted at the Metropolitan Museum of Art were primarily seeking new knowledge and this has been an opportunity beyond all my expectations. This has given me such an enhanced vantage point of knowledge and goldsmithing skills that without it success indicators of international and national prizes and awards would not have occurred.

An increasing dilemma has been the restricted integration of the new knowledge. Requests within the museum to not publish or to reduce published information is valid though confining to one who is a publishing artist and researcher.

Some museums prefer restricted publication in relation to authenticating artworks. This has become an increasing dilemma considering the amount of time spent on research. My knowledge has been discreetly implemented for the understanding of an authentic history of our material culture.¹⁵³ A major activity during the 1999 and 2002 Senior Research Fellowships was the authenticating of pieces from the treasure of the three foreign queens of Tuthmosis III at the Metropolitan Museum of Art in New York.



Figure 5.1,2. Intervention of Red, Bracelet 2003, silver gilt, powdercoat. Schmuckmuseum Pforzheim, 2005. Photography by Garry Sommerfield

¹⁵³ Lilyquist, C. The Tomb of Three Foreign Wives of Tutmosis III, MMA, 2003, see index for extensive citations.

5.3. Selected Reviews and Commentary

1. “Baines is one of the greatest technicians, historians and philosophers among art jewellers. More than anyone else he has mastered the technical subtleties of the ancient Etruscan goldsmiths so as to subject them to rigorously scientific historical study and transpose this knowledge into the present day. The archaeological relevance of the jewel is challenged by the choice of colours. His imaginative floral compositions and his brooches made of miniature thread of silver are coated in a fine coloured powder. It’s a sort of industrial dye he has developed for his own needs. The texture is that of a finely-knit meshed structure, which has more than a simple aesthetic intention: the empty spaces or gaps in the material confirm the status of these brooches, suspended between existence and non existence.

Maria-Bettina Eich : Schmuck Magazin, 2000/4 P.64

2. Robert Baines is a studio artist goldsmith and lecturer. “He has made a significant contribution to Australian jewelry, object-making, and international historical scholarship for over twenty years. A graduate of the RMIT University in gold and silversmithing, Baines also holds a Master of Arts in classics and archaeology from Monash University. He has written and presented numerous scholarly papers on jewellery studies from ancient antiquity through to Renaissance. He has received many fellowships (Churchill, Senior Fulbright, Senior Fellow, the Metropolitan Museum of Art) prizes, and solo exhibitions (Italy, USA, Germany and New Zealand).”

Robert Baines is the Coordinator of Gold and Silversmithing at RMIT University

Marjorie Simon, (ed.) Metalsmith journal USA, June 2000

3. Robert Baines: Close Up

TarraWarra Museum of Art, Healesville, Victoria

8 March – 26 June 2005

‘Jewellery is not only adornment but also a cultural, archaeological and technological document. Technology applied by the ancient goldsmith leaves characteristic traces investigated by archaeometallurgy.’ So begins goldsmith artificer Robert Baines text in his recent Partyline 2004 catalogue. For Baines the intimate treasures of knowledge revealed incrementally by existing fragments of ancient jewellery holds continual fascination. Baines first research project to investigate Greek Etruscan goldsmithing techniques (particularly granulation) occurred in 1979. Since then the artist has undertaken more than ten international research projects, primarily to investigate Etruscan, Egyptian and Greek jewellery in collections including the Metropolitan Museum of Art and the John Paul Getty Museum in United States, the Victoria and Albert Museum in London, the Antikensammlung in Munich and the Villa Giulia in Rome.

From 1980 Baines has been exhibiting profusely, however since 1996 his exhibitions have been presented mostly in Europe and the United States. Fresh from receiving the prestigious Bayerische Staatspreis 2005 gold medal at the 57 Internationale Handwerksmesse, International Trade Fair in Munich, the artist has assembled over 70 works that are beautifully installed at the new TarraWarra Museum of Art in the Yarra Valley.

Robert Baines: Close Up includes pieces from eight different bodies of work spanning from 1998 to 2005. The earliest works are brooches from his Bloodier than Black series of 1998. Baines was motivated to create the work after reading a 1961 quote from Claes Oldenburg: ‘I have just had an insight, red is redder than green, meaner than yellow and bloodier than black.’ The most recent piece in the exhibition is his delicate Pig, Neckpiece 2004-5 from the Ferlini’s Secret from Meroe? series. Here the artist speculates on the possibility that the object has just been ‘unearthed’ and is in fact the work of royal goldsmiths from around 300 BC. Baines imagines that the piece had been ‘missed’ or ‘secreted away’ at an excavation site at Meroe in Upper Nubia.

The largest and possibly most spectacular piece in the exhibition is the Philadelphia Centrepiece: Candlestand 2001-2 that materialised from Baines’ time in 2000 at the Metropolitan Museum of Art. Whilst researching at the Museum, the artist encountered an elaborate eighteenth century Italian

centrepiece from the workshop of Carlo Albincini. Baines' response was to create a work in red powder coated silver and silver gilt that resembled an aberrant maquette for a Russian Constructivist sculpture by Vladimir Tatlin. The work suggests untold imaginative possibilities as to its form and purpose and is breathtaking in execution.

Also included is the intriguing series, A Brooch from Saaremaa 2002-4, that was inspired by a filigree brooch 'excavated', as Baines explains, from an antique shop in Saaremaa, an ancient city of Estonia on the Baltic Sea. The bracelets and brooches that form this series offer a sumptuous and maverick exploration in gold, silver, powder coat, plastic and metal toy cars.

Baines has articulated a unique and respected space internationally through his contemporary interventions. In his 1997 catalogue 'The intervention of red', he writes: 'The invasive red changes the form of the object as it contorts in order to house the red. With the implant comes exaggeration. ... This historically incorrect jewellery becomes an offering of a (new) conversion to a (new) believing.' To view Robert Baines: Close Up is as absorbing as it is provocative. The artist manages to draw from his immense technical and stylistic knowledge of historical jewellery making and interweave this with a masterful manipulation of materials to challenge our notions of material culture and its intersections with contemporary artifice.

Rhana Devenport, "Robert Baines: Close Up", Object Magazine 46 p.44, 2005

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CURRICULUM VITAE

ROBERT BAINES

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BIOGRAPHY

1949 Born Melbourne, Australia.

1969 Diploma of Gold and Silversmithing at Royal Melbourne Institute of Technology.

1973 Opened own goldsmith studio in Collins street, Melbourne.

1979 Awarded Winston Churchill Fellowship to study the fine metalwork of the ancient Greek Etruscan goldsmiths and the method of granulation in particular in order to apply such techniques to the artistic expression of the ancient but timeless quality of the Antipodes. Athens, Florence, Rome, Hamburg, Munich, Pforzheim, England, Cambridge, Brooklyn, New York, Boston.

1980 Commenced position of lecturer in goldsmithing at Royal Melbourne Institute of Technology.

1985 Undertook a study of Etruscan and the '19th Century Archeological' revival gold work in Rome, London and Berlin.

1986 Undertook a study of ancient gold work at the John Paul Getty Museum, Malibu, California.

1989 Artist-in-Residence, The Waikato Polytechnic, Hamilton, NZ.

Lecture tour of New Zealand - Auckland, Dunedin, Invercargill, Hamilton.

1990 Invitation to present a paper at the "Fifth International Symposium on Jewellery Studies" conducted by The Society of Jewellery Historians in London.

Undertook a study of goldworks from the Barberini and Bernandini Tombs at the Villa Giulia in Rome.

1991 Invitation to present a paper at the International Symposium "Outils et Ateliers D'Orfèvres 5000BC-1600AD" conducted by the Musée Des Antiquités Nationales Saint-Germain-en-Laye, France.

Undertook a study in Etruscan goldwork at the Villa Giulia, Rome, British Museum, Victoria and Albert Museum, London, Louvre, Paris.

Invitation to conduct a granulation workshop in conjunction with the international symposium "Ancient Jewellery and Archeology" at the Indiana University, Bloomington, Indiana, USA.

Undertook a study of goldwork from the Egyptian Department at the Metropolitan Museum of Art in New York, USA.

1993 Awarded an Australia Council Fellowship Grant.

Undertook a study of goldwork at the Villa Giulia, Rome; British Museum, the Victoria and Albert Museum, London; Metropolitan Museum of Art, New York and the J. Paul Getty, Los Angeles County Museum in Los Angeles.

1994 Invitation to present a paper at the international conference, "The Art of the Greek Goldsmith", organised by The Society of Jewellery Historians and the Department of Greek and Roman Antiquities, British Museum, London.

1996 Undertook a study of goldwork at the Antikensammlung, Munich; British Museum, London; and the John Paul Getty Museum, Malibu.

Received a Senior Fulbright Award to conduct a research project on Etruscan goldwork at the Sherman Fairchild Center for Object Conservation in the Metropolitan Museum of Art in New York, USA

Master of Arts in Classics and Archaeology, Monash University Melbourne

Invitation to present a paper at the World Archaeological Congress No4, University of Cape Town, South Africa.

1999 Received an Andrew Mellon Conservation Fellowship at The Metropolitan Museum of Art in New York, USA

2001 Invitation to present a paper Visual Communications: Rhetorics and Technologies Conference, Rochester Institute of Technology, New York USA

2001 Invitation to be a keynote speaker at the International Jewellery Colloquium, Tallinn, Estonia.

2002 Received an Andrew Mellon Conservation Fellowship at The Metropolitan Museum of Art in New York, USA

2005 Received Bayerische Staatspreis 2005, gold medal at the 57 Internationale Handwerksmesse, Munich, Germany

2005 Invitation to be a speaker at the international jewellery survey Schmuck 2005 Awards, at the Handwerkskammer für München und Oberbayern, Munich, Germany

2005 opening speaker at international symposium Ars Ornata Europaea X, Museu Nacional de Arte Antiga, Lisboa, Portugal

SOLO EXHIBITIONS

1977 "Sculpture, Jewellery and Other Objects"- Realities Gallery, Melbourne, Australia.

1978 "Sculpture to be Worn", David Jones Art Gallery, Sydney, Australia.

1979 Kym Bonython Gallery, Adelaide, Australia.

1981 "A Visible Likeness...", Robin Gibson, Sydney, Australia.

"A Visible Likeness...", Georges Gallery, Melbourne, Australia.

1982 "Antipodean Forms", Bonython Gallery, Adelaide, Australia.

"Misteri Antipodei", Via Veneto 50, Rome, Italy.

1985 "A Journey to the Plenitude", Realities, Melbourne, Australia.

"The Plenitude", Bonython-Meadmore Gallery, Adelaide, Australia.

1988-9 "Travel", Touring exhibition to Victorian regional galleries: Sale Regional Arts Centre; Latrobe Valley Arts Centre; Mildura Arts Centre; Benalla Art Gallery; Hamilton Art Gallery.

1989 "From the Plenitude", City of Horsham Regional Art Gallery, Victoria, Australia.

1989 "The Plenitude", Solander Gallery, Canberra, Australia.

"The Waikato Pieces", Fingers, Contemporary Jewellery, Auckland, New Zealand.

"The Waikato Pieces", Fluxus, Dunedin, New Zealand.

"The Waikato Pieces", Waikato Museum for Art and History, Hamilton, New Zealand.

1992 "Adventures of the ARCHEGOS", Lauraine Diggins Fine Art, Melbourne, Australia.

1992-3 "The Art of the Goldsmith", Touring exhibition in New Zealand: Auckland Museum; Hawkes Bay Museum, Napier; Wairarapa Arts Foundation, Masterton; Suter Art Gallery, Nelson; McDougall Art Gallery, Christchurch.

1993 "Adornments From the Waikato and Beyond", Lauraine Diggins Fine Art, Melbourne, Australia.

1995 "WORD Action Artefact: Worship", Celebration Arts, St. Johns, Southgate, Melbourne.
 1996 REDLINE, part 2 of AAA.....REDEVENT, Lauraine Diggins Fine Art. Melbourne, Australia.
 INTERVENTION OF RED, part 3 of AAA.....REDEVENT, Galerie Biró, Munich, Germany.
 AAA,AA.....REDEVENT : Survey, Brisbane City Gallery, Brisbane, Australia
 2000 REDEVENT: bloodier than black, Helen Drutt: Philadelphia, USA
 2000 Bloodier than Black, Galerie Biró, Munich, Germany, 2003 Robert Baines:Stopping at the Red:
 Jewellery Survey 1992-2002
 Toowoomba Regional Art Gallery, 9 September – 26 October 2003
 2004 "Robert Baines Entdecker der antiken Goldschmiedetechnik," Staatliche Antikensammlungen,
 München, Germany
 2004 "Partyline", Galerie Biró, München, Germany
 2005 "Close Up", TarraWarra Museum of Art, Victoria

SELECTED GROUP EXHIBITIONS

1974 Diamond Valley Art Award, Victoria, Australia.
 1975 Diamond Valley Art Award, Victoria, Australia.
 1976 "Diamonds Today", Sydney, Australia.
 1978 Australian Design Award, Melbourne, Australia.
 1979 Practising Goldsmiths and Jewellers of Victoria Georges Gallery, Melbourne, Australia.
 1980 Objects to "Human Scale" organised by Australia council, toured Japan, Hong Kong, Phillipines.
 1981 Arm Jewellery, Makers Mark Gallery, Melbourne, Australia.
 1982 "Tendenzen 1982", Schmuckmuseum, Pforzeim, West Germany.
 "One Year Later", Axion Gallery, Melbourne, Australia.
 Australian Jewellery, European Tour, organised by Australia Council.
 Australian Crafts, Meat Market Craft Centre, Melbourne, Australia. nchen
 1984 Brooch Exhibition, Makers Mark Gallery, Melbourne, Australia.
 "Phantastische Figurationen", Friedrich-Wilhelm-Muller-Weltbewerb 1984
 Hanau, Bonn, Pforzeim, Hannover, West Germany.
 Four Directions, Mildura, Benalla, Morwell, Horsham, Galleries of Victoria, Australia.
 1985 Treasures from Australian Churches, National Gallery of Victoria, Australia.
 Orgehang, Galerie am Graben, Vienna, Austria.
 1986 Australian Crafts, Meat Market Craft Centre, Melbourne, Australia.
 1987 J.M.G.V. Meat Market Craft Centre, Melbourne, Australia.
 1987 "Victoria" Osaka, Japan.
 1988 "Jewellery on the Move", J.M.G.V. Biennal Conference, Brisbane, Queensland.
 "Jewellery on the Move", Gold Coast, Sydney, Melbourne.
 Australian Crafts, Meat Market Craft Centre, Melbourne.
 Ernest Leviny Commemorative Silver Exhibition, Castlemaine, Victoria, Australia.
 Tenth Mildura Sculpture Triennial, Mildura, Australia.
 1988 Australian Decorative Arts 1900-1985, Australian National Gallery, Canberra, Australia.
 1989 25 Years of Gold and Silversmithing from RMIT, RMIT Faculty Gallery, Melbourne.
 1989-90 Directions- Silversmithing 1989, Australia High Court, Canberra, A.C.T., Australia, 1989;
 Hamilton Regional Gallery, Victoria, 1989-90; Meat Market Craft Centre, Melbourne, Australia, 1990.
 1990 Australian Crafts, Meat Market Craft Centre, Melbourne, Australia.
 1991-2 Contemporary Australian Hollow Ware, Canberra School of Art Gallery, A.C.T.; Art Gallery of
 Western Australia, Perth; Wagga Wagga City Art Gallery, N.S.W.; National Gallery of Victoria,
 Melbourne; Hamilton Art Gallery, Victoria.
 1992 "Design Visions - the 2nd Australian International Crafts Triennial". Australia - New Design
 Visions, Art Gallery of Western Australia, Perth.
 1992 Australian Modernism: The Complexity and the Diversity, Lauraine Diggins Fine Art, Melbourne,
 Australia.

1992 Third Australian Contemporary Art Fair, Lauraine Diggins Fine Art, Melbourne, Australia.
 1992 Third Commemorative Ernest Levy Silver Exhibition, Castlemaine, Victoria.
 1993 Directions - Glass Jewellery 1993, Canberra School of Art, Craft Council of Victoria Gallery, Orange Regional Gallery.
 1993 "The Changing Face of Melbourne; 1841-1993", Lauraine Diggins Fine Art, Melbourne, Australia.
 1994 Australian Decorative Arts Survey 1994", Lauraine Diggins Fine Art, Melbourne, Australia.
 "Armed", The Door Exhibition Space, Fremantle, Western Australia.
 Australian Art, Lauraine Diggins Fine Art, Hong Kong.
 1995 "Tribute 1", Eltham Library Gallery, Eltham.
 1995 25: CRAFT VICTORIA ARTISTS AT ARTS VICTORIA, Arts Victorian Foyer Gallery, Melbourne.
 1995 Fine Art Department, RMIT.
 Australian High Commission, Singapore.
 1995 "Australian Decorative Arts Survey 1995: The Object All Sublime", Lauraine Diggins Fine Art, Melbourne, Australia.
 1995 "VicHealth National Craft Award", National Gallery of Victoria, Australia.
 1996 "Granulation 1996. Internationaler Schmuckwettbewerb"; Pforzheim, Hanau, München, Münster, St. Gallen, Erfurt and Augsburg, Germany.
 1996 Ord Minnet, 376 Collins st, Melbourne.
 1996 "Collecting today for tomorrow", Powerhouse Museum, Ultimo, Australia.
 1997 "In Praise of Make-Up", Plimsoll Gallery, Centre for the Arts, Hobart; University Gallery, Newnham.
 "Contemporary Vessels and Jewels, Australian Fine Metalwork, Shangai Museum, May - August, 1997.
 1997 "19th & 20th Century Australian Painting Sculpture and Decorative Arts 1997, Australian Antique & Fine Art Dealers' Fair, Sydney, Lauraine Diggins Fine Art, Melbourne.
 1997 Cicely and Colin Rigg Craft Award, 1997. National Gallery of Victoria, Melbourne
 1997 City of Hobart Art Prize, Hobart City Council, Tasmania
 1997 Art of Gold", Ballarat Fine Art Gallery, Victoria.
 1998 Schmuck '98, Sonderschau der 50. Internationalen Handwerksmesse München
 1998 "Contemporary Jewellery: Value Added", National Gallery of Victoria, Melbourne
 The Deacons Graham & James Arts 21 Award, The Ian Potter Museum of Art, Melbourne
 1998 Jewellery Moves, National Museums of Scotland, Edinburgh
 Brooching it Diplomatically : A Tribute to Madeleine K. Albright, Helen Drutt, Philadelphia; The Museum of Contemporary Art, 's-Hertogenbosch, The Netherlands; Konstindustrimuseet, Helsinki; Kunstgewerbemuseum, Berlin; Schmuckmuseum, Pforzheim.
 1998 RMIT Fine Art at the Hong Kong Arts Centre, Wanchai, Hong Kong
 Seppelt Contemporary Art Award, Museum of Contemporary Art, Sydney.
 Skill, Craft Victoria Travelling Exhibition, Mornington Peninsula Regional Gallery.
 1999 Contemporary Australian Craft: A Japanese View. Hokkaido Museum of Modern Art, Takaoka City Art Museum, Museum of Modern Art Shiga, Customs House Sydney.
 1999 Water Medicine, John Curtin Gallery, Perth
 1999 Handmade: Shifting Paradigms, Singapore Art Museum
 1999 Trace, Museum of Art Craft, ITAMI, Gallery Yu, Tokyo.
 2000 Bejewelled, Monash University
 2000 Commemorative Medals/Trophies: The Politics of History, Helen Drutt: Philadelphia.
 Australia and Germany 8. Craft Triennale, Museum für Kunsthandwerk, Frankfurt, Art Gallery of South Australia, Object Galleries Sydney.
 Spectaculum, Tarbekunstmuseum, Tallinn Estonia
 Hermanns Art Award, Sherman Galleries, Sydney
 2001 Micromegas, Bayerischer Kunstgewerbe-Verain e.V. Germany
 2001 Nocturnos, International Jewellery Colloquium, Estonia
 2001 The Tactile Art Exhibition, Object Australian Centre for Craft and Design, Sydney

Schmuck, Robert Baines und Karl Fritsch Schmuck, Robert Baines und Karl Fritsch, Stadtische Galerie im Rathausfletz Neuburg an der Donau Germany

2002 Material Culture, National Gallery of Australia, Canberra

2003 Bijou Contemporain, Robert Baines und Karl Fritsch, Cagnes-sur-Mer, France

2003 Melbourne International Mokume Symposium and Exhibition, Melbourne

2005 Schmuck 2005, 57 Internationale Handwerksmesse, International Trade Fair Munich, Germany

2005 Closer, Interventions from the MNAA Colleccions. Museu Nacional de Arte Antiga, Lisboa Portugal

2005 'Transformations: The Language of Craft', National Gallery of Australia, Canberra. 11 November 2005-29 January 2006

2005 'Inspired Across Time' Powerhouse Museum, Sydney

AWARDS AND PRIZES

1970 Winner; L. Puzsar Award, RMIT

Best Third Year Jewellery Award.

1973 Selection for the "Australian Diamond Collection" while employed by M. Hurwitz, Crossley Street, Melbourne.

1974 Winner; Diamond Valley Award. (Non-acquisitive).

Selection for the "Australian Diamond Collection" while employed by M. Hurwitz, Crossley Street, Melbourne.

1975 Winner; Diamond Valley Award. (Non-acquisitive).

1979 Awarded a Winston Churchill Fellowship.

1980 Commendation Australian Design Award, Melbourne.

1988 Finalist in two categories: Argyle "Bicentennial", Diamond Jewellery Competition.

"Medibank Private Bicentennial Craft Acquisition", Australian Crafts.

1989 "Artist in Residence" Waikato Polytechnic, New Zealand.

1992 Australia Council for the Arts Fellowship Grant.

1994 Winner; Twentieth anniversary of Diamond Valley Art Award sculpture commission. (National competition \$20,000)

1995 Short-listed for the Acquisition of a Ceremonial Mace for Ballarat University. (National competition)

Winner; VicHealth National Craft Award acquisition, (\$11,000) Melbourne.

1996 Recieved a Senior Fulbright Award to conduct a research project at the Sherman Fairchild Center for Object Conservation in the Metropolitan Museum of Art in New York.

1996 Australia Council Development grant.

1997 Winner; Cicely and Colin Rigg Craft Award, 1997, (\$30, 000) National Gallery of Victoria

1998 Finalist, The Deacons Graham & James Arts Award, The Potter Museum, Melbourne

Winner; The Seppelt Contemporary Art Award, (\$15, 000) Museum of Contemporary Art, Sydney

1998 Australia Council Development Grant.

Received an Andrew Mellon Conservation Fellowship at The Metropolitan Museum of Art in New York.

2002 Received an Andrew Mellon Conservation Fellowship at The Metropolitan Museum of Art in New York.

2002 Australia Council Development Grant

2003 RMIT Innovation Research Award in the Portfolio of Design and Social Context

2005 Bayerische Staatspreis 2005 gold medal at the 57 Internationale Handwerksmesse, Munich. (€5000)

2005 Distinguished Research Award, ACUADS (The Australian Council of University Art and Design Schools)

2005 Received Teaching Award, Research Supervision, Portfolio of Design and Social Context RMIT University.

2005 Received Teaching Award, Research Supervision, RMIT University.

CATALOGUES

'Sculpture to be Worn', David Jones', Art Gallery, Sydney, 1978

'A Visible Likeness', Robin Gibson, Sydney, Australia, Georges Gallery, Melbourne, 1979/81

'Robert Baines, The Art of the Goldsmith', Exhibitour MDF, New Zealand Limited, 1991

'Misteri Antipoidei', 1985, Assozione Italia-Australia, Rome, 1985.

'Travel, Goldsmith Robert Baines', introduction, Jenny Zimmer, 1988.

'Journey to the Plenitude', Realities Gallery, Melbourne.

'The Plenitude', Bonython-Meadmore Gallery, Adelaide, 1985.

'From the Plenitude', City of Horsham Regional Gallery, 1989.

'Adventures of the Archegos', Lauraine Diggins Fine Art Pty Ltd, 1992.

'The Plenitude', text by Dawn Mendham. Melbourne, 1996

'The Intervention of Red', Galerie Biró, Munich, 1997.

'AAA, AA.....REDEVENT : Survey, Brisbane City Gallery, 1998

'Stopping at the Red', Helen Drutt: Philadelphia, Galerie Biró, Munich, 2000

'Partyline', RMIT University Press, Melbourne, 2004

ARTICLES AND REVIEWS:

Diamond Valley News, October 1974, "Top Jewel Man Wins Award Again".

The Age, December 1977, "The Golden Opportunity", by Alix MacDonald.

The Age, December 1977, "Baines At Last", Ted Greenwood.

The Age, July 1978, "New Inspiration from Old Gold", Margaret Geddes.

The Australian, August 1978, "God Guides an Artist in Gold", Lyndall Crisp.

The Advertiser, February 1979, "Putting Art Into Modern Jewellery", Simon Blackal.

Lemel, May 1983, Vol. 2, no.14 - "Robert Baines Exhibition at the Bonython Gallery", Kate Hunter.

Gallery, National Gallery of Victoria, August 1985, "Treasures From Australian Churches", Judith O'Callaghan.

JWG Business Press International, April 1985.

10. The Age, November 1985, "Formal Expressions of the Essence of Creativity", Kim Martin.

The Herald, November 1985, "Small Sculpture - Big Concept" Grant Hannan.

The Advocate, November 1985, "Mystical Presence", Bernard Hoffert.

Cosmopolitan, September 1986.

Art and Australia, Spring 1986, Exhibition Commentary.

Wimmera Mail-times, February 1989, "Metalworks Show Natural Beauty", Caroline Field.

Canberra Times, June 1989, "Ancient Techniques Aid Gold Metamorphosis",

Sue-Anne Wallace.

Wimmera Mail-times, February 1989, "From the Plenitude", Caroline Field.

Otago Daily Times, New Zealand, Contemporary Artist Links Ancient Craft, Lee Harris, October 10 1989.

Southern Skies, Frontline, New Zealand, October 1989, p.5.

20. Craft New Zealand, "The Art of the Goldsmith - Robert Baines", Peter Woods, Issue 40, Winter 1992, p.25.

New Zealand Herald, February 1992, "Awesome Touch With Gold", Helen Schamroth.

The Australian, "Medal Metalwork A Badge of Excellence", Nov. 20 1992, Bryce Hallett.

The Canberra Times, "The Rare and the Conventional", Feb. 1 1993, Helen Ennis.

The Age, "The Golden Best of Both Worlds", Nov. 30 1993, Jenny Zimmer.

Daily Times, "'Ancient' Jewels Touch of Class", by Judy Wilford, Apr, 18 1992.

Nelson Evening Mail, "Ancient Metal Inspiration", Aug. 19 1992.

Timaru Herald, "Top Goldsmith Puts Jewellery on Display", Jan. 22 1992.
 Diamond Valley News, "Prize Sculpture Chosen From 70", May 31 1994, Duska Sulicich.
 30. Lemel, "Robert Baines Senior Fulbright Award, pp.4-5, Autumn issue, 1996
 RMIT Openline, "RMIT goldsmith wins Senior Fulbright award,"p. 5, June 1996.
 Süddeutsche Zeitung Nr. 210, Open Art '97, "Rückblicke und Ausblicke", Seite 16, 12 September 1997, Sabine Buchwald.
 Herald Sun, "Artisans on their Metal", by Zelda Cawthorne, p.45, October 7, 1997.
 Herald Sun, "A Vesseled Victory", 14 October, 1997
 Herald Sun, "Metal that Works", Robyn McKenzie, p.82, November 24, 1997
 The Age, "Crafting a Secret Life", Anna Clabburn, November 19, 1997.
 Diamond Valley News, "Sculptor's Award", p.33, November 26, 1997
 Powerhouse Brochure, "Become part of the Powerhouse", 1997.
 Research and Publications Report, 1996, RMIT, Ancient Metal Technologies in the Twentieth Century, pp.16-17, December, 1997
 40. Object Magazine 4. 1997, Inside cover.
 State Of The Arts, December 1997 - March 1998. Front Cover.
 The Courier Mail, "Lines of the times in jewellery", review by Jeff Shaw, October 19, 1998
 The Australian, "Judges Agonise Over Art-Felt Dilemma", p.5, November 27, 1998
 The Sydney Morning Herald, "Jewellery Artist in The Red \$15,000 Better Off", November 27, 1998.
 The Courier Mail, ARTS "City Gallery exhibitors star in art awards", p.21, December 3, 1998
 Diamond Valley News, "Ancient design a winner", p.18, January 27, 1999.
 The Southern Cross, "Smith goes for gilt-edged emotion", March, 1999
 Herald Sun, "Thrills spill from the skill", May 10, 1999
 Age, Sydney Morning Herald, Good Weekend, "Golden Eye," pp. 33-37 June 16, 2001
 50. Neuburger, "Fritsch und Baines", p.37, 17 August 2002
 Age Review Art 7 "Modern Twist on the Past" by Megan Backhouse, March 19, 2005
 Age Arts Metro 9 "Robert Baines: raider of the lost art" by Penny Webb, April 13, 2005
 Object Magazine 46, "Robert Baines: Close Up", by Rhana Devenport, p.44, 2005

SELECTED BIBLIOGRAPHY:

1. Commonwealth Jeweller and Watchmaker. December, 1970. p.55.
2. Commonwealth Jeweller and Watchmaker. "Gold Prices" 1977.
3. "Jeweller and Watchmaker", Diamonds Today, 1973.
4. "Dictionary of Living Australian Artists and Galleries", by Max Germaine, Boolarong Publications, Brisbane, 1984.
5. Vogue Australia, October, 1981, No. 10, p.62.
6. Art and Australia, Volume 19/4, p.396.
7. Art and Australia, Volume 21/1, p.26.
8. "Objects to Human Scale", Australia Council Catalogue, p.14.
9. "Australian Jewellery", Australia Council Catalogue, p.23.
10. "Schmuck 1982 - Tendenzen" Schmuckmuseum Pforzeim Catalogue".
11. Phantastische Figurationen,
 Fredrich Muller, Wettbewerb 1984 Catalogue, p.6.
12. "The Jewellery Collection". Gallery, National Gallery of Victoria.
 August 1984, pp.12 & 13 by Judith O'Callaghan.
13. "Treasures from Australian Churches",
 August 1985, pp.9 & 10 by Judith O'Callaghan.
14. "Spiritual Values", Craft Australia, Winter 1987/2, front cover, pp.64-7 by Dawn Mendham
15. "Travel, Goldsmith Robert Baines", introduction Jenny Zimmer, 1988.

16. "Directions - Silversmithing 1989", Craft Council of the A.C.T. Inc.
17. "Journeys of a Modern Magi", Craft Arts International, August/October 1988, by Jenny Zimmer, pp.49-52.
18. "Robert Baines: Artificer of the Metaphysical", New Zealand Crafts, Summer 1989, by Maurizio Sarsini, pp.16,17.
19. "Tea and Coffee Service", "The Art Foundation of Victoria Annual Report", 1989, p.17.
20. "The Refining Fire", by Dawn Mendham, Albatross Books, pp.26 - 33.
21. "A Recent Acquisition", Gallery, National Gallery Society of Victoria May 1991, by Belinda Powles, p.18.
22. "Contemporary Australian Hollow Ware", Curated by Daniel McOwan, 1991.
23. "Robert Baines, The Art of the Goldsmith", 1991, Exhibitour MDF, New Zealand Limited.
24. "Australian Modernism: The Complexity and the Diversity", by Helen Rayment, Malakoff Fine Art Press, p.49.
25. "New Design Visions" - The Second Australian International Crafts Triennial, Design Visions, p. Perth, 1992.
26. "Modernism Reexamined", by Marie Geissler, Craft Arts International, Vol. 26, pp.81-2, 1992-3.
27. "The Changing Face of Melbourne, 1841-1993", by Anna Long, Malakoff Fine Art Press, 1993, p.3.
28. "Australian Decorative Arts Survey 1994", Ed. Lauraine Diggins, Malakoff Press, 1994, p.3.
29. "Gallery Commentary", Lee Tulloch, Vogue Australia, October 1981.
30. Art and Australia, Winter 1982, Exhibition Commentary.
31. "Schmuck" 1982 - Tendenzen, Schmuck Museum Pforzeim, 1982, Catalogue.
32. Art and Australia, Spring 1983, Exhibition Commentary.
33. Art and Australia, Spring 1986, Exhibition Commentary.
34. "Robert Baines and the Deconstruction of Masculinity", by Robert Nelson, Craft Victoria, Vol. 23, No. 220, 1993.
35. "Contemporary Australians 1995/96", Reed Reference Australia, 1995, p.20.
36. Granulation 1996. Internationaler Schmuckwettbewerb, Gesellschaft für Goldschmiedekunst e. V., Hanau, p.44, 1996
37. In praise of MAKE-UP, curated and essay by Clare Bond, University of Tasmania, pp. Catalogue, 15,23,28,29.
38. 19th&20th Century Australian Painting Sculpture and Decorative Arts 1997, Lauraine Diggins (ed.), p.53.
39. Contemporary Vessels and Jewels-Australian Fine Metalwork, Queensland Art Gallery, pp.11-13, 1996
40. Cicely and Colin Rigg Craft Award, 1997, National Gallery of Victoria, pp.8,10,11.
41. The Art of Gold,, Ballarat Fine Art Gallery, 1997, front Cover, nos. 20,21.
42. Schmuck, kunst und die Idee des Recycling: Robert Baines, Australian und Karl Fritsch, Deutschland., Kunsthandwerk & Design, Frechen, September/October 5/97, pp. 16-21.
43. Schmuck '98, Sonderschau der 50. Internationalen Handwerksmesse München, 1998, pp.26, 27.
44. "New Age Alchemy: Ancient Gold Secrets Fingered", uniVATION, The Australian Vice-Chancellors' Committee, Vol.13 no. 2, May 1998, pp.10, 11.
45. Brooching it Diplomatically : A Tribute to Madeleine K. Albright, Helen Drutt, Philadelphia, 1998, pp.24,25,146
46. Front cover, American Craft, Feb - March, 1999
47. "Die Königsdisziplin", Schmuck Magazin, Juli, 3/1999, pp.46-48. Nos.17, 20.
48. "Blut, Gold und Coca-Cola", Schmuck Magazin, Aug/Sept, 4/2000, pp.64-67
49. Craft from Scratch, eine spur von handarbeit 8. Triennale Für Form und Inhalte-Australien und Deutschland, Sept, 2000, pp.53, 171
50. "What's New in (Very) Old Gold? Robert Baines Shows All, by Marjorie Simon, Metalsmith vol.21 no.1 pp.26-33.
51. Hermanns Art Award, 2001. Catalogue
- 52." Material Culture" by Robert Bell, National Gallery of Australia, 2000

53. Research Highlights 2002, RMIT University Research & Development p.4
54. Australian Art in the National Gallery, Ann Gray (ed.), NGA 2002, p.394
55. "Get-Together der internationalen Gold- und Silberschmeide", Goldschmeide Zeitung, Internationales Journal für Schmuck und Uhren 4/2005, pp.18,19
56. Intervenções a partir da colecções do MNAA, Ars Ornata, Everywhere Nowhere Lisboa 2005, Instituto Português de Museus
57. "Em Toda a Parte, Em Lugar Nenhum", Blue Living, saber viver em Portugal, p. 39
58. A arte da JÓIA, VISÃO, Portugal, 13 de Julho 2005, p. 9

SELECTED PUBLIC COMMISSIONS

- 1969, All Saints Greensborough, Communion Set;
 1984, St Edward's Blackburn Sth, Memorial Board;
 1987, St Faith Montmorency, Altar Cross;
 1988, National Gallery of Victoria, Tea Set;
 1994, Diamond Valley Shire, Twentieth Year Commemorative Art Award Sculpture;
 1994, Ruby Company, MacKenzie St, Singapore, Entrance Lions.
 1995, Powerhouse Museum Sydney, Tea Set
 1997, Office of the Vice Chancellor, RMIT, Innovation Award Pins.
 2002, Australia Council Emeritus Awards

WORKS IN PUBLIC COLLECTIONS

Schmuckmuseum, Pforzheim, Germany
 Victoria and Albert Museum, London
 Ville de Cagnes-sur-Mer, France
 Deutsches Blockflötenmuseum, Fulda, Germany
 Museum of Fine Arts, Houston, USA
 Waikato Museum of Art and History, Hamilton, New Zealand
 Waikato Polytechnic, Hamilton, New Zealand.
 Galerie am Graben, Vienna, Austria
 Australian National Gallery, Canberra
 National Gallery of Victoria
 Royal Melbourne Institute of Technology, Victoria
 Prime Minister's Department, Canberra
 The Victorian State Craft Collection, Melbourne
 Art Gallery of Western Australia
 Diamond Valley Art Award Collection
 Banyule City Art Collection
 Art Gallery of South Australia
 Powerhouse Museum, Sydney
 Queensland Art Gallery

SELECTED PUBLICATIONS:

1. "Colonial Silversmiths - Heritage", Australian Heritage Society, December 1979 - February 1980, pp.12 &13.
 2. "Fine Metalwork of the Ancient Greek & Etruscan Goldsmiths and the Method of Granulation in particular", Churchill Memorial Trust, Canberra, 1979.
 3. "Letters", Craft Australia, Summer 4/1988.
 4. "Art Australia - International Influences" - Heritage, Australian Heritage Society, June 1988. pp.17-19.
 5. "Civilisation: Ancient Treasures from the British Museum", Lemel, September, 1990, pp.14.
 6. "Gold and Silversmiths Guild of Australia", JMGV, No. 51, July 1988.
 7. "Diamond Valley Art Award - Metal Section", JMGV, 1986.
 8. "Hallmarking", Lemel, Vol. 1, No. 4, June 1982.
 9. "Essential Accessories", JMGV, October 1991, p.5.
 10. "First Australian Jewellery Contemporary Jewellery Biennial 1991", JMGV, June 1992.
 11. "Contemporary Hollow Ware", Lemel, June 1992.
 12. "The Significance of Double Row Granulation from Palestrina", Jewellery Studies 5 1992, Society of Jewellery Historians. London.
 13. Jewellery Philosophies, Robert Baines (ed). A series of seminars, JMGV, Melbourne, 1992.
 14. "Technical Decisions in the Gold Cylinders from Praeneste", Outils et Ateliers D'Orfevres 5000-1600 AD, Musée des Antiquités Nationales Saint-Germain-en- Laye, France, 1993.
 15. "Luring the Body : New Marks", Craft Victoria, pp.15-17, Vol. 23, No. 222, December/January 1993/4. Lemel, p.12, Summer 93/94.
 16. "Tools and the Historical Materialist : Tools of the Trade", Craft Victoria, pp.16-18, Vol. 24, No.225, Spring 1994.
 17. Adventures of the Archegos, Lauraine Diggins Fine Art Pty Ltd, North Caulfield, 1992.
 18. "The Adventures of the Archegos", conference paper, "Religion, Literature and the Arts", M.Griffith and R.Keating ed., Australian Catholic University, Sydney.
 20. "Journey into Technologia", Object, H.Zilco (ed)., issue 4.94, New South Wales Craft Council.
 21. "Fluid Mechanics", Craft Victoria, 1995 (Forthcoming).
 22. Lemel, Robert Baines, editor, Journal of the Jewellers & Metalsmiths Group of Australia. Commencing 1995. Editorials: "Search and Research", Summer, 1995- 6; "Jewellery Needs no Justification", Autumn, 1996; "Reworking the Object", Winter, 1996; Summer, 1996-7, "Naming the Maker" Autumn 1997; "To Fuse or to Refuse: That is the Answer" Winter 1997; "Questions on Showing", Spring/Summer 1997; "Taking in the Periphery", Autumn 1998.
 23. "Double Row Granulation from the Orientalising Period", Lemel, Summer edition,1996, pp. 10-14
 24. "A Standard Cut-Donna Brennan", Object, I Were (ed).,issue 1.97, New South Wales, pp. 34-35.
 25. "The Intervention of Red", The Intervention of Red, Melbourne, 1997.
 26. Researching the Hidden and the Revealed", Knowledge Makers, S. Attiwell(ed.),Craft Victoria, 1998, pp.45-53.
 27. "Technical Antecedents of Early Hellenistic Disc and Pendant Ear Ornaments", The Art of the Greek Goldsmith, D. Williams (ed.), The British Museum, 1998, pp.122-126.
 28. "Research Peripheries and Some Recent Applications", Lemel, Autumn Edition, 1998.
- he Intervention of Red", Spirit of Place: Source of the Sacred? Australian International Religion, Literature and the Arts Conference Proceedings, M. Griffith & J. Tulip (ed), Australian Catholic University, 1998, pp.110-112

- Jewellery Philosophies: Contexts of working 1999, Robert Baines (ed.) JMGA Vic, 1999
- "Food", Exhibition review, Craft Vic vol.30 no.239 1/2000 pp. 32,33.
- 32 "Reconstruction of Historical Jewellery and its Symmetry with the Contemporary Document", Symmetry, International Society for the Interdisciplinary Study of Symmetry Conference Proceedings, (ed.) College of Fine Arts, UNSW, July, 2001
- 33 Cosmic Reciprocity", The Jewelry of Karl Fritsch O Book Publisher, Amsterdam 2001.
- 34 Balcony: The Subconscious in Jewellery" Nocturnos, International Jewellery Colloquium, Estonia, Sept. 2001
- 35 "Standing Up for Jewellery", Craft Arts International, no.54, 2002
- 36 "Debbie Sheezel: Mappings of the Heart", Craft Arts International no.58, 2003
- 36 Melbourne International Mokume Symposium and Exhibition,, Robert Baines (ed.) Melbourne, RMIT Publishing, 2003
- 37 Bogus or Just "Played With", Inherited Futures, Conference Proceedings R. Baines and S. Errey (ed.), JMGA(Vic), Melbourne Feb. 13-15 forthcoming
- "The Authentic and the Altered", Postgraduate Book 2004, RMIT University Press 2004
- "Partyline" RMIT University Press 2004
- "LOOK KOOL", Gold and Silversmithing Graduate Book 2004, Robert Baines (ed.) RMIT University Press 2004
- 40 "Vicky Shukuroglou: ALT" Object Magazine 4, p. 45
- 41 Antipodean Recorder Melbourne, 1980-1981 Deutsches Blockflötenmuseum, 2004

SELECTED CITATIONS IN TECHNICAL JOURNALS

- Etruskische Granulation Eine antike Goldschmiedetechnik, Gerhard Nestler-Edilberto Formigli, Nouvo imagine editrice, Ausgabe, 1993, p.93
- Silver, History and Design, Pillippa Glanville, Victoria and Albert Museum, London, 1996, p. 80.
- The Manufacture of Ancient Beaded Wire: experiments and observations, Niamh Whitfield, JS, vol.8, pp.57-86
- The Tomb of Three Foreign Wives of Tutmosis III, Christine Lilyquist, MMA, 2003, see index.

CATALOGUE ESSAYS AND REVIEWS

- "Secrets of Gold", Innovation@ Work, RMIT University, December, 1997.
- "Architecture For The Body", Fusion, catalogue of Kathryn Wardill, RMIT University, December, 1997, p.5
- Demi Parure, Foreward to RMIT Graduate catalogue 1999
- ART□FACT, Immigration Museum, November, Melbourne, 2000
- " Travelling with Loose-ID ", Foreward to Loose-id, CD ROM Catalogue, 2001
- LEAF, Graduate exhibition, Gold Treasury Museum, 2002
- In the Drawer, Craft Victoria, catalogue of Kirsten Haydon, 2002
- "Ad Astra per Aspera", Gold Treasury Museum, Melbourne, 2003
- CAD is not a Castaway, catalogue of Nicole Jacquard, 2004
- Housing the Memory, catalogue of Katherine Bowman, 2004
- Body-Vessel-Landscape: The work of Vito Bila, catalogue of Vito Bila, 2005

CHURCHILL FELLOWSHIP STUDY, 1979

1. Athens, National Museum - Strathatos Collection, Benarki Museum
2. Rome, Villa Giulia, Museo Della Terme, Pigorini Museum
3. Florence, Museo Archeological

4. Hamburg
Museum for Kunst und Gewerbe
5. Munich, Antikensumlungen
6. Pforzheim, Schmuckmuseum
7. England, British Museum, Fitzwilliam Museum – Cambridge, Victoria and Albert Museum
8. Brooklyn, U.S.A., Brooklyn Museum
9. Boston, Boston Museum of Fine Arts
10. Richmond, Virginia Museum of Fine Arts

To undertake a study in Europe and the U.S.A. of the fine Metalwork of the Ancient Greek and Etruscan goldsmiths and the method of Granulation in particular, in order to apply such techniques to the artistic expression of the ancient, but timeless quality of the Antipodes.

APPOINTMENTS

- 1975 Founder and co-convenor, Craft Workers Guild of Australia.
- 1977,1983 Selector and advisor of acquisitions at the Diamond Valley Art Award;
Metal Section.
- 1984 Invited to Advisory Committee for the accreditation of the Associate Diploma in Jewellery and Silversmithing at the South Australian College of Advanced Education.
- 1992-5 External Examiner, Undergraduate and Higher Degrees, Monash University, Faculty of Art and Design.
- 1995 Panel Chairperson, committee member, JMGA National Conference, Melbourne.
- 1986 Lecture: "Etruscan Goldsmithing", San Diego State University, San Diego, California.
- 1991,1993 Lecture: Wangaratta College of TAFE, Victoria.
- 1989 Lecture: "Etruscan Goldwork", Carrington Polytechnic, Auckland, New Zealand.
- 1989 Lecture: "Contemporary Jewellery", Otago Polytechnic, Dunedin, New Zealand.
- 1994 Lecture: "Granulation Applications", Central Saint Martins College of Art and Design, London.
- Lecture: "Own Work", Royal College of Art, London
- 1995-1998 Editor of Lemel - national journal of the Jewellers & Metalsmiths Group of Australia.
- 1996 Lecture: Central St Martins, Royal College of Art, London.
- 1997 Lecture: "Contemporary Goldsmithing and Archaeological Research" Fine Art jewellery classes at New York University, New York, April 28 and May 7.
- Lecture: "Personal Goldworks", The Fashion Institute of Technology, New York, May
- 1998 Lecture: "Research and The Intervention of Red", University of New South Wales, 1st June.
- 1998 Lecture: "AAA.....REDEVENT", Academy of Fine Arts, Prague, Czech Republic,
- 1999 Lecture: "Own Work", La Salle-SIA, Singapore
- Juror, "Contemporary Wearables", Toowoomba Regional Gallery
- 2002 Invited speaker, Contemporary Wearables, Maroondah Art Gallery, Melbourne.
- 2002 Invited speaker, Oba lala, First Site Gallery, Melbourne.
- 2002 Invited speaker, Out of the Drawer, an exhibition by Kirsten Haydon, Craft Victoria
- 2002 Invited speaker, Pearl Gillies, Craft Victoria
- 2003 Judge and selector of acquisitions, "Contemporary Wearables 2003," Toowoomba Regional Art Gallery
- 2002-03 Chairman, Melbourne International Mokume Symposium and Exhibition, Melbourne, RMIT University
- 2003 Chairman, Jewellers and Metalsmiths Group of Australia International Conference, Melbourne Feb. 13-15

MAJOR PUBLIC LECTURES

1. "Jewellery, Manufacturing and Design"

Australian Institute of Metal Finishing, Clunies Ross House, Melbourne, 29 May 1983.

"Greek and Etruscan Gold"

National Gallery of Victoria, Melbourne, 9 March 1983.

"The Art of the Renaissance Goldsmith"

National Gallery of Victoria, Melbourne, 24 October 1984.

"Technical Forms of the Etruscan Goldsmith"

Museum of Victoria, Melbourne, 17 September 1986.

"Robert Baines - Goldsmith"

J. M.G.V., Melbourne, September, 1987.

"Ancient Irish Gold: The Materials and Technology"

National Gallery of Victoria, Melbourne, 22 June 1988.

"The Gold of the Pharaohs: The Egyptian Goldsmith"

J.M.G.V., Meat Market Craft Centre, Melbourne, 10 May 1989.

"The Ancient Goldsmith: Reference. An Expression of a Deity"

Auckland City Art Gallery, 13 September 1989.

10. Dunedin Public Library, 4 October 1989.

The Waikato Museum of Art and History, 31 October 1989, New Zealand.

"An Historical Survey of the Goldsmith"

National Gallery of Victoria, 18 April 1990.

"Civilisation; Ancient Treasures from the British Museum"

Lecture series No. Fifteen. "Buried Riches; The Oxus Treasure"

"Technology: The Ancient Goldsmith"

Australian National Gallery, Canberra, 17 May 1990.

"Ancient Gold Technology"

Museum of Victoria, Melbourne, 8 July 1990.

"Metallic Hollow Ware: Egyptian to Post Modern"

National Gallery of Victoria, 12 August 1992.

"Word Action Artefact: Worship"

Annual General Meeting Celebration Arts, St. Johns Southgate, Melbourne,
1 September 1995.

"Diffusion Bonding in Goldworks of the Classical Era"

Museum Research Fellows Colloquia, The Metropolitan Museum of Art , New York, USA,
1 May 1997.

"Etruscan Goldsmiths: Troubleshooters of Diffusion Bonding"

The Institute of Fine Arts, New York University USA, 5 May 1997

20. "Jewellery Making in Ancient Times"

The Sherman Fairchild Center for Object Conservation, The Metropolitan Museum of Art, New York,
USA, 20 May 1997.

"Research of Ancient Gold"

The Knowledge Makers Forum, Craft Victoria, Royal Society, 19 July 1997

"Etruscan Goldwork-The Finest in Antiquity"

Monash Friends of the Australian Archaeological Institute at Athens, Monash University, Clayton, 29
October 1997

"The Rigg Award: Contemporary Metalwork."

National Gallery of Victoria, 8 November 1997.

"Concepts and Technology of Contemporary Hollowware"

National Gallery of Victoria, 11 November 1997.

Innovation Lecture "Gold", Celebration of Innovation & Research at RMIT, RMIT Storey Hall, 2
December 1997.

"Ancient Jewellery Manufacture", Dutch Institute Cultural Heritage, Amsterdam, 19 June 1998

SKILL : A question of process, Craft Victoria, Melbourne, 8 May 1999
 "Gold Treasures of the Etruscan, Greek and Romans", Sunday Forum, in conjunction with the exhibition Ancient Lives: Greeks, Romans and Etruscans, National Wool Museum, Geelong, 03 October, 1999
 30 "Manufacture of Hellenistic Egyptian Goldworks", Museum Research Fellows Colloquia, The Metropolitan Museum of Art, New York, USA, 11 April, 2000
 "Reading the Artifact", Winter School Lecture Series, RMIT University, School of Art, 5 July, 2000
 "Bloodier than Black-Survey", Germany and Australia Seminar, Art Gallery of South Australia, 9 March 2001
 "Balcony: The Subconscious in Jewellery," Keynote speaker Nocturnos, International Jewellery Colloquium, Estonia, Sept. 2001
 "The Authentic Fake", Sydney College of the Arts
 "The Authentic Artifact and the Destruction of History," Radio Theatre, RMIT University, 19 September 2001
 "Authoring the Artifact," Postgraduate Winter school, RMIT, July 2003
 "Pettus või lihtsalt mäng?", Eesti Kunstiakadeemia, 28 April, 2004
 "Unecht Oder'Nur Verspielt'" at the international jewellery survey Schmuck 2005 Awards, at the Handwerkskammer für München und Oberbayern Munich. 12 March
 "Bracelet'Java-la-Granda'", opening speaker, Ars Ornata Europæa X, Museu Nacional de Arte Antiga, Lisboa, 7 July 2005

SEMINARS, SYMPOSIA & WORKSHOPS:

1. Presented Paper: Latrobe University Christenson Collection, RMIT Faculty Gallery. May 2 1988. Title: "Coptic Crosses"
2. Convenor: Jewellery Philosophies 1, Introduction: "A Jewellery History" 21 March 1990", Meat Market Craft Centre, Melbourne.
3. Convenor: Jewellery Philosophies 2 Introduction: "Reference: Vantage Points"
- 4 18 July 1990, Meat Market Craft Centre Craft Centre, Melbourne. Conducted Workshop: "Ancient Concepts - Contemporary Contexts", National workshop, The Waikato Polytechnic, Hamilton, New Zealand, September 22-24 1989.
4. Presented Paper: "Fifth International Symposium on Jewellery Studies", The Society of Jewellery Historians, Burlington House, Picadilly, London, 1990. Title: "The Significance of Double Row Granulation from Palestrina",
5. Presented Paper: "Outils et Ateliers D'Orfevre 5000-1600 AD" Technical Decisions in the Gold Cylinders from Praeneste, Musee Des Antiquites Nationales, Saint-Germaine-en-Laye, France.
6. Convenor: Jewellery Philosophies 3 August 14 1991, Meat Market Craft Centre, Melbourne.
7. Convenor: Jewellery Philosophies 4 June 17 1992, Meat Market Craft Centre, Melbourne.
8. Conducted a "Gold Granulation" workshop: "Ancient Jewellery and Archeology", Indiana University, Bloomington, USA, September 30 1991.
9. Conducted a one day seminar: "Ancient Jewellery Identified" Royal Melbourne Institute of Technology, July 6 1992.
10. Presented Paper: The First International Australian Conference on "Religion, Literature and the Arts", Australian Catholic University, Sydney. Presented a paper: "The Adventures of the Archegos", January 15 1994.
11. Presented Paper : Institute for Theology and the Arts, Summer School, North Parramatta, January 13 1994. Title: "Object and Meaning"

12. Presented Paper: "The Art of the Greek Goldsmith" international conference at the British Museum 4th-6th October 1994. Title: "Technical Antecedents of Early Hellenistic Disc and Pendant Earrings"
13. Forum convened with Susan Cohn, one of four speakers: "Temporal/Temple : Jewellery", Casey Plaza Lecture Theatre, RMIT, April 1993.
14. "Jewellery Workshop" Lasalle-SIA, Singapore, 1994, 1995, 1996, 1999, 2000
15. Four part seminar: "Art and Culture", Whittlesea Uniting Church, Whittlesea, September 1995.
16. Lecture and Seminar, at the Akademie der Bildenden Künste, München, February 1997
- Presented Paper: Celebration of Innovation and Research at RMIT, RMIT Bundoora Campus, December, 1997. Title: "Bronze Age Gold in the Classical Era",
18. Jewellery Workshop 'jewellery making in ancient times' Sherman Fairchild Center for Object Conservation, Metropolitan Museum of Art in NY, May 20, 1997
19. Presented Paper: Fifth International Australian Conference on "Religion, Literature and the Arts", Australian Catholic University, Sydney. Presented a paper: "The Intervention of Red", 30th May, 1998.
20. Conducted Seminar: "Ancient Jewellery Identified", lectures : Ancient Jewellery Types, Manufacture of Ancient Goldwork, Identifying Fakes, Brisbane City Hall, 3 October, 1998.
- Presented Paper: World Archaeological Congress No4, University of Cape Town, South Africa, 14 January 1999. Title "The Laboratory Reconstruction of some Etruscan and Greek Goldworks".
22. Symposium Convenor: Jewellery Philosophies 5, April 22, 1999, Metro Craft Centre, Melbourne.
23. Presented paper Winter School, RMIT
24. Jewellery Workshop 'Vessel Making: High Raising and Sinking' Sherman Fairchild Center for Object Conservation, Metropolitan Museum of Art in NY, May, 2000
- presented Paper: Visual Communication: Rhetorics and Technologies, Rochester Institute of Technology, Rochester, New York. April, 2001 Title "Reading the Artifact"
- symposium Convenor: Jewellery' Philosophies 8', 2001, Metro Craft Centre, Melbourne.
- Artists Workshop "Reading the Artifact", Goulburn and North East Art Alliance, Wangaratta, August 17-20
28. Presented Paper: ISIS SYMMETRY, International Society for Interdisciplinary Study of Symmetry. University of New South Wales, Sydney. Aug. 2001 Title "Reconstruction of Historical Jewellery and its Symmetry with the Contemporary Document"
- presented Paper: 'NOCTURNOS', International Jewellery Colloquium, Tallinn, Estonia. Sept. 2001 Title: "Balcony: The Subconscious in jewellery"
- Jewellery Workshop 'Goldschmiedspiele', Sommerakademie für Bildende Kunst, Neuburg an der Donau, Germany, 4-17 August 2002
- Symposium Convenor: 'Jewellery Philosophies 10', 14 Sept. 2002, Metro Conference Room, Melbourne.
- Symposium Convenor: 'Artefact and the Expression of Belief' Kaleide Theatre RMIT, August, 2002
- Forum Speaker, 'Dutch Jewellery' Forum, RMIT Gallery, February 2002
- 34 Jewellery Workshop 'Granulation and the Hearth Fire' Sherman Fairchild Center for Object Conservation, Metropolitan Museum of Art in NY, May, 2003
- 35 Forum Convenor, 'A Tiara for Maxima,' Speaker Panel, Yvonne Joris (Netherlands), Susan Cohn, Mascha Moje, Robert Baines. Gold Treasury Museum, Melbourne, 12 September, 2003
- 36 Granulation Workshop in conjunction with JMGA (Vic) International Conference, Melbourne, RMIT University Feb. 17-19, 2004
- 37 Master Class workshop, 'Filigree', Eesti Kunstiakadeemia, 28 April, 2004

EXHIBITIONS CURATED MANAGED

- 1992 "Designer Cutlery from Germany and Australia", Craft Council of ACT/Goethe Institute Australia Council, Storey Hall, Melbourne.
- 1994 "9 LIVES", Customs House, June, Melbourne.
- 1995 "The Beast Won't Sleep", 300 Russell St, Melbourne.
- 1996 "TOY TO TOY", Customs House, June, Melbourne.
- 1999 Demi Parure, Reserve Bank, Melbourne
- 2000 ART□FACT, Immigration Museum, November, Melbourne, 2000
- 2001 Head Heart Hand, Reserve Bank, Melbourne
- ART□FACT, Immigration Museum, November, Melbourne???????
- 2002 LEAF, Graduate exhibition, Gold Treasury Museum, 2002
- 2002 "Melbourne International Mokume Symposium and Exhibition", Project Space, RMIT University, Melbourne
- 2003 "Ad Astra per Aspera", Gold Treasury Museum, Melbourne
- 2003 "The Magic Touch", Survey exhibition of Gerd Rothmann.RMIT Gallery, Melbourne. Import from Munich return to Munich.
- "View from America: Contemporary Jewelry (1974-2003)" Gold Treasury Museum, Melbourne. Import from Philadelphia return to Philadelphia.

8. THE RESEARCH PROPOSAL

TITLE OF PROJECT:

The Reconstruction of Historical Jewellery and its Relevance as Contemporary Artefact

SUMMARY OF PROJECT:

The dating of ancient jewellery is given by the archaeological context. Technology applied by the ancient goldsmith is traceable through archaeometallurgy. The aim of this research is to analyse historical jewellery and to construct copies based on the known technology of the era. Resultant laboratory constructions with their historical correctness will then be available for reworking to convey a contemporary visual relevance and a statement of history. The results of these analyses and reconstructions will form the basis of metalwork objects in which contemporary aesthetics are informed by historical practice.

Background

Scientific examination of historical jewellery has its genesis in the nineteenth century. Although chemical analysis of objects was carried out, assemblage and configuration became a major interest. This was the catalyst responsible for the archaeological revival jewellery of the second half of the nineteenth century. These early enquirers were mostly practical jewellers with a knowledge and understanding of metalsmithing processes. In Italy the two Castellani brothers Alessandro and Augusto inherited from their father the business practice of goldsmithing as well as antiquarian pursuits.¹⁵⁴

Between 1910 and 1925 the German dealer and collector Marc Rosenberg published major studies in ancient goldsmithing technologies.¹⁵⁵ Caroline Ransome Williams' 1924 catalogue of the collection of the ancient Egyptian goldworks then in the collection of the New York Historical Society provides a combination of technical information and replication experiments particularly in the making of ancient wire and granulation. Included in the survey are some of the earliest published microphotographs identifying ancient gold manufacture.¹⁵⁶ The catalogue *Greek Gold* concerning the high Classical era has a very important introduction identifying alloying by X Ray fluorescence in the goldsmithing of Greek jewellery.¹⁵⁷

Joining characterization needs specific methods. With electron microprobe, analyses can be made on the object but are more often made on a sample. This results in a limited number of tested joins. Parrini¹⁵⁸ at al published information on a cylinder from Marsiliana d'Albegna in 1982 and more recently Duval and Eluere in 1989.¹⁵⁹

¹⁵⁴ G. Munn, (1984), see also K. Snowman, (1989) 10-15.

¹⁵⁵ C. Rosenberg, (1918) 28-41.

¹⁵⁶ C. R. Williams, (1924) 1-160.

¹⁵⁷ H. Hoffman and P. Davidson, (1969) 18-49, *The Technical Introduction*, by Davidson has one of the earliest published analyses of gold objects by XRF determining gold, silver and copper alloys. William J. Young of the Museum of Fine Arts, Boston, carried this out.

¹⁵⁸ Parrini, P. *et al*: 'Etruscan Granulation: Analysis of Orientalising Jewellery from Marsiliana D'Albegna', *AJA*, 86 (1982), pp.118-121.

¹⁵⁹ Duval, A.R. *et al*: 'The Use of Scanning Electron Microscope in the Study of Gold Granulation', *Archaeometry* (1989), pp.325-333.

Analysis and Reconstruction

In particular ancient jewellery, the decorative configurations that accumulatively mark their style can also be regarded as a consequence of technology. Their placement and relationship to each other is in part a testimony to the joining technology carried out by the goldsmith.¹⁶⁰ The aim of this research is to identify the mode of joining first by visual inspection, as observation of contact points reveal the characteristics of particular heat systems of joining. Further identification will be made by comparing the joined core by qualitative analysis with the substance of the joining material using an energy-dispersive x-ray fluorescence spectrometer. An objective in such methodology is to articulate metal analysis and define its contextual meaning with regard to the period of gold technology of the Classical Era. Laboratory reconstructions will be based on the known technology of this period.

A further objective is to identify worked surfaces and structures and place them in a technological and chronological context. Such evidence can also develop the source and location of theories of manufacture.

Following selection of jewellery types predominantly from the Classical era, observation with microscope and the compiling of working drawings for developing strategies of analysis will be made. Scanning Electron Microscope (SEM) will further identify manufacturing idiosyncrasies and surface and sub surface analyses of alloys will be carried out.

The same scrutiny will be made of laboratory samples for comparative analysis. This provides a vantage point to consider the broad manufacturing aspects of sheet, wire and granules.

Series of drawings will be made of selected artefacts depicting possible sequence of assemblage based on the copper salt diffusion joining system. The drawings will be used as maps for the scanning microscopy. The Energy Dispersive Spectrometer (EDS) elemental analyses of artefacts and samples identify surface and subsurface alloys and this is integral to the research and discussions. Using the SEM, markings and structures indicating manufacture of the decorative components will be observed and photographed. This visual information on surfaces can reveal sequence of assemblage and identify goldworking methods.

Applications

Samples will be made replicating artefacts by means of goldsmithing skills based on typical technology of the same era

The laboratory constructed samples will be available for reinterpretation. The pieces will be reworked and physically changed in response to the inclusion of contemporary materials. Found object and modern materials placed into the previously historically correct jewellery will interfere and confront the previous orthodoxy of the jewellery object.

What was once historically correct will become stylistically distorted. The jewellery objects having been interfered with will offer a new experience of jewellery as a historical document.

Research Questions:

In what ancient jewellery types is style or placement of iconographic forms as much a consequence of technology as the stylistic genre of the day?

¹⁶⁰ The stylistic configuration of the most complex goldworks can be characteristic of the diffusion bonding system. This theory was first presented by the author at the international conference *The Art of The Greek Goldsmith* held at the British Museum in October 1994.

What new knowledge of technology and modification of current theories can be gleaned from laboratory reconstruction of historical goldworks?

Is it possible to construct artefacts that are stylistically, chemically and methodologically conformable to ancient examples?

How can my work express aspects of the knowledge gained from analysis and reconstruction in contemporary jewellery and object using both historic and current forms and materials?

Rationale

Laboratory reconstruction and the making of copies of these particular jewellery types have a number of attributes. Principally it tests assumptions and theoretical strategies of working of the ancient goldsmith. Laboratory reconstruction, based on a putative sequence of assembly with the copper salt diffusion joining system is a recent development in the enquiry of jewellery history. Dr. Joan Mertens of the Metropolitan Museum in New York in correspondence to the Fulbright Review Committee "To my knowledge, Mr. Baines is the only person who is focussing specifically on the process of construction of ancient jewellery and the degree to which technical factors determine the appearance of the finished object. His research is revealing that features generally interpreted on stylistic or artistic grounds in fact are determined by the technological requirements of goldworking"(07-08-95).

Added to this, in some instances the observation of stylistic configurations determined by technical factors of gold works suggests the using of the copper salt diffusion joining system. In correspondence to the Fulbright Review committee on this subject Barbara Deppert-Lippitz wrote, "His (Baines) articles on the gold cylinders from Praeneste, published in 1992 and 1993, have set a completely new standard in the scientific as well as in the art historical analysis of ancient jewellery. For about 30 years most of the research on ancient goldsmithing techniques has been quite repetitive. Mr. Baines' work was the only remarkable exception. His approach led to the discovery that in ancient goldwork stylistic features are often the result of technical necessities"(05-09-1995).

The documentation, exhibition, and publication of the research outcomes will increase awareness of jewellery knowledge to historians, jewellery conservators and jewellery practitioners.

By utilising this knowledge in my own work I will contribute to the evolution of contemporary metalwork which is both an expression of a current aesthetic and a transmitter of techniques and methodologies of past goldsmiths.

Methods

Location and Resources:

Laboratory based work will be conducted at the Gold and Silversmithing area of the Fine Art Department at RMIT, the Metropolitan Museum of Art in New York and within my own studio. The research will include access to Scanning Electron Microscope for qualitative analysis. The Faculty of Chemical and Metallurgical Engineering at RMIT together with the Scientific Research Laboratory at the British Museum and the Sherman Fairchild Center for Objects Conservation at the Metropolitan Museum will be the primary laboratories for this work. The author has had access to these facilities over a period of twenty years.

Jewellery subjects will be selected from museum collections within Australia and overseas. Some data gleaned from previous research including a four month Senior Fulbright programme will be combined with new knowledge collected.

Using museum contacts established over the past twenty years the research will be drawn from works in collections at the Villa Giulia and the Vatican Museum, Rome; the British Museum, the Victoria and Albert Museum in London and the Fitzwilliam Museum at Cambridge. The Staatliche Museum, The Antike Museum in Berlin (Charlottenburg) and The Antikensammlungen in Munich and The Museum für Kunst und Gewerbe in Hamburg in Germany will be other sources. In Athens the Benaki Museum and the Stathatos Collection in the National museum will also be other sources. In the USA the Metropolitan Museum of Art in New York, The Los Angeles County Museum and the J. Paul Getty Museum at Malibu collections will be considered.

Phase 1 : Investigate and collate existing data and drawings

Initial Resource Search
February 1999 – January 2000 (12 months)
Part-time study
Collate data and drawings

Phase 2 : Collection of data
February 2000 – May 2000 (4 months)
Full-time study
Commence fellowship study at the Metropolitan Museum of Art. Visit Brooklyn Museum, The Cleveland Museum, The Dallas Museum, The British Museum, Victoria and Albert Museum

Investigate catalogues and indexes in public collections.
Select and examine primary research material for analysis, considering technical factors. Formulate technical data file.
Compose technical and working drawings.
Decide on appropriate subject matter.
Carry out laboratory samples with note taking of laboratory findings.
Incorporate relevant information into the visual project.

Phase 3 - Analysis and Collation
June 2000 – May 2001 (12 months)
Part-time study

Analyse data and drawings.
Carry out appropriate laboratory test pieces with note taking of laboratory findings.
Consolidate technical data file.
Select appropriate subject matter.
Develop a body of visual artworks
Develop and consolidate written text for supervisors comment

Phase 4 - Consolidation
June 2001 – May 2002 (12 months)
Part-time study

Carry out laboratory samples with note taking of laboratory findings.
Consolidate technical data file.
Develop the body of visual artwork
Develop and consolidate written text for supervisors comment

Phase 5 - Review and Resolution
June 2002 – September 2003 (16 months)
Part-time study

Develop the body of visual artwork
Analyse, evaluate and refine visual research and written text.
Consolidate technical data file.
Provide written text to supervisors for comment
Selection and compilation of durable visual record.
Finalise presentation for examination in consultation with supervisors.

Phase 6 - Review and Resolution
October 2003 – November 2005 (26 months)
Part-time study

Develop the body of visual artwork
Analyse, evaluate and refine visual research and written text.
Consolidate technical data file.
Provide written text to supervisors for comment
Selection and compilation of durable visual record.
Finalise presentation for examination in consultation with supervisors.

9. APPENDIX A

Research Workshop and Seminar 'Vessel Making: High Raising and Sinking'
Sherman Fairchild Center for Object Conservation, Metropolitan Museum of Art in NY,
May, 2000



APPENDIX B

Research Workshop and Seminar 'Granulation and the Hearth Fire' 1

Installer's Workshop, Sherman Fairchild Center for Object Conservation, Metropolitan Museum of Art in NY, April, 2003





APPENDIX C

Research Workshop and Seminar 'Granulation and the Hearth Fire' 2

Installer's Workshop, Sherman Fairchild Center for Object Conservation, Metropolitan Museum of Art in NY, May, 2003









APPENDIX D

Robert Baines, Entdecker der antiken Goldschmiedetechnik Staatliche Antikensammlungen, München, 2004



Robert Baines
Entdecker der antiken
Goldschmiedetechnik

Eröffnung am Mittwoch,
21. April 2004 um 18.00 Uhr.
Robert Baines ist anwesend.
Dauer der Ausstellung
22. April bis 13. Juni 2004

Staatliche
Antikensammlungen

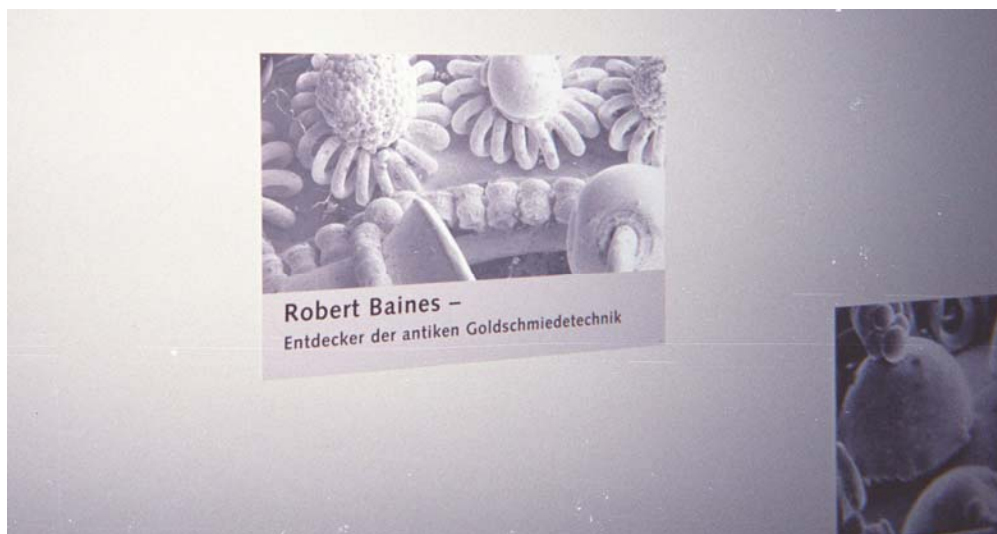
Königsplatz
München
Telefon 089/59988830
Di, Do - So 10 - 17 Uhr,
Mi 10 - 20 Uhr

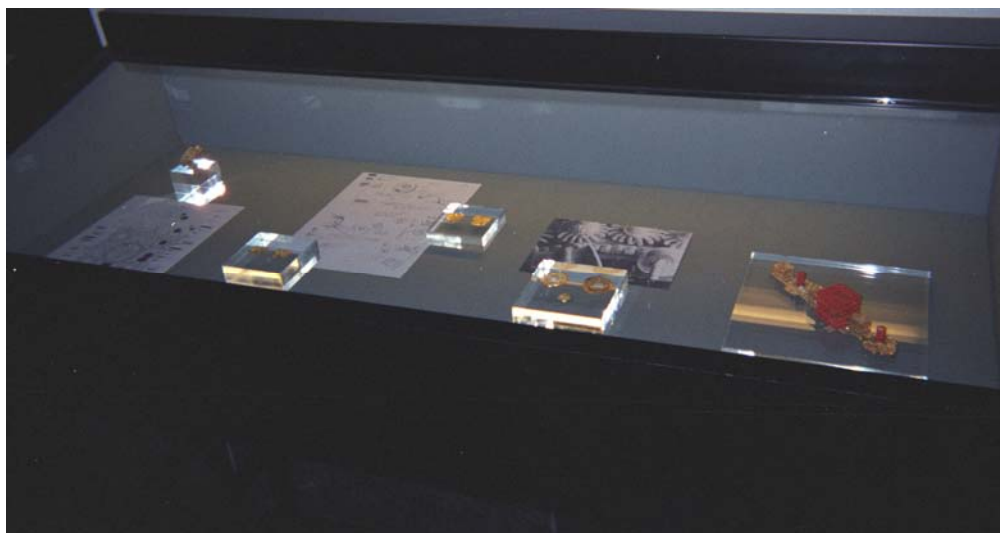
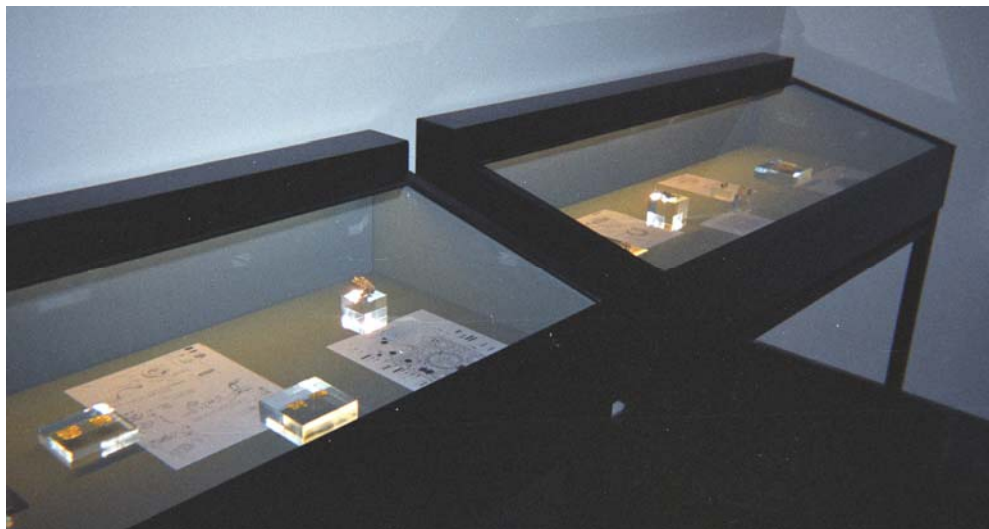
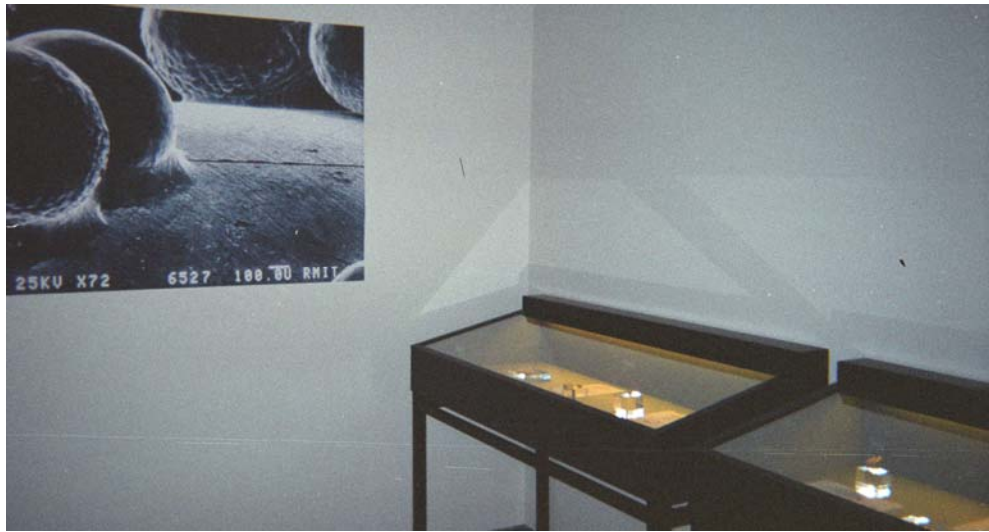
Robert Baines
Partyline

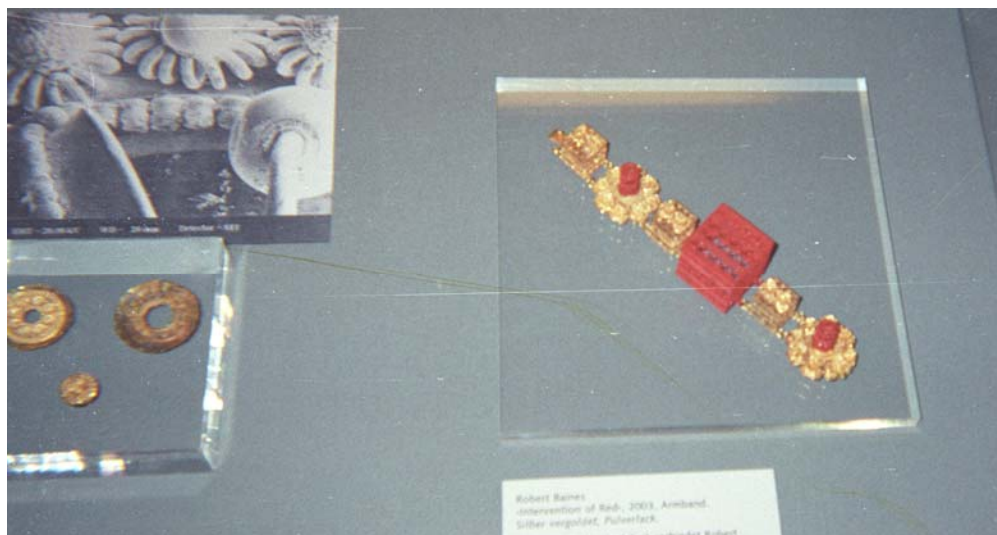
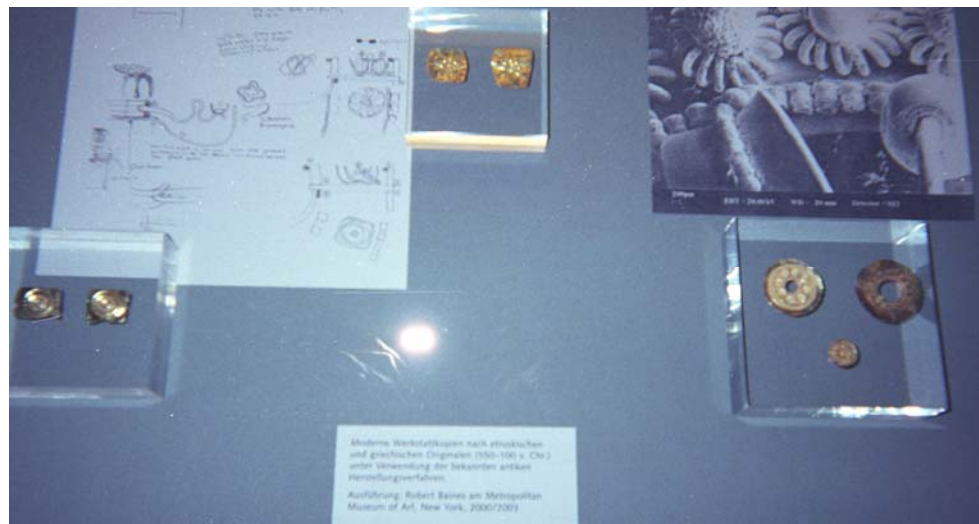
Eröffnung am Donnerstag,
22. April 2004 um 18.30 Uhr.
Robert Baines ist anwesend.
Dauer der Ausstellung
22. April bis 12. Juni 2004

Galerie Biró

Zieblandstraße 19
80799 München
Telefon 089/2730686
Di - Fr 14 - 18 Uhr,
Sa 11 - 14 Uhr
www.galerie-biro.de











Robert Baines – Entdecker der antiken Goldschmiedetechnik

Antiker Goldschmuck kann durch die Fundumstände, aber auch durch Eigenheiten des Stils datiert werden. Die Herstellungstechnik des antiken Goldschmieds lässt sich durch so genannte archäometallurgische Untersuchungen herausfinden.

Die zur Untersuchung ausgewählten Schmuckstücke stammen aus etruskischen und griechischen Werkstätten.

Zunächst werden die Originale unter dem Lichtmikroskop betrachtet und umgezeichnet. Diese Zeichnungen dienen als Grundlage für die Ausarbeitung einer Analysestrategie. Unter dem Rasterelektronenmikroskop (REM) lassen sich Merkmale der Herstellungsverfahren beobachten, aber auch Fragen zu den Metalllegierungen an und unter der Oberfläche beantworten. Während dieser Untersuchungsphase liefern die Zeichnungen die Orientierungshilfe – ähnlich einer Straßenkarte.

Besonders die Herstellungs Spuren der Verzierungselemente werden unter dem REM fotografiert und ausgewertet. Auf diese Weise kann die Montage der einzelnen Elemente, also die Arbeitsweise des Schmieds, rekonstruiert werden.











Die Frage nach der Art der Befestigung, die der antike Goldschmied bewacht hat, lässt sich nur durch die Untersuchung des Objekts, aber auch durch Überlegungen zu den physikalischen Anforderungen beantwortet werden.

Es gibt Hinweise dafür, dass der Goldschmied ein Schmiedeweise als einen Block geformt hat, auf dem diese Platte einsetzt ein festes, ungeschwächtes Fundament, das sich bei großen Arbeiten und Einwirkung von Wärme verformen lässt.

Verbleibt dürfen es auch Blockschmiede mit mehreren Schmiedestellen ansetzen, die wenigstens nicht in einem Kasten, sondern in einem Block geformt sind. Dies ist eine hervorragende Konstruktion. Die Goldschmiede werden in diese geschäftige Welt eingeführt, um Schmiedestellen und Schmiedeweisen zu entwickeln.





Goldschmieds nachvollzogen werden:

Da die Charakteristika der Arbeitsprozesse als Kriterien für die technologische und chronologische Einordnung der Schmuckstücke herangezogen werden, können nun auch Argumente für die Zuweisung zu einzelnen Werkstätten entwickelt werden.

Auf der Grundlage der zahlreichen neuen Erkenntnisse zu Techniken und Vorgehensweisen der antiken Goldschmiede konnte der Schritt gewagt werden, originalgetreue Repliken anzufertigen. Die Herstellung von Kopien hilft, die Überlegungen zu den antiken Produktionsverfahren zu überprüfen und zu erweitern.

Die zeichnerische und fotografische Dokumentation sowie die Goldschmuckrepliken wurden von Robert Baines in seinem Studio in Melbourne, Australien und anlässlich eines Forschungsaufenthaltes am Sherman Fairchild Center for Object Conservation am Metropolitan Museum of Art (MMA) in New York (1996–2003) durchgeführt. Besonderer Dank gilt Dick Stone, Dr. Joan Mertens und Dr. Dorothea Arnold (MMA). REM Aufnahmen wurden von Mark Wypyski (MMA) und Safa Shawan (RMIT University) durchgeführt.

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LABORATORY RECONSTRUCTION SAMPLES



1. Baule *MMA 95.15.139* Copy

2. Baule flat, *MMA 95.15.139* Copy



3. Baule Pair, *MMA 95.15.138 Copy*

4. Baule, *MMA 95.15.146 Copy*



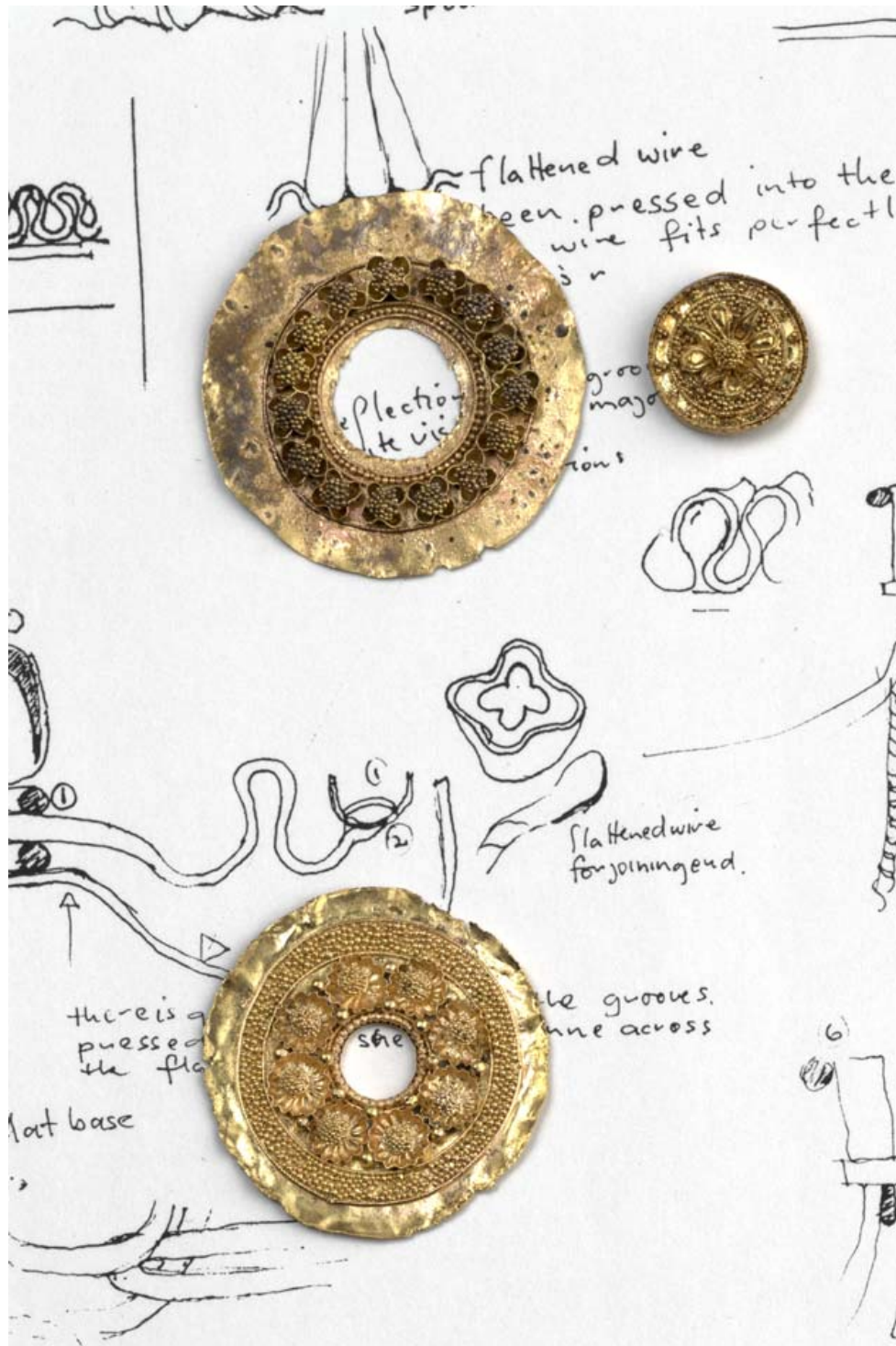
5. Egyptian Box Bead *MMA.23.2.42* Copy

6. Rosette samples pair

7. Disc samples pair



8. Baule Copy
39 x 27 x 20mm



9. Disc 15mm dia,
10. Disc open center 34mm dia.
11. Disc open center 37mm dia.



12. Disc open center, *MMA 30.225.30A*, Copy

2.1 THE INTERVENTION OF RED



Bracelet with Fire Car, circa.?, 2001,
Silver gilt, plastic cars
98 x 93 x 69 mm

National Gallery of Victoria



Chain Intervention of Red 2003,
Gold, plastic
650 x 13 x 47mm



Bracelet Intervention of Red 2003,

Silver-gilt powdercoat

205 x 32 x 32mm

Schmuckmuseum Pforzheim, Germany

2.2. Ferlini's Secret



Pin, 2001
Gold, silver plastic
68mm high



Neckpiece, 2004-5
Gold, silver plastic
240 x 28 x 21mm

2.3. The Saaremaa Brooch



A Brooch from Saaremaa
Bracelet from Saaremaa (?) 2002
Silver, gold, plastic car, metal car
105 x 75 x 68 mm



. Five Brooches from Saaremaa (?) 2003,
Silver, gold, plastic
54 x 36 x 8mm



Neckpiece from Saaremaa (?) 2002,3

Gold

140 x 270 x 12mm



Close UP
Neckpiece from Saaremaa (?) 2002,3
Gold
140 x 270 x 12mm



Bracelet from Saaremaa (?) 2004,
Gold, plastic car, metal car
75 x 47 x 62mm

Banyule City Council Collection

2.4. Bracelet 'Java-la-Grande'



Bracelet 'Java-la-Grande', 2004,5

India, Goa (Indo-Portuguese) (?)

Circa. Second quarter of the 16th century

Silver-gilt, iron, plastic, mahogany

99 x 7 x 89mm

5.REDLINE

Neckpiece, 2001,2

Silver, powdercoat
270 x 160 x 21mm

National Gallery of Victoria



Brooch REDLINE 2003, no.2,

Silver powdercoat
55 x 42 x 29mm

Brooch Whiter than Red 2004, no.1,

Silver powder coat
62 x 41 x 32mm



Pendant REDLINE 2003, no.1

Silver powder coat

74 x 80 x 42mm



Pendant REDLINE 2003, no.2

Silver powder coat

75 x 70 x 22mm



Pendant REDLINE 2003, no.5

Silver powder coat
78 x 59 x 59mm

Pendant REDLINE 2003, no.6

Silver powder coat
72 x 75 x 42mm



Pendant REDLINE 2003, no.7

Silver, plastic, powder coat

80 x 60 x 69mm

Pendant REDLINE 2003, no.8

Silver powder coat

41 x 35 x 35mm



Neckpiece, REDLINE 2003,
Silver, powder coat
290 x 290 x 30 mm



Neckpiece REDLINE 2003, no.1
Silver powder coat
315 x 195 x 25mm

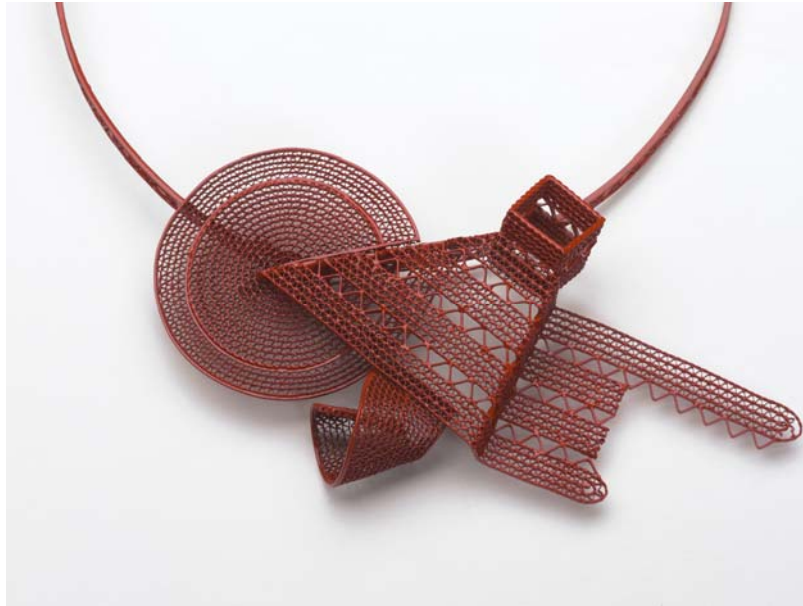


Pendant REDLINE 2003,
Silver gilt powder coat
70 x 70 x 45mm



Pendant REDLINE 2003, no.3
Silver powder coat
76 x 109 x 24mm

Pendant REDLINE 2003, no.4
Silver powder coat
80 x 60 x 40mm



Neckpiece REDLINE 2003, no.1
 Silver powder coat
 315 x 195 x 25mm



Neckpiece REDLINE 2003, no.2
 Silver powder coat
 240 x 170 x 46mm



Neckpiece REDLINE 2003, no.3
Silver powder coat
320 x 24 x 90mm

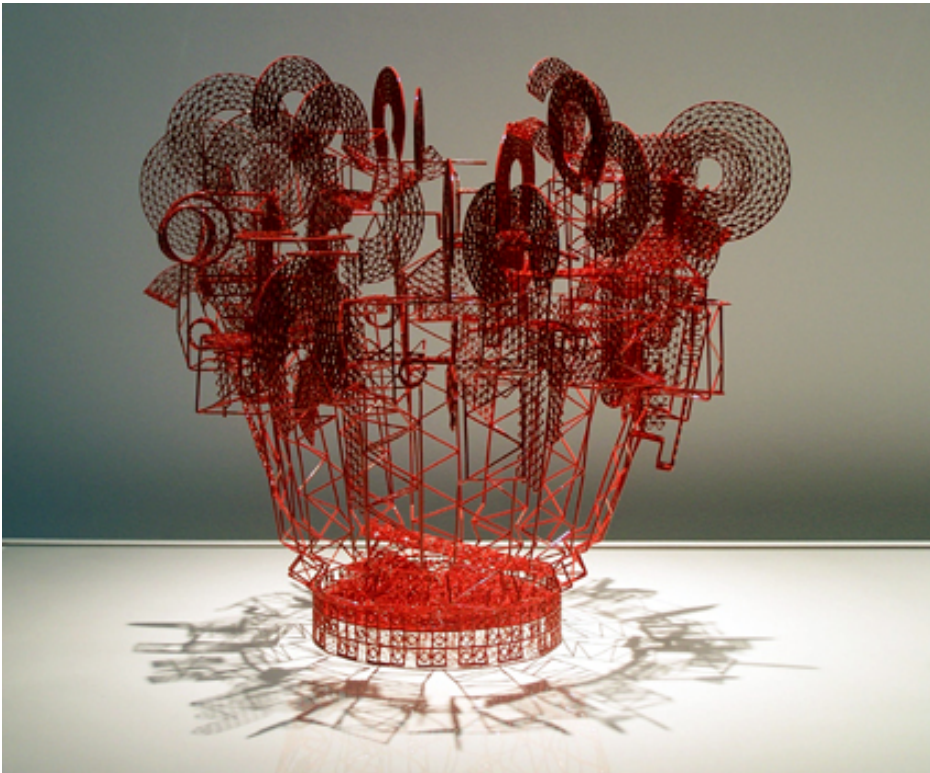


Five Brooches 2003
Silver, plastic, powdercoat
Smallest: 35 x 13 x 22mm
Largest: 54 x 45 x 28mm

6. A Vesseled History



**Philadelphia Centerpiece
Candlestand, 2001-2,**
Silver, silver-gilt, powdercoat
790 x 710 x 530mm
With Candle total height 1090mm



Philadelphia Centerpiece

Vase 2004-5

Silver, powdercoat
400 x 450 x 450 mm

Philadelphia Centerpiece

Tray 2005-6

Silver, plastic, Coca Cola crate, collected object, powdercoat
620 x 455 x 250 mm

A Vesseled History no.6, 2004

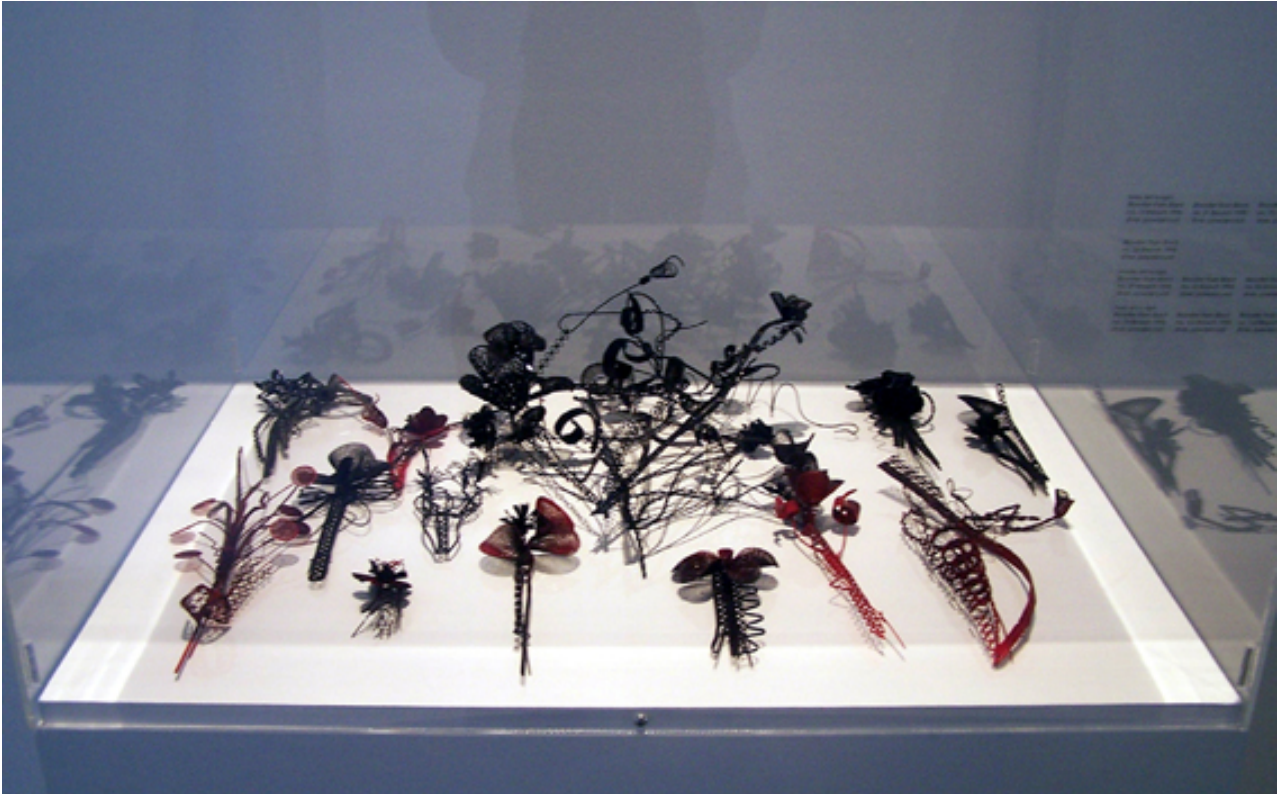
Gold, silver, powdercoat

Height

Weight 133.9 gms, box 77.3 gms, lid 56.6gms.

Private Commission

7. Bloodier than Black

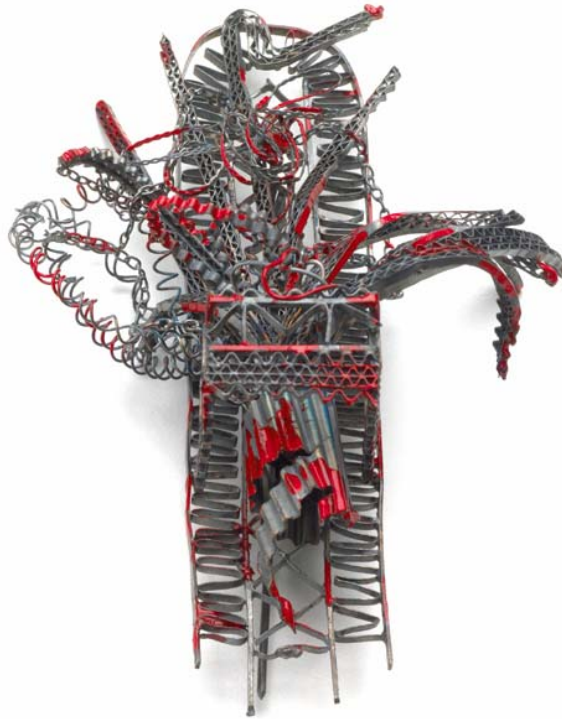


Wreath 1999, no. 75,
Silver, powdercoat
320 x 320 x 90mm

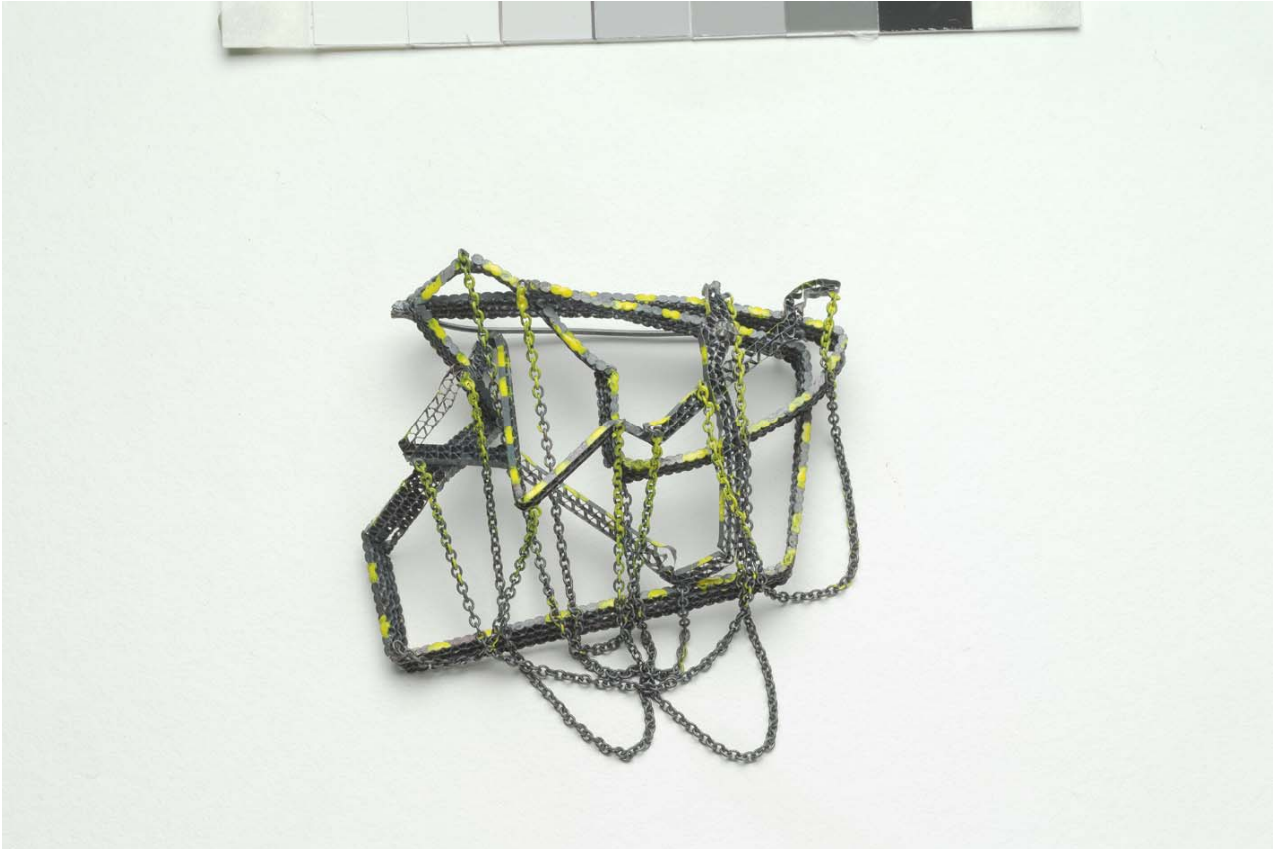


Brooch 1999, no.122,
Silver, paint
Helen Drutt Collection

Brooch 1999, no.123,
Silver, paint
100 x 67 x 31mm



Brooch 1999, no.124,
Silver, paint
92mm x 65 x 37mm



Brooch 2002, no.1,
Silver, paint
95 x 81 x 22mm

Brooch 1999, no. 82,
Silver, powdercoat
85 x 120 x 20mm



Brooch 2001,no.2

Silver, powder coat

172 x 149 x 44mm

Ville de Cagnes-sur-Mer, France



Brooch 2001, no. 5,

Silver, powdercoat
35 x 145 x 20mm

Brooch 2001, no. 8,

Silver, powdercoat
175 x 50 x 25mm



Brooch 2002, no.1,

Silver, powder coat
180 x 80 x 32mm

Brooch 2002, no.2,

Silver powdercoat
165 x 60 x 30mm

Brooch 2002, no.3, silver powdercoat

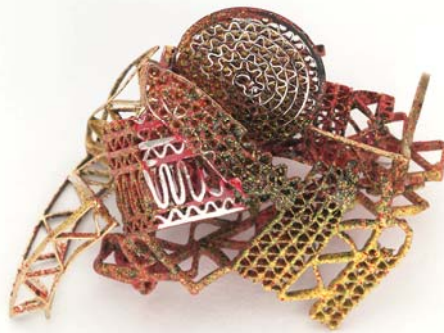
200 x 205 x 70mm





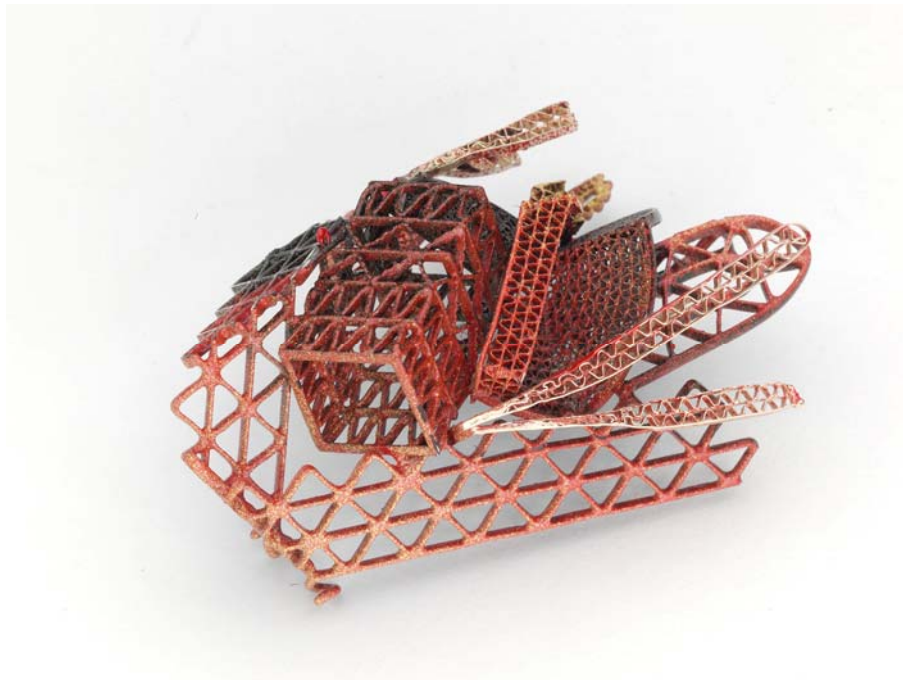
Brooch 2004, no.1, silver powdercoat
200 x 140 x 46

**Bayerische Staatspreis 2005 gold medal at the 57 Internationale
Handwerksmesse, Munich. Brooches nos.1-6**



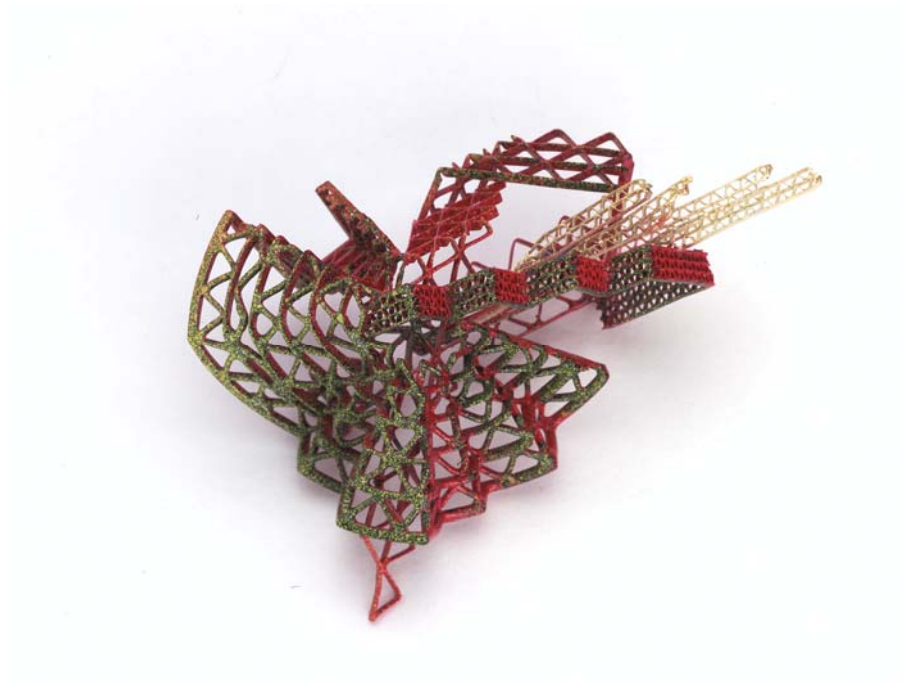
Brooch no.1, Bloodier than Black 2004

Gold, silver, powder coat
59 x 42 x 37mm



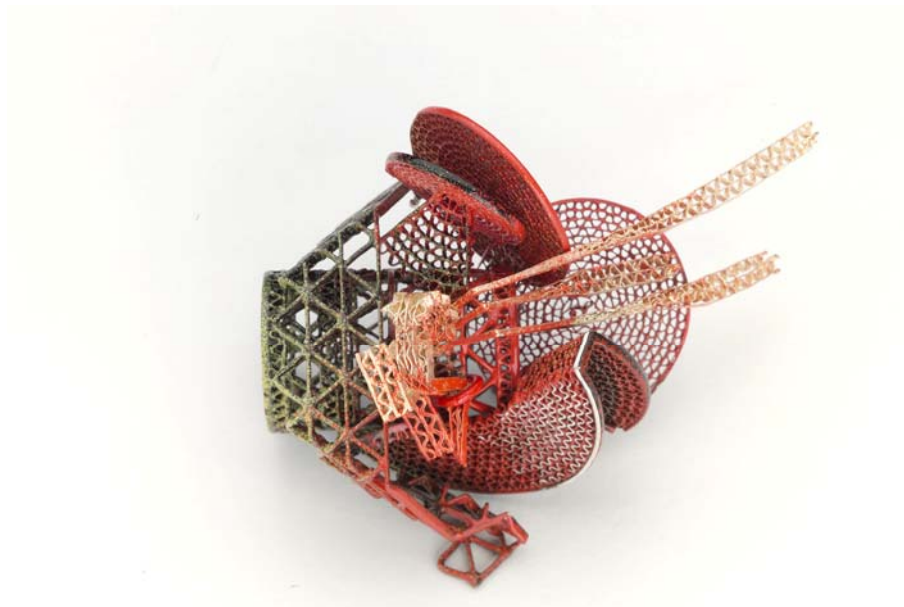
Brooch no.2, Bloodier than Black 2004

Gold, silver, powder coat
77 x 58 x 28mm



Brooch no.3, Bloodier than Black 2004

Gold, silver, powder coat
89 x 53 x 25mm



Brooch no.4, Bloodier than Black 2004

Gold, silver, powder coat
80 x 59 x 40mm



Brooch no.5, Bloodier than Black 2004

Gold, silver, powder coat

68 x 44 x 31mm



Brooch no.6, Bloodier than Black 2004

Gold, silver, powder coat

74 x 60 x 35mm

8. Meaner than Yellow



Pendant 2002, no.1,
Silver, powdercoat
90x100x35mm

Pendant 2002, no.2,
Silver, powdercoat
80x65x50mm

Pendant 2002, no.3,
Silver, powdercoat
62x65x45mm



Brooch 2002, no.10,
Silver, powdercoat
67 x 30 x 30mm

Brooch 2002, no.7,
Silver, powdercoat
75 x 42 x 20mm

Brooch 2002, no.8,
Silver, powdercoat
80 x 54 x 20mm



Brooch 2002, no.2,
Silver, powdercoat
68 x 30 x 15mm

Brooch 2002, no.3,
Silver, powdercoat
65 x 30 x 20mm

Brooch 2002, no.1,
Silver, powdercoat
80 x 35 x 27mm

9. Whiter than Red



Bracelet Whiter than Red 2004, no.1

Silver, plastic powdercoat
105 x 88 x 75mm

Bracelet Whiter than Red 2004, no.2

Silver, plastic powdercoat
120 x 82 x 85mm

Bracelet 2004 no.7

Silver
95 x 82 x 80mm

Bracelet 2004 no.9

Silver
148 x 148 x 37mm

10. Other Works



The Crinkle and Crankle of Water, 1999

Who has measured the waters in the hollow of his hand
And measured off the heavens with a span?
Fire causes water to boil –
He turned the waters into blood and
Now the water, yellow and black is bent and shaped.

The Crinkle and Crankle of Water, Yellow.

Brass, powdercoat
480 x 500 x 30mm

The Crinkle and Crankle of Water, Black.

Brass, powdercoat
640 x 640 x 40mm



Drummer's Gig 2000-2001,
Gold, silver, powdercoat and snare drum
250 x 390 x 390mm



Galerie Biró Ten Year Birthday, 2002
Gold, silver, plastic, powdercoat
145 x 95 x 30mm

Australia Council Emeritus Awards 2002



2002, Emeritus Medal William Wright,
Gold, silver, alloys



2002, Emeritus Award : Robert Owen
Silver, powder coat



Brooch ,2004

Australian Sapphires, fine gold, coloured gold , silver

56 x 50 x 20 mm

Private commission