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Die Granulation und ihre künstlerischen Interpretationen im Schmuck des 20. und 21. Jahrhunderts

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Master's Thesis

Granulation and its Artistic Interpretations in 20th and 21st Century Jewellery

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1 Research Question

Granulation is a 4500 year old goldsmithing technique[1] used in the ornamental decoration of metallic surfaces. Very tiny metal spheres, so-called granules of approx. 0.07 to 1 mm in diameter, mainly made of gold, are arranged on a recipient – a metallic substrate – and are metallically bonded with it through a soldering process, more specifically a welding process. The spheres appear to be resting on the workpiece with almost no connection to it. Incoming light is reflected, shining silkily, in all directions.

In this paper I focus my attention explicitly on goldsmiths who sought new artistic interpretations of granulation and represent unusual positions in the 20th and 21st century. Granulation works by three artists[2] from three generations, namely Elisabeth Treskow (Germany, 1898 - 1992), Robert Baines (Australia, *1949) and David Huycke (Belgium, *1967), are exemplarily presented. In addition, I examine the work of Christiane Förster (Germany, *1966) and Giovanni Corvaja (Italy, *1971), who won a Granulation Competition organized by the German Goldschmiedehaus in Hanau in 1996. I am interested in the way these goldsmiths[3] explored the possibilities of granulation, which has been passed on over thousands of years, in their work. I am also interested in the way they tried to translate the technique into a contemporary jewellery design language through very different approaches. I will try to work out and contextualize their conception of granulation by means of a technical and formal analysis of single works.

My paper starts with an explanation of the technical process and a brief overview of the history and diffusion of granulation. Around the middle of the 19th century, the long forgotten Bronze Age technique was rediscovered. Based on technical and stylistic imitations and copies of antique jewellery, the Roman company Castellani pioneered this rediscovery. At the beginning of the 20th century a second technical and artistic rediscovery of granulation took place. In these first two phases of its rediscovery, the technical rediscovery of granulation, combined with an articulate reception of antiquity, was of great relevance. Only gradually goldsmiths began to interpret the technique in a contemporary way. Elisabeth Treskow belongs to the first generation of rediscoverers of the 20th century. Throughout her career, she has devoted herself intensively to granulation, its history and its creative possibilities. Through her activity as a teacher at the Kölner Werkschulen, she contributed to the popularization of the technique. Towards the end of the 20th century yet another rediscovery took place. The works of the prizewinners of the 1996 Hanau Competition demonstrated new possibilities in the

[1] Prévalet 2014, p. 427 et seq. and Roßberger 2015, p. 78 and Zettler 1998, pp.122, 164, 169.

[2] Wenn im Folgenden einzig die männliche Form genutzt wird, geschieht dies allein aus Gründen der Lesbarkeit; selbstverständlich sind weibliche Personen stets mitgedacht.

[3] siehe Fußnote 2.

application of granulation. They attempted to expand the purely ornamental use of the technique for surface design by using the spheres as structural building blocks. Some pieces of jewellery and objects presented within the competition were merely made of spheres without any stabilizing background as an attempt at abandoning two-dimensionality for three-dimensionality. The goldsmiths experimented with new forms, modern technology and unusual materials and stylistically and methodologically adapted granulation to the time at the turn of the millennium. This last phase of the rediscovery to date is characterized above all by a change in the artistic subject matter in the application of the granulation technique, but also in the use of modern process techniques and of new materials. In many of his works, Robert Baines combines granulation with the technically related filigree. His large-scale works have a sculptural quality. In terms of design and technique, he references antiquity, reinterpreting it through conceptual artistic strategies of narration, of the fake and of appropriation. Finally, David Huycke works with state-of-the-art technical procedures such as electroplating and stabilizing concrete mouldings. This allows the silversmith to produce very large sculptural vessels and objects that are constructed solely out of spheres.

2 State of Research

A number of archaeological publications describing the latest discoveries of granulation artefacts starting from the Bronze Age have been released until 2016. In 2004 Susan Weber Soros published the book "Castellani and Italian Archeological Jewellery", which examines in detail the history of granulation in the 19th century from an art-historical perspective and which answers, among other things, questions about manufacturing techniques. The only publication to date covering the development of granulation in the 20th century up to 1980 from a technical and historical point of view is a survey from 1983 by Jochem Wolters: „Die Granulation. Geschichte und Technik einer alten Goldschmiedekunst.“[4]. This publication describes the technical procedures and names well-known goldsmiths who have worked with granulation. An exhibition catalogue on Elisabeth Treskow, edited by Rüdiger Joppien, was published in 1990 and presents her work retrospectively and comprehensively in chronological order. The works produced for the 1996 competition were displayed in a touring exhibition and the accompanying publication introduced the new design approaches of contemporary goldsmiths. The work of Robert Baines and David Huycke is documented in various exhibition

[4] Wolters 1983, the most recent illustrated work is by John Paul Miller from 1980, pp. 273, 274
Jochem Wolters headed the Goldschmiede- und Uhrmacherschule in Pforzheim for 18 years, see: https://www.goldschmiedeschule.de/index.php?option=com_content&view=article&id=20%3Ageschichte-2000&catid=7%3Ageschichte&Itemid=19&lang=de, access on 9.1.2018.

catalogues and in their own practice-oriented doctoral theses, in which Baines and Huycke describe methods and results of their artistic research.

3 Techniques and History

3.1 Techniques

The granulation technique is used for the decoration of jewellery and other artefacts. The vast majority of the applications of the granulation technique are artefacts consisting of gold alloys, although there are also granulations made out of silver and combinations of silver and gold.

A granulated workpiece is created in three steps: The granules must be crafted, attached to the recipient and metallically bonded to the recipient through the application of heat.

There are numerous historical descriptions for all three process steps, for example in Pliny the Elder from 77 AD[5], later in Theophilus Presbyter from the 12th century[6] or in Vanoccio Biringuccio from around 1540[7] and in Benvenuto Cellini's "Trattati" from 1568, to name but a few.[8]

Due to the cohesion forces and surface tension that occur, liquid metal has the property of contracting to the shape possessing the smallest surface area: a sphere. In order to obtain evenly shaped spheres, cylinders of equal size are cut from very thin gold wires. The size of the cylinders determines the size of the spheres derived from them. A first layer of charcoal powder is sprinkled into a small ceramic crucible, on top of which the small gold cylinders are sprinkled, which in turn are covered with charcoal powder. The next layer of gold is then sprinkled on top of it, and so on. Thus the whole crucible is filled little by little. The ceramic crucible filled following this process is then placed in a furnace preheated to 1100°. Finally, the small cylinders melt in the charcoal and contract into perfect spheres. After cooling, the contents of the crucible are poured into a container filled with water. The spheres sink to the bottom of the container and the charcoal can be washed out. The spheres can then be sorted by size using layered sieves.

In the second step, the small spheres are placed on a substrate made of the same alloy to form patterns and are then fixed with a liquid bonding agent, for example diluted Fluoron, soda, fish glue, tragacanth, etc. The agents also prevent oxidation at the contact points between the sphere and the recipient.

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[5] Brepohl 2014, pp. 186, 187.
[6] Theobald 1933, p. 101.
[7] Nestler /Formigli 1993, p. 41 and Wolters 1983, p. 45.
[8] Fröhlich 1974, p. 18 and Wolters 1983, p. 280 and Nestler / Formigli 1993, pp. 70, 75.

When granulation is used as surface decoration, a distinction is made between various possibilities for arranging the spheres. In point granulation individual spheres are fixed to the base surface as single accentuated points. Linear granulation is the term used for spheres arranged in a linear fashion. Field granulation is characterized by entire areas covered in granules. In self-supporting granulation the spheres do not rest on a substrate, but are metallically bonded to each other, thus creating openwork structures. In grape-like granulation, the spheres are arranged in layers on top of each other to form small three-dimensional structures.

Traditionally, granulation has a flat two-dimensional character, only in grape-like granulation do the patterns grow into space. Following the principle of the closest packing, the spheres have the property of clustering closely and filling the gaps between each other. The resulting basic geometric pattern is necessarily a triangle. In fact, triangles are very often found on antique and contemporary pieces, as this stable form is the easiest to apply.

In the third step, a metallic bond must be established between the spheres and the substrate. Today, different processes are in use, for example colloidal soldering, soldering using the copper coating method and welding.

The method of colloidal soldering, a 4500-year-old tradition, is confusingly called soldering, although no low-temperature melting metal is added in the process. Just like in the more modern technique of welding, no solder marks are visible because no solder is used and the spheres seem to rest freely on the substrate. A tiny metallic connection between the spheres and the substrate is only visible under a magnifying glass. Jochem Wolters explains how until the 11th/12th century, colloidal soldering was the commonly used technique for metallically bonding the finest metal works. This technique requires so-called solder-forming fluxes: *"These are mineral and artificially obtained copper compounds which are reduced to metallic copper through the influence of the reducing atmosphere of the charcoal fire and of the heat provided by charred organic glues, and which by diffusion act as a solder and form a surface alloy with the base material."*[9] Once this process is completed, the spheres and the substrate are metallically bonded firmly to each other. The oldest solder-forming flux is malachite, a green mineral consisting of basic copper carbonate. Its ability to be reduced to metallic copper was already discovered in the 5th millennium BC. Its Greek name is chrysocolla, which literally means “gold glue". As early as 450 BC, Herodotus described a mixture that could be used for soldering, consisting of soda, chrysocolla and the urine of an innocent boy[10], and as already mentioned, Cellini described a

[9] Wolters 1983, p. 57.
[10] Nestler / Formigli 1993, p. 70.

similar mixture in his "Trattati" in the chapter on filigree[11]. Today, a solution of copper(II) chloride with fish glue and distilled water is generally used as a bonding agent and solder-forming flux.[12]

In his 1983 book "Die Granulation", Jochem Wolters stresses several times that this process of colloidal soldering with copper compounds was the only historically verifiable procedure used to create granulation work without solder marks.[13] Granulation work without solder marks was predominant until the 1st century. Wolters writes: *"At that time, the only available technique was colloidal soldering with copper compounds, which was by no means only used for granulation, but in general for all soldering of fine goldsmithing work. Only this technique is consistent with the documented tradition, with the technical characteristics of historical solder-free granulation work, with the technical possibilities of heating in an open charcoal fire, as well as with analytical findings, and can be carried out using only historically proven components and materials."*[14]

3.2 Discovery and Diffusion

The origin of the term granulation goes back to the Latin "granum", which stands for grain or seed. It was not until the 19th century that the term granulation was introduced to describe this millennia-old technique in reference to the small granules. The Italian goldsmith Alessandro Castellani was probably the first to use the term granulation in a lecture he held in English on this technique in the year 1861.[15] In Germany, the term granulation was introduced in 1918 by Marc Rosenberg, and the term became popular with the 1930 edition of the Große Brockhaus encyclopaedia.[16] A specific term was needed to define the technique, which would offer a conceptual and formal distinction from another technique, namely filigree.

Marc Rosenberg was one of the first to try to distinguish the two techniques more precisely in his book "Geschichte der Goldschmiedekunst auf technischer Grundlage". Probably greatly impressed by ancient Greek and Etruscan gold finds from archaeological excavations, he considered granulation to be a *"courtly art, now lost"* and the widespread filigree a *"folkloristic activity"*.[17] The use of the term filigree for a goldsmithing technique dates back to the 16th century and derives from the Italian "filo" (thread) and "grano" (grain).[18] Filigree works are patterns bent out of very fine metal

[11] Fröhlich 1974, p. 18.
[12] Information from Thomas Nicolodi, owner of Goldschmiede Nicolodi, Munich 2017.
[13] Wolters 1983, p. 60.
[14] ibid. p. 67.
[15] ibid. p. 283.
[16] ibid. pp. 11, 12.
[17] Rosenberg 1918, pp. 3, 4.
[18] Wolters 1987, p. 1063.

wires, which are either metallically attached to a substrate as decorations or conceived as self-supporting structures connected together metallically without a metal base.
Actually, these two techniques are often combined in one and the same workpiece and represent complementary creative means. The distinction is rather based on design criteria, since technically speaking the process of colloidal soldering was originally used for both granulation and filigree.
The oldest examples of granulation work probably originate from Mesopotamia, present-day Syria and Bronze Age Troy.[19]
In 1934, Charles Leonard Woolley published his research reports in two volumes on the excavations in the city of Ur, in present-day Iraq, and in particular on what he himself named the 16 Royal Tombs, which date back to approximately 2500 - 2400 BC. High-ranking personalities lay buried in those graves together with their entourage and the most valuable funerary goods. The excavators found extraordinarily finely crafted jewellery and other artefacts, and also a small golden ring with a diameter of only 2 mm, composed of six individual spheres and considered to belong to the oldest group of finds.[20] (fig.1, location unknown). Additionally, several golden daggers of about 30 cm in length with wooden handles and shafts decorated with triangular granulations of different sizes were discovered, as well as two golden wheel-shaped jewellery discs of about 3.6 cm in diameter, bent from filigree into self-supporting structures. Already at the time Woolley was pointing out that most of the works were made without adding solder.[21] During excavations in Syria that started in 1995, gold pearls decorated with granules sized between 0.5 - 1 mm were found in Tell Banat. They are dated between 2600 and 2300 BC.[22] The oldest silver granulations, dated between 2370 and 2200 BC, were found during excavations in Tell Brak.[23] In the same period, pieces of jewellery decorated with both filigree and granulation were found - a combination that allows to make imaginative patterns and which also became widespread elsewhere.[24]
The first European granulation works were found on the island of Crete.[25] In Bronze Age Greece, the first documented examples of applications of the granulation technique date back to around 1550 BC. In this period the tiny spheres were mainly used for surface, triangular, grape-like and linear granulation. The spheres are used to

[19] Prévalet 2014, p. 427 et seqq. and Roßberger 2015, p. 78 and Wolters 1983, p. 13.
[20] Woolley 1934, volume 1, pp. 296, 297 and Wolters 1983, p. 69.
[21] Zettler 1998, pp. 122, 164, 169 and Woolley 1934, volume 1, pp. 296, 297 and volume 2, plates 138, 152, 157.
[22] Prévalet 2014, p. 427 et seqq. and McClellan / Porter 2016, p. 109.
[23] Wolters 1983, p. 13.
[24] Prévalet 2014, p. 427 et seqq.
[25] Wolters 1983, p. 68 et seqq.

trace and thus emphasize the lines of chiselled motifs.[26] In recent years, experimental archaeologists, in collaboration with the Athenian goldsmith Akis Gourmas, attempted to recreate granulation work from the period between 1500 and 1400 BC using Bronze Age tools and were successful.[27]

In archaic Palestine, artefacts were found which in turn suggest a stylistic affinity with granulations from Mesopotamia. The technique spread eastwards until the region of today's Ukraine, where the Scythians lived, as well as to India and Iran. In Iran the tradition of applying the granulation technique was handed down from 1600 BC until the late 19th century.[28]

Greek and Phoenician goldsmiths probably brought the technique of filigree and granulation as well as their decorative iconography to the Etruscans in Italy. Greek and Phoenician influences can be found in the Etruscan canon of forms.[29] From the 8th century onwards, Etruscan goldsmiths perfected the technique of granulation. They were able to craft the finest granules with a diameter of only 0.07 mm, covering entire surfaces so that the individual spheres could no longer be distinguished by the naked eye, but rather gave the impression of a subtly matted surface. This granulation technique is called dust granulation. Some artefacts were decorated with hundreds of thousands of spheres.[30] They applied granulation on large-format pendants of up to 31 cm in length. They made magnificent brooches and spherical chain links, earrings in disc form and in the shape of small baskets, as well as rings and belt buckles, which were decorated with the most elaborate granulation and filigree. [31] The Antikensammlungen in Munich own a pair of bracelets from the 7th century BC, executed in finest loop-shaped filigree (fig. 2). The museum also owns a 5.5 cm gold pendant from around 650 BC found during an excavation in Vulci. A decidedly Etruscan scene is granulated on the centrepiece. We see hunters on horseback and hunters leading a tamed stag on a leash in order to attract other stags and roe deer. The hunters carry throwing spears to kill the lured animals (fig. 3). This hunting practice can be traced back to the Villanovan culture in central Italy. Only the Etruscans represented animals and humans in compositions made out of spheres in different sizes. No figurative representations composed only of spheres are known from other cultures.[32]

[26] ibid. pp. 70 - 73.
[27] Konstantinidi-Syvridi 2014, p. 343 et seqq.
[28] Wolters 1983, pp. 72, 74, 171.
[29] Gebauer / Knauß 2015, p. 31.
[30] Nestler / Formigli 1993, p. 11.
[31] Gebauer / Knauß 2015, pp. 47, 51, 77, 185.
[32] ibid. p. 79.

Also preserved are vessels made of gold, which are decorated with opulent granulated decoration. A bulbous golden bowl from 650 BC measuring 10 x 6 cm coming from Praeneste is on display today at the Victoria & Albert Museum in London (fig. 4). The bowl is completely decorated with linear granulation in two rows, forming zigzag patterns and meanders as well as braided bands. A total of 137,000 spheres with a diameter of 0.32 mm were used for this bowl. It still represents the most elaborate granulation work ever carried out with this technique.[33]

The know-how about the granulation technique reached Eastern and Central Europe in the 6th century BC via the Danube region and the Alps. However, there are very few finds from the Hallstatt or the La Tène period.[34]

During the time of the Great Migration, the technique of granulation spread throughout Europe and reached India, China and Korea by sea and via the Silk Road.[35]

In the Early and in the High Middle Ages, it was mainly the Slavs and the Vikings in Sweden and Norway who practiced the granulation technique. The goldsmiths of the Viking Age used granulation exclusively as a complementary technique in conjunction with filigree.[36]

The technique of granulation and filigree once again reached a peak in Iran and Palestine in the 12th and 13th centuries. The Israel Museum in Jerusalem owns an extremely realistically modelled goat from Iran, 10.5 cm in height, which is entirely covered with finely twisted wires and spheres of various sizes.[37]

There are examples of modern-time granulation work from all around Europe. From the 16th to the 19th century granulation was increasingly used in combination with filigree.[38]

The granules became bigger and the granulations simpler and coarser. Due to the development of more modern solders, colloidal soldering was used less and less and was slowly falling into oblivion, at least in Europe.[39]

Through excavations in Italy and Greece in the 18th and 19th centuries, in the age of classicism antiquity was popularized not only among experts. One of the first to adorn herself with original antique jewellery was Caroline Bonaparte (1782 - 1839), the Queen of Naples. She allegedly wore jewellery found in excavations around Naples. For a festive occasion, Princess Alexandrine of Canino (1778 - 1855) wore original Etruscan jewellery found at her country estate. Starting in France, in the 18th century a

[33] Wolters 1983, p. 81 et seqq.
[34] ibid. p. 88.
[35] ibid. p. 157.
[36] Eilbracht 1999, pp. 39, 40 and Wolters 1983, p. 165.
[37] Dayagi-Mendels / Rozenberg 2010, pp. 290, 295.
[38] Wolters 1983, p. 225.
[39] ibid. pp. 232 - 236.

great fascination for antique jewellery set in.[40] Goldsmiths tried to imitate the technique of granulation used to decorate these pieces of jewellery by using the contemporary method of soldering with solder alloys.[41] Around 1850, the discovery of Etruscan granulation work, especially in Italy, led to a discussion about the possible ways in which the Etruscans could have metallically attached such delicate gold work with tiny spheres of metal to a substrate without using a solder. Nobody thought about the obvious solution, colloidal soldering, the technique that had been used for thousands of years until it was replaced by soldering using solder alloys.[42]

Even today it is often claimed that the technique of granulation was lost for a long time. In his book, Wolters very plausibly describes how granulation was essentially never lost at any point in the course of four and a half thousand years of history. He believes that the impression of the technique having been lost is due to the one-sided fixation of 19th century archaeology and art history on Greek and Etruscan granulation work, and to the fact that after the end of these ancient cultures, granulation in the Mediterranean region actually lost its importance. This, however, does not mean that it was not still in use in other parts of the world and especially in combination with filigree.[43]

3.3 Rediscovery through Castellani in the 19th Century

It was precisely in this period, at the beginning of the 19th century, that the extraordinary success story of the Castellani goldsmiths began, whose style influenced jewellery trends in Italy and Central Europe for decades.[44] The goldsmith and antique dealer Fortunato Pio Castellani (1794 - 1865) opened a workshop in Rome in 1814. Castellani and especially his sons Alessandro (1823 - 1883) and Augusto (1829 - 1914) soon discovered that antique jewellery sold well. They produced imitations of antique jewellery as well as creations in an antique style, which they themselves marketed throughout Europe as "Italian archeological jewellery".[45] In the four rooms of their shop on the Piazza di Trevi, the collection of antiques already put together by Fortunato and continued by Augusto was displayed side by side with their own creations.[46] The Castellani company expanded from Rome to Naples, Paris and London, meeting the rapidly growing demand for copies of antique pieces and antique-looking designs.[47] Even some of the works now identified as forgeries seem to come

[40] Marquardt 1998. pp. 15, 21 and 22.
[41] Wolters 1983, pp. 23, 232 and Nestler / Formigli 1993, p. 21.
[42] Wolters 1983, p. 232 and Nestler / Formigli 1993, p. 21.
[43] Wolters 1983, p. 35.
[44] Marquardt 1998, p. 22.
[45] Weber Soros / Walker 2004, p. 9.
[46] Moretti Sgubini 2004, pp. 304, 307, 308, 312 .
[47] Weber Soros 2004, p. 33.

from the Castellani workshop.[48] As a strategically-thinking businessman, Augusto Castellani was aware of the role of major international exhibitions. During the 1862 World Exhibition in London, the Castellani and Giuliano company had their own stand. Carlo Giuliano (1831 - 1895) managed the London branch. Among the sixty pieces of jewellery on display, there were also a few granulation works.[49] The new archaeological and historical style of the Castellanis served as a model for many other goldsmiths and designers. Their designs have been published in numerous arts and crafts magazines. Castellani knew how to create fashionable jewellery for the elegant lady with an interest in antiquity, for example braided bands and foxtail chains with pendants in the shape of drops, vases, shells and palmettes. Amulets crafted by Castellani in the shape of the Roman or Etruscan bulla and brooches in the style of antique jewellery were also very popular.[50] At the World Exhibition, Castellani handed out an advertising brochure in which he explained that despite intensive research into the art of granulation and its manufacturing processes, this ornamental technique of invisibly applied granules decorating antique goldsmithing work had unfortunately been lost.[51] However, he claimed that he was on the verge of unlocking the secret of granulation and filigree. For more than forty years he had researched the Etruscan method.[52] He claimed to have read the writings of Pliny, Theophilus Presbyter and Cellini[53], but it seems like he missed the important parts.[54] We therefore owe it to him if the granulation technique has been elevated to a mystery.[55]

Castellani worked with powder solder, which was also used for the finest filigree work. Anna Maria Moretti Sgubini writes that Castellani carried out a "granulazione al pulviscolo"[56]. Castellani's soldering method was based on using solder that was ground to a fine powder with the addition of arsenates serving as soldering flux.[57] Granulation can thus be carried out almost without displaying any solder traces – but only almost. Electron microscope examinations carried out in 2004 at the Victoria and Albert Museum in London clearly prove the use of solder.[58] Still today claims are made in scientific publications about Castellani's alleged rediscovery of the technique[59] or about

[48] Wolters 1983, pp. 323, 234.
[49] Munn 1984, p. 85 and Weber Soros 2004, p. 233.
[50] Marquardt 1998, pp.14, 82.
[51] Castellani, Alessandro: Antique Jewellery and its Revival, London, 1862, p. 16, quoted by Nestler / Formigli 1993, p. 9 and Munn 1984, p. 131 and Wolters 1983, p. 283
[52] Munn 1984, p. 85, 132.
[53] Wolters 1983, p. 283.
[54] ibid. p. 323.
[55] Nestler / Formigli 1993, p. 9.
[56] Ogden 2004, pp.181, 191 et seqq. and Moretti Sgubini 2000, p. 185.
[57] Wolters 1983, pp. 234, 283.
[58] Ogden 2004, pp.181, 191 et seqq.
[59] Marquardt 1998, p. 82.

the supposed lack of clarity about whether he rediscovered the technique or not.[60] Castellani removed excessive solder via etching in a final working step.[61] Nevertheless, the spheres seem to have partially sunk into the solder. In 1918, Marc Rosenberg noted that in Castellani's work the spheres looked as if they had been baked into the substrate and that the overall impression was too technical and unartistic, so that his works could not compete with the antique models in any way.[62] Nevertheless, the works from Castellani's workshops are excellently made and are today highly sought-after collector's items.[63] In 1865 Jakob Falke wrote[64] about the Vienna World Exhibition and reported on Castellani's work on display. Falke states that the company's work had initiated a reform and that they had introduced an antique gold jewellery style into fashion. Falke describes their work as characterized by finely modelled, perfectly formed shapes and extraordinarily delicate details. He emphasizes the fineness of the filigree, which covers the surfaces like velvety grains or surrounds them in threads.[65] Henry Cole, the first director of the South Kensington Museum, purchased jewellery for his house from Castellani in 1858.[66] One of Castellani's most famous works, reproduced in all the books, is a copy or rather a series of copies of an Etruscan pendant in the shape of a chiselled golden faun or a head of Pan.[67] The faun's hair and full beard are covered all over with the finest spheres (fig. 5, National Gallery Dublin). The original from around 480 BC is on display in the Louvre in Paris[68] (fig. 6). Unlike the antique model, the head is more symmetrical, stylized and more pleasing to the eye in his expression, according to the taste of the time. Another very famous piece is a bracelet based on a design by Duke Michelangelo Caetani (1803 - 1882), who worked as a designer for Augusto. Today the bracelet is displayed at the Schmuckmuseum Pforzheim and shows two snakes winding around each other. Caetani combined antique-looking, medieval and Nordic design elements. The contours of the snakes are accentuated with a fine granulation decoration (fig. 7).[69] At the beginning of the 20th century, the grandson of the founder, Alfredo Castellani,

[60] Krogemann 2005, p. 20.
[61] Wolters 1983, p. 283.
[62] Rosenberg 1918, pp. 4, 5.
[63] Nestler / Formigli 1993, p. 9.
[64] Falke, Jacob: Die Wiener Weltausstellung, pp. 2, 8, 50, quoted by Marquard 1998, p. 23.
[65] Marquardt 1998, p. 23.
[66] Bury 1975, p. 667.
[67] One pendant is at the Louvre and one or more are in Dublin. The inscriptions are not always clear and I have found several images of the pendant with different location information in different sources.
[68] Moretti Sgubini 2000, p. 185.
[69] Schmuckmuseum Pforzheim 1981, p. 54 and Falk 1985, pp. 42 - 50. Another bracelet is on display in the Villa Giulia.

finally donated the extensive collection of ceramics, bronze and jewellery to the Museo Nazionale Etrusco di Villa Giulia, where it is been presented to the public since 1929.[70]

3.4 Rediscovery at the Beginning of the 20th Century

All in all, the attempts of numerous goldsmiths at the turn of the 19th and 20th centuries to unveil the secret of the ancient granulation technique were unsuccessful. Around 1920, Julius Schneider from Munich developed a process in which the spheres were welded on using a particular alloying method. During a stay in Rome from 1900 to 1913, the art historian Hans-Joachim Wagner rightly assumed that the name chrysocolla, the gold glue, must contain a hint of the functioning of the ancient technique.[71] Around 1919/20, the Munich goldsmith Johann Michael Wilm (1885 - 1963) was finally successful. Using copper oxide as a colloidal solder, he carried out the first granulations which equalled those from Etruria in technical quality.[72] He is regarded as the rediscoverer of granulation and built large ball chains using the finest linear and field granulation techniques. One of his special design features were frieze-like rows representing animals and figurative scenes which were integrated into landscape depictions.[73]

Elisabeth Treskow probably learned about Wilm's experiments during her apprenticeship at the Rothmüller goldsmith's shop in Munich from 1917 to 1918. Wilm, however, kept the results secret. According to her own accounts, she herself achieved the first granulations in acceptable quality around 1930. The first granulation work she ever published is a ring with flat granulated shoulder pieces (fig. 8, location unknown).[74] Treskow worked according to two methods: she made both use of a welding process[75] to attach the granules to the recipient without soldering and of colloidal soldering with different copper salts.[76] In England, the London goldsmith H. A. P. Littledale was successful with a process in which he used copper hydroxide as a colloidal solder. He knew Johann Michael Wilm and Elisabeth Treskow since 1936 from a series of London lectures on the subject of granulation, during which he presented his procedure, and perhaps the goldsmiths had exchanged views on their working methods.[77] However, it is also very probable that all three goldsmiths came to the same results independently

[70] Moretti Sgubini 2004, pp. 304, 307, 308, 312 .
[71] Wolters 1983, p. 236.
[72] Joppien 1990, p. 35 and Wolters 1983, p. 236.
[73] Weber 1989, p. 89, and Weber 2000, pp. 218, 219.
[74] Joppien 1990, pp. 14, 35.
[75] On page 236 Wolters talks about a sintering process she invented. According to her words, she used and welded very high-alloyed gold.
[76] Treskow 1990, p. 52.
[77] Joppien 1990, p. 16.

of one other.[78] The art historian Christianne Weber explains that Wilm and Treskow were not the only goldsmiths who worked with granulation, but were probably among the few whose work was internationally successful.[79]

In the USA, John Paul Miller (1918 - 2013),[80] whose works were shown in 1961 at the "Modern Jewellery" exhibition in London's Goldsmith Hall together with works by Wilm and Treskow, was an innovative designer with his granulation work. He often used the granulation technique in combination with enamel and is known for his sculptural depictions of animals, especially octopuses and polyps, whose suction cups Miller emulated using granules.[81] In an interview for the magazine "Die Kunst" in 1940, he stated that he became aware of Treskow's work and that through her he discovered granulation for himself.[82] In his home country, Miller is celebrated as the rediscoverer of the granulation technique, having received decisive advice on how to overcome technical problems during a trip to Rome.[83]

All granulation works by artists from the generation of the rediscovers are characterized by particularly finely worked spheres and high technical quality. It is interesting to note that in addition to technical refinement and their own artistic expression, the aspect of the rediscovery of a mysteriously antique technique plays a major role. For the sake of reputation, being the first one seems at least as important as one's own artistic interpretation. What is interesting to note as well is that granulation has been used in all the works as a creative medium for surface design.

As a representative of the generation of the rediscovers, Elisabeth Treskow's work is particularly fascinating, since her granulation works document very clearly the creative variety of its applications up to the seventies of the 20th century.

4 The 20th and 21st Century

4.1 The Pioneer Elisabeth Treskow

After her apprenticeship as a gold- and silversmith, Elisabeth Treskow (1898 - 1992) started her own business in 1919.[84] The period of her work between the World Wars was marked by social and economic upheavals. Women developed a new self-confidence. As craftswomen and designers, they slowly began, from the beginning of the 20th century onwards, to also play a role as producers. Before that, they had been

[78] Wolters 1983, p. 237.
[79] Weber 1989, p. 89.
[80] Hughes 1963, n.p.
[81] https://www.clevelandart.org/events/exhibitions/jewelry-john-paul-miller, accessed 11/29/2017.
[82] http://www.professionaljeweler.com/archives/articles/1998/mar98/0398pm1.html, accessed 10/23/2017 and Wolters 1983, S. 287.
[83] http://clevelandartsprize.org/awardees/john_paul_miller.html, accessed 10/26/2017.
[84] Joppien 1990, p. 9 et seqq.

denied access to appropriate training.[85] As a successful craftswoman and artist, who also dedicated herself to researching a specific technique, Treskow is a pioneer. When the goldsmith began to experiment with granulation at the end of the 1920s, the technique was virtually unexplored and not very widespread.

The twenties were the decade of Art Deco. Alongside high-quality jewellery, inexpensive fashion jewellery was en vogue. Machine aesthetics and cubism, combinations of geometric elements such as spheres, circles, triangles and squares in countless variations characterized the new forms. Naum Slutzky (1894 - 1964), goldsmith and industrial designer at the Bauhaus, formulated a design language devoid of any decoration. However, especially in Germany and starting in 1930, a return to old craft techniques is evident,[86] combined with a new desire for plasticity. Moving lines, spirals and volutes became modern again. The goldsmiths and Treskow herself were tired of puristic forms and they again found pleasure in naturalistic themes such as the animal world and the plant world.[87]

Already in the mid-twenties Treskow began to study the ancient art of European jewellery very intensively. In the jewellery from the Celtic-Germanic period, from the period of the Great Migration, from the Merovingian period and also in late medieval motifs she found inspiration for her own designs. In 1928 she created a bracelet that recalls Celtic torques (location unknown).[88] The ends of the bracelet, which are shaped like large hollow spheres, are decorated with fine filigree and granules. The decoration is still soldered on with solder. In the same year Treskow made a ring out of platinum, sapphires, moonstones and pearls, which can be seen today at the Schmuckmuseum Pforzheim. Here the artist shows clearly how the stones are not understood as a means to decorate the metal, but rather form the actual surface of the piece.[89]

According to Bettina Krogemann, Treskow was particularly fascinated by the art of Mediterranean antiquity and by Etruscan jewellery.[90] Around 1929 she began to experiment with the technique of granulation.[91] In the same year she bought the book "Die Welt der Etrusker" by Hans Mühlestein and an illustrated catalogue from the British Museum titled "A Guide to the Anglo-Saxon and Foreign Teutonic Antiquities", London 1923.[92]

In 1929 Elisabeth Treskow created the complement to the ring with sapphires and moonstones mentioned above. It is a ring made out of 750/- yellow gold, which she

[85] Weber 2000, p. 226.
[86] Weber 1991, p. 79.
[87] Weber 2000, pp. 12, 13 and Weber / Möller 1999, pp. 12, 20, 36, 227.
[88] Joppien 1990, p. 33 et seqq.
[89] Weber 1991, p. 78.
[90] Krogemann 2005, p. 19 and Joppien 1990, p. 31.
[91] Joppien 1990, p. 34.
[92] Joppien 1990, p. 14.

kept for herself. In 1977 she donated it to the Cologne Museum of Applied Arts, MAK (fig. 9). The ring is interesting because it probably represents the artist's first successful granulation work[93] and because it constitutes an early example of the opulent style with lively surfaces which is so typical for her. The loose, free arrangement of the most diverse gemstones, the combination of a variety of forms, the voluminous spatiality, the playfulness and opulence and, not least, the very peculiar use of granulation in the structuring of surfaces: all this confers her work its high recognition value. The ring has a rectangular ring head crafted as a plate, which follows the curve of the finger. It measures 24.8 x 18.4 mm. Further down, towards the ring band, the plate is reinforced with a wide rib, which gives the rectangle stability and volume. Treskow has placed 15 platinum and gold settings on the plate. They contain differently cut sapphires in shades of blue and violet, cabochon-cut moonstones and pearls. The free spaces between the settings are filled with spheres of approx. 0.3 - 2 mm in size. In the remaining free spaces, the artist has finely engraved dot-shaped and circular hallmarks. The scattered, freestanding granules arranged in triangular granulations have partly sunk into the gold plate somewhat too deep.[94] Treskow herself stated that she managed to carry out the first granulations in acceptable quality around 1930/31.[95] In 1932 she received a prize for a competition work titled „der Ehrenring“ (The Ring of Honour). On the ring plate of this ring that has now been lost and that was published in issue 19 of the “Goldschmiedezeitung" in 1933, the artist has granulated a figurative motif. A lively jumping horse with a rider wearing a victory wreath is represented on it.[96] At the beginning of the 30s, her style becomes smoother and more planar. Treskow uses granulation to enliven the spaces left empty. Representational, figurative motifs characterize her granulation works of the following period. Her preference for certain animals is noticeable. Alongside the zodiac signs, galloping bucks, deers, dogs, but also many birds, such as peacocks, swallows, flamingos and some fish can be found. In later works, lizards, snakes and dragons are added. According to Joppien, Elisabeth Treskow set new standards in the figurative granulation through the vividness of her depictions.[97]

She was also a collector. Over a period of about fifty years she assembled a jewellery collection of 165 objects covering about 4500 years of ancient lapidary and goldsmith’s art. In 1977 she donated her collection to the MAK. The collection includes various

[93] ibid. pp. 35, 139.

[94] Visit to the depot and museum space of the Museum of Applied Arts in Cologne on 10/10/2017 and 10/11/2017. Together with the metal restorer Jürgen Schablitzky, I was allowed to examine granulation works by Castellani, E. Treskow, J.M. Wilm, E. Teutsch and W. Nagel in the depot using a magnifying glass.

[95] Krogemann 2005, p. 19, Joppien 1990, p. 14.

[96] Joppien 1990, p. 36.

[97] ibid. p. 37.

Italian, Celtic and Iranian fibulae prominently adorned with representations of animals, which date back to the period between the 10th and the 7th century BC. Elisabeth Treskow was particularly interested in objects in which animals were fully sculptured and in incised gems representing people and animals. Depictions of lions, cows, geese, hunting scenes, bulls, antelopes, wild goats or horses can be found on many pieces.[98]

From 1933 onwards, she often used the motif of the rider on horseback, for example on a bracelet from the year 1934 (fig. 10, MAK Köln) and one from the year 1935 (privately owned), as well as on two brooches from 1941 and 1943 (both privately owned).[99] This motif could be based on an Etruscan representation. Mühlestein's book contains a picture of the already mentioned pendant of Vulci from the 7th century BC, with the typically Etruscan hunting scene (fig. 3). Further representations of horses in granulation technique are found on a brooch and a pendant, respectively from 1941 and 1942 (both privately owned).[100] Matching ink drawings of horses, finely executed, are also in private ownership in Koblenz.[101] Inspiration for the posture and dynamics could also have been derived from the antique gems she collected, which are now part of the collection of the MAK. Some of the old stone carvings represent jumping and rearing horses. They are extremely detailed and vividly depicted.[102] In 1933 Elisabeth Treskow went to Rome to attend an international jewellers' congress and visited the Roman museums, among others Villa Giulia, where she was able to view the antique jewellery of the Etruscans from close[103] and certainly studied the Castellani collection thoroughly. The book, her own collection she was putting together and the trip to Rome served as a source of inspiration for her.

In the 1980s, the goldsmith also donated her graphic work to the MAK, with more than 1300 sketches and drafts from her creative work of sixty years.[104] These works are motion studies, for example of dancing people, as well as drawings from nature of flying birds, flowers, branches and buds. They provide additional information about the artist's love of detail and illustrate how many sketches were necessary to ensure that the dynamic elegance of the figures would live on in the finished piece of jewellery. Most of the drawings are in colour and they are usually made so as to be easily converted into jewellery without modification. What is interesting, however, is that in their execution, the artist faithfully adhered to her drawings. Even the patterns that

[98] Joppien 1978, p. 1727 et seqq.
[99] Joppien 1990, two ill. p. 90 and one on pp. 98 and 102.
[100] Joppien 1990, ill. p. 100.
[101] Joppien 1990, ill. p. 100.
[102] Visit to the depot of the MAK and ill. in: Chadour / Joppien 1985, volume II, ill. pp. 25,34,40,51.
[103] Joppien 1990, p. 15.
[104] Joppien 1983, pp. 2070, 2071.

would later be granulated were already planned out in them. Often, even individual spheres the size of tenths of a millimetre are drawn in.[105] Moreover, the dated drawings provide information about how Treskow's style changed over the decades. From 1936 onwards, fine wire decoration was added as an additional graphic element.[106] Granulation and filigree complement each other and form a unity, like in antiquity. There are spiral patterns and wave-like ornaments. It is definitely all in line with the trend of the time. Christianne Weber cannot determine a uniform European style in the years from 1920 to 1940, but only individual stylistic tendencies. Protectionism and nationalism became stronger. In Germany, germanized jewellery decorated with many spirals became popular. The thirties were characterized by a figurative-naturalistic style, with representations of birds and reptiles, which continued into the forties.[107]

In 1936, a 42.4 cm long necklace was created from approx. 2 cm wide rings and 13 band-like spacers, each approx. 1 cm wide (privately owned). The wide bands are decorated with filigree and granulation. Treskow chose different animals besides sun, moon and stars as motifs. It looks like the artist drew on the surface using fine wires and set accents with individual spheres. Only a few areas are completely filled with granules to achieve a painterly effect. The clasp is decorated with a granulated spiral.[108]

A round brooch from 1938 has only survived as a photographic image (Fig. 11).[109] The brooch is decorated with chiselled snake-like dragons, which are knotted together decoratively. The bodies are traced with linear granulations. In its form the brooch recalls Viking jewellery, like the one from the jewellery find of Hiddensee[110] and especially a large disc brooch with a decorative snake ornament (Kulturhistorisches Museum Stralsund), but also two bracelets from the Castellani company from 1865. One of the bracelets is on display at Villa Giulia. Treskow probably saw it during her stay in Rome (fig. 7).[111]

From about 1940 the artist turned increasingly to motifs from ancient mythology. She represents Greek gods and bacchants with aulos players, dolphin-riding boys and torch-bearing youths in the finest granulation. On smooth, oval pendant discs and round brooches she draws mythological scenes entirely from tiny spheres. Associations with antiquity come to mind. However, according to Joppien, no directly

[105] Visit to the depot of the MAK.
[106] Joppien 1990, p. 37.
[107] Weber 1991, p. 78 et seqq.
[108] Joppien 1990, ill. p. 61.
[109] Joppien 1990, p. 37.
[110] The find is on display since 1873/74 at the Museum Stralsund, http://www.stralsund-museum.de/Unsere_Highlights/wikingergold/beschreibung_schmuckteile/, accessed 12/20/2017.
[111] Another bracelet identical in design is on display at the Schmuckmuseum Pforzheim.

referenced antique models are known.[112] Elisabeth Treskow brought her very own and highly dynamic vision of antiquity into being. A particularly elaborate piece is a ring from 1942, with a ring head forming a round hinged capsule (fig. 12, MAK Köln). Several studies exist for this ring. Using white ink on black cardboard, she drew twelve very detailed drafts.[113] There is also a small pencil drawing on which a dancing Dionysos can be seen.[114] The version of the ring that was finally made displays the granulated figure of the god Apollo with bow and arrow on the outside of the capsule, which has a diameter of 2.3 cm. The granulated surfaces of the inner sides have been made concave in order to protect the sensitive granulation. On one side, a dancing Dionysus is granulated in the same posture as in the drawings. On the other side are two granulated snakes winding around each other. Apollo and Dionysus are marked with a granulated lettering in Greek letters. All representations are entirely composed of small spheres. The spheres are regular in size. Lines, which are to indicate muscles, are marked by omitting spheres. These omissions create fine shadow lines and give the representation depth. The capsule ring is crafted in 585/- gold. It is probable that the lack of money and material during the war led to this decision.

One of Elisabeth Treskow's most famous works was created in the middle of the war. In 1942 she made a brooch for the textile artist Irma Goeke. Today this brooch in the shape of a grape is at the Schmuckmuseum Pforzheim (fig. 13). Its draft was drawn on transparent paper with pencil and crayon. Originally Treskow wanted to use diamonds, pearls and star rubies. The rubies were replaced by additional gold elements.[115] In its realization, the artist adhered closely to her master drawing. She even planned out the granulated patterns. The grapes are composed of hemispheres of different sizes. The hemispheres are either completely covered with field granulation or decorated with filigree flowers, which are in turn filled with field granulation on the inside. Treskow will take up the bucolic grape motif again and again, for example in a brooch from 1958 (privately owned). Here the grapes are made of green tourmaline cabochons and on a round brooch from 1966 the grapes are composed of granules of different sizes. The leaf veins and branches are made of filigree. Joppien states that the motif of the grape has been a standard theme in European jewellery art[116] since the early Biedermeier period, and of course it is also to be seen as the artist's reception of antiquity. This reception of antiquity, very visible in her work, could possibly have represented a way for Treskow to evade co-optation by the National Socialist rulers and their aesthetics. There are no statements about how Elisabeth Treskow positioned herself in relation to

[112] Joppien, 1990, p. 38.
[113] Visit to the depot of the MAK and Joppien 1990, ill. p. 39.
[114] Visit to the depot of the MAK and Joppien 1990, ill. p. 99.
[115] Joppien 1983, pp. 2070, 2071.
[116] Joppien 1990, p. 45.

National Socialism. However, she avoided commissions from the party.[117] Essen, the city where Treskow lived and worked, was almost completely destroyed by a bombing raid in 1943. She left her bombed-out studio and moved to Detmold.[118] The life-threatening times of war are also reflected in her jewellery work. The result is a brooch with a granulated vanitas motif (location unknown). It represents a skull from which a flowering plant grows. The inflorescence is pollinated by two butterflies. Transience and hope for new life are the themes here. During this time Treskow produced a series of white drawings on black background (owned by the MAK). On small tondi a destroyed city is depicted, with a skeleton, apocalyptic horsemen and angels of death placed between the ruins. They could well be models for granulation work, as the drawing is executed almost pointillistically.[119]

In the last years of the Second World War and in post-war times, for obvious reasons Treskow did not produce much jewellery. In 1948 she was appointed professor at the Kölner Werkschulen.[120] She was now financially secured and could work more freely. From 1953 Treskow travelled to Italy several times, where she visited the sites of ancient and Early Christian cultures in Rome, Paestum and Sicily.[121]

From 1960 the goldsmith scene began to break away from the traditional concept and manufacture of jewellery. Artistic tendencies such as Art Informel and Tachism, with their ideas of planned coincidence and spontaneous action art also led to the development of new techniques in goldsmithing and a detachment from traditional materials. Jewellery is no longer merely a status symbol, but aims to be an expression of identity.[122] Cornelie Holzach explains that during this time there were two parallel approaches to jewellery-making: on the one hand, the communication of a message, a conceptual idea, a thought about the relationship between jewellery and the body was important. Artists began to explore the limits of jewellery. On the other hand, the tradition of craftsmanship, in which the aspects of wearability and beauty, even if these terms are many-faceted, play a major role.[123] In the sixties, concepts of clarity, simplicity and the dynamics of form, such as can be found in the work of Sigurd Persson (1914 - 2003), are just as important as structured surfaces and planned coincidence, as in the work of Ebbe Weiß-Weingart (*1923).[124] The design is characterized by friction and rhythm. In jewellery the surfaces are crinkled, torn, cut.[125]

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[117] ibid. p. 15.
[118] ibid. p. 16.
[119] Visit to the depot of the MAK, Joppien 1990, p. 40.
[120] Joppien 1990, p. 17.
[121] Joppien 1990, p. 45.
[122] Falk / Holzach 1999, p. 24 et seqq.
[123] Falk / Holzach 1999, p. 15.
[124] Falk / Holzach 1999, pp. 36, 38, 39, 40, 41, 48, 49.
[125] Lochmüller / Schöner 1973, pp. 31, 34 and Falk 1989, p. 20.

Treskow, who for a long time had been experimenting with structured surfaces and with techniques that could be used to enliven them, only granulated figuratively at the special request of the customer,[126] and field granulations abound. Most notably, her work turned towards stylized and simplified granulation decors. In 1963 she created a round golden brooch with black and white pearls, on which a decorative version of the Chinese Yin-Yang symbol is executed in field granulation and filigree (fig. 14, Pforzheim Jewellery Museum). Jochem Wolters used an image of the brooch in 1983 as the cover photo for his textbook "Der Gold- und Silberschmied".

Besides organic forms, she also worked with geometric ones. Square granulated fields with frames, zigzag patterns and parallel stripes appeared. In 1961, the artist created a slightly conical bangle, which is completely decorated with a geometric filigree pattern that forms large triangular and diamond-shaped fields. The fields are partially filled with triangular granulation, field granulation or linear granulation. (fig. 15, privately owned)

A large breast cross with a matching ring also dates from 1961 and can be viewed in the Treasury of the Cologne Cathedral. The approximately 15 cm high cross in the shape of a Byzantine cross with widening ends is completely covered with a very even field granulation except for a centrally placed amethyst and four rows of pearls in the middle of the crosses axes. The surface reflects incoming light in all directions with a shimmering effect.[127] The keywords of sixties design, clarity, simplicity and the dynamics of form, are combined in this cross with the traditional Byzantine cross shape.

From about 1967 onwards, Treskow worked less and less at the worktable and resorted to the production of jewellery designs. She left the execution to younger goldsmiths. In 1967 Gertrud Weber-Vogel created a brooch for the artist in the shape of a bulging chiselled seashell. The brooch is decorated with filigree ornaments in wavy lines. The spaces in between are completely filled with small spheres that become smaller starting from the inside out. In between, sapphire and fire opal cabochons are set irregularly (fig. 16, MAK Köln). This brooch once again combines typical elements from Treskow's jewellery form language; a surface structured and enlivened by granulation, colourful stones and harmonious well-proportioned forms. The brooch is based on a design drawing by the artist owned by the MAK, executed in pencil on transparent paper.[128]

In the sixties and seventies, multiple chains made of different materials became modern. Hippie fashion with floral and ethnic jewellery was considered chic. Long

[126] Joppien 1990, p. 42.
[127] Visit to the Treasury of the Cologne Cathedral on 10/11/2017.
[128] Visit to the depot of the MAK and Chadour / Joppien 1985, volume II, pp. 365, 575.

necklaces with pendants that consisted of several links were en vogue.[129] 1967 Treskow received the State Award for Arts and Crafts of North Rhine-Westphalia[130] for a necklace that combined a modern sixties hippie touch and an ancient Greek look and feel. It is a simple link chain from which dozens of small pendants with stones, pearls and granulated and punched cones cascade down around the neckline. In the works of the following years the cascades become more orderly and symmetrical. A necklace with a central section from which five multi-sectional pendants consisting of set stones, eyelets and granulated cones dangle down next to each other, dates from 1971. This pendant again mixes the style of the seventies with antique elements. Treskow made chains and pendants of this type in various versions in yellow and white gold, with and without granulation. One can find several drafts of them in the depot of the MAK.[131]

In the mid-seventies she experimented artistically with self-supporting granulation.[132] With this type of granulation, she took a first step into three-dimensionality, away from granulation as surface decoration. One of her last works is a chain whose midsection is arranged as a grid-like pendant with vertical and horizontal bars. Triangular granulations with no recognizable substrate are attached to the horizontal bars (fig. 17, privately owned). A Byzantine pendant from the 10th - 11th century from of the artist's collection is decorated with symmetrically arranged triangular granulation and could have been a source of inspiration (fig. 18, MAK Köln).[133]

Elisabeth Treskow has not only helped make granulation popular, but has also found her own and unmistakable stylistic solutions in applying the ancient technique. Her work is shaped on the one hand by the freely interpreted reception of antiquity and on the other hand by the combination of intensely colourful gemstones and the dynamic structuring of surfaces through granulation. She was a pioneer in the stylistic advancement of this technique, with her incessant quest for design possibilities offered by this type of surface decoration.

In the seventies and eighties of the 20th century, larger formats and base materials combined with precious metals became en vogue. The concept of the jewellery object was also newly introduced.[134] New creative ideas in the field of granulation are however rare. Christianne Weber-Stöber states that the next generation of "granulators" has remained stuck with the classic modes of application as surface decoration with geometric and figurative motifs.[135] They include, for example, Mechthild

[129] Weber / Möller 1999, pp. 180, 210, 215.
[130] Joppien 1990, p. 24.
[131] Visit to the depot of the MAK.
[132] Joppien 1990, p. 47.
[133] The earrings were on display in the permanent collection of the MAK at the time of my visit on 10/10/2017 and 10/11/2017.
[134] Stephan 2009, p. 79.
[135] Weber-Stöber 1996, p. 24.

Baumann (*1939) and Cornelia Roethel (*1946[136]). Robert Baines also belongs to this generation, but when he started his business in the early seventies he was looking for his own possibilities for interpretation. In the eighties Baines produced a series of post-modern-looking, decorative objects and small sculptures, which were meant to be viewed at 360 degrees.[137] He combined self-supporting and grape-like granulations with architectural-looking volumes, whose individual modules are reminiscent of machine parts. For reference: "The Accumulation of the Already Created Form I - III" from the years 1983 - 84. Later Baines developed his own unique way of applying the ancient technique, which I will present in chapter 4.3.

4.2 Granulation Competition 1996 / New Ideas

From 1996 onwards, however, the granulation technique experienced a new flourishing. In cooperation with the Gold- und Silberscheideanstalt C. Hafner from Pforzheim, the Goldschmiedehaus Hanau announced an international competition on the subject of granulation. The competition was initiated by Jochem Wolters and the goldsmith Reinhold Bothner (*1911), who also granulated.[138] The aim was that of reviving the traditional gold- and silversmithing techniques with new creative ideas.[139] 139 goldsmiths took part.[140] Many of them had been using the technique for a long time. 28 competition works are presented in the exhibition catalogue.[141] The modest number of participants revealed how small the circle of goldsmiths who worked with this technique was, but also how outmoded the technique had become again or how much it had remained so. In her comments on the competition, Weber-Stöber states that many works remained faithful to what is already well known, both in terms of formal design and of the way granulation was used. Innovative executions were missing. [142] Mechthild Baumann's competition work was honoured with an acknowledgement award.[143] She was a student of Elisabeth Treskow and Wilhelm Nagel (1927 - 2014) at the Kölner Werkschulen.[144] She is represented in the catalogue with two technically demanding works. In the tradition of the techniques used to enliven surfaces, she chiselled and granulated organic and geometric decors. Cornelia Roethel from Munich, who completed her apprenticeship at Johann Michael Wilm Junior's

[136] Information from Cornelia Roethel by e-mail, 1/8/2018.
[137] Errey 2010, p. 28 and Soumalis 2011, p. 10 et seqq.
[138] Weber-Stöber 1996, p. 24.
[139] Granulation 1996, p. 6.
[140] ibid., p. 69 et seqq.
[141] ibid. p. 25.
[142] ibid. p. 25.
[143] ibid. p. 42.
[144] Granulation, p. 42 (Nagel in turn was a student of Treskow's).

workshop (ca. 1934 - 1987[145]), submitted a ball chain whose individual beads are decorated with triangular and field granulation.[146] Technically, it represents a perfectly executed work with traditional patterns combined with high-quality gold and diamonds.
The first prize was awarded to Christiane Förster (*1966) from Munich. She states that her interest in Greek, Etruscan and Roman goldsmithing has always been very strong.[147] During her studies at the Academy of Fine Arts in Munich, she had also attended to a lecture by Robert Baines on his investigations of ancient granulation works. A short time later the competition was announced and she began to engage with the technique intensively.[148] Her awarded work, however, bears witness to an unbiased approach to the mystically charged technology. The result was achieved through free experimentation rather than years of practice and study of ancient models. It is a pendant made of silver granules melted together in free order and without a metallic substrate (fig. 19, owned by the artist).[149] The spheres are not arranged into an ornament, which decorates and structures a surface. They are surface and structure of the piece of jewellery in one. The pendant is designed in the shape of a triangle and measures 6.5 cm x 4.5 cm x 3 cm.[150] Additionally, the construction is completely coated with a mixture of glass and plastic.[151] This gives stability to the austere but very fragile and porous-looking object made of silver spheres that are only just metallically connected to each other, and makes the monochrome silver surface shine almost transparently in many colours when it is hit by light. After many attempts, Förster had submitted four of a total of twelve successful pieces of jewellery made of gold and silver to the competition.[152] Förster explains that preciousness and decay are closely related in these works and that during the process of granulating she was particularly interested in the sensual flickering and delicate play of light on a lively surface.[153] After about two years of intensive granulation, her involvement with textile techniques and enamel led her away from the filigree technique. However, she stresses that she was always able to draw on her technical experience with the welding technique for her

[145] E-mail Roethel.
[146] Granulation 1996, p. 63.
[147] Information from Christiane Förster by e-mail, 11/26/2017.
[148] ibid.
[149] ibid.
[150] Granulation 1996, p. 6.
[151] E-mail Förster.
[152] ibid.
[153] ibid.

later works.[154] Many of her jewellery pieces are actually characterised by transparent and delicate, textural constructions.[155]

The second prize was awarded to Giovanni Corvaja (*1971) for a round golden brooch with a diameter of 5.5 cm, from which hundreds of hair-thin golden wires with braised gold drops sprout like hair from skin (fig. 20)[156]. The wires are only about 0.01 mm thick.[157] Corvaja writes that he learned the granulation technique from books, such as the publication on Etruscan goldsmithing by Nestler and Formigli. With the expert support of his parents, who work in the field of physical chemistry, he experimented extensively, and while using the most modern welding technology and particularly precise tools, he expanded the technique to such an extent that he was able to put his artistic ideas into practice.[158] In an idiosyncratic and technically sophisticated way, he combines filigree and granulation and brings the surface into motion not only visually. He developed a kind of filigranulation. A very large number of extremely fine gold threads form a dense carpet[159] and seem to grow out from the base plate of the brooch. These delicate and flexible spherical head hairs vibrate as if alive with every movement of the wearer. The precursor of this idea could be a brooch by Pol Bury (1922 - 2005) from 1970 called "Threads on a disk" (fig. 21, Galerie Maeght Paris).[160] Attached to the golden brooch are moving wires with small spheres at their ends, which can be wildly shuffled. The goldsmith Jacques Bugin crafted them according to Bury's plans.

David Huycke and Robert Baines also took part in the competition. Huycke's contribution were two silver bowl objects made entirely of spheres and without supporting substrates. Baines submitted a pair of golden earrings called "Ear Ornament" from 1994/96[161], made of gold, silver and plastic (fig. 22, location unknown). These are copies of Etruscan originals from the 7th century BC from the Victoria and Albert Museum (fig. 23).[162] The golden earrings, richly and freely constructed out of granulation and filigree, are completed with four arch elements made of blackened silver beaded wire and gold granulation as well as red plastic reflectors. The contemporary addition locates the copy in the present.

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[154] ibid.

[155] 2012 I attended a lecture by Christiane Förster about her work at the Akademie der bildenden Künste in Munich and http://www.maurer-zilioli.com/attachments/article/95/presse-weber-f%C3%B6rster-2015.pdf, accessed 1/9/2018.

[156] Information from Giovanni Corvaja by e-mail, 12/20/2017: „The brooch is no longer of my property, I sold it to a Belgian gallery."

[157] https:www.youtube.com/watch?v=DttuJU04Q348, accessed 12/26/2017.

[158] E-mail Corvaja and http://www.giovanni-corvaja.com/, accessed 12/27/2017.

[159] E-mail Corvaja.

[160] Marquenie 2017, p. 239.

[161] In the catalogue it says 1996, but Baines' dissertation indicates that it is a work from 1994, which he probably added to later, Baines 2005, pp. 40, 41.

[162] Joppien 2010, p. 62.

The competition showed that contemporary solutions for the use of granulation *"without infringing upon the classical defintion"*[163] were indeed possible. According to Weber-Stöber, experiments helped finding new departures.[164]

4.3 Robert Baines, Discoverer of the Ancient Goldsmithing Technique

With Robert Baines (*1949), goldsmith and archaeologist,[165] the history of the rediscovery of granulation enters a further phase. "Robert Baines. Entdecker der antiken Goldschmiedetechnik" (Robert Baines. Discoverer of the Ancient Goldsmithing Technique) is the title the artist chose for an exhibition organised at the Staatliche Antikensammlungen in Munich in 2004.[166] What led to this title? The ancient granulation technique had already been discovered and rediscovered several times, and had been additionally studied with the aid of modern microscopes and analytical methods.[167] The artist's life and artistic evolution could help understand the choice of the title.

Baines learned the basics of granulation during his training as a goldsmith at the Royal Melbourne Institute of Technology. One of his teachers was German-born Wolf Wennrich (1922 - 1991),[168] who had emigrated to Australia in 1953 and who introduced Baines to the ancient technique.[169] In 1979 Baines received the first of numerous research grants, which to this day enable him to study the technique and construction of antique gold work in American and European museums.[170] He visited Rome several times, where he studied the works of the Etruscans, but also of the Castellani goldsmiths in Villa Giulia.[171] He concentrated on the copies and imitations from the 19th century, which had long been regarded as originals by many collectors and jewellery lovers.[172] Further study visits to the Metropolitan Museum of Art in New York, the British Museum, the Victoria and Albert Museum and the Staatliche

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[163] Weber-Stöber 1996, p. 28.

[164] ebd, p. 28.

[165] Robert Baines obtained a Master's Degree in Archaeology from Monash University in Melbourne in 1998, Baines 2010, CV pp. 114 - 117.

[166] According to an oral statement from 12/6/2017 by his Munich gallerist Olga Zobel, the artist and the gallerist conceived the title together. Mrs. Astrid Fendt from the Antikensammlung wrote me an e-mail dated 12/4/2017 in which she states that the artist himself had brought with him the exhibition labelling. Furthermore in Baines 2005, p. 96 and in Appendix D, pp. 4 - 15. At the same time a solo exhibition of the artist was organised by Galerie Biró in Munich. The catalogue Baines 2004, n.p. and Baines 2005 contains illustrations of the works shown at the Antikensammlung.

[167] See Ogden 1982, Wolters 1983, Nestler / Formigli 1993, Ogden 2000.

[168] Soumilas 2011, p. 6.

[169] http://www.printsandprintmaking.gov.au/artists/12448/ and works by Wennrich at: https://www.ngv.vic.gov.au/explore/collection/artist/2734/, accessed 11/5/2017.

[170] Soumalis 2011, pp. 8, 9 and e-mail from Robert Baines 10/31/17, in which he mentions his ongoing studies.

[171] Baines 2010, CV pp. 114 - 117.

[172] Errey 2010, p. 33.

Antikensammlungen in Munich followed.[173] In 2005, Baines summarized the results of his artistic research conducted with the aid of scanning electron microscopes and X-ray spectroscopic analyses of antique metal alloys and antique processes for the production of granulation and filigree in his dissertation "The Reconstruction of Historical Jewellery and its Relevance as Contemporary Artefact". In it, Baines also explains the relevance of these techniques for his own jewellery work. He wanted to understand how the ancient goldsmiths could conceive and execute jewellery composed of many individual parts. To this end, he made drawings of the jewellery and copied it using the alloys, tools and techniques available in antiquity, so that he also used the technique of colloidal soldering with copper salts for the granulation work.[174]

In the case of works of unknown provenance, archaeology works with stylistic comparisons and material analyses in order to be able to date artefacts and place them into their historical context. Baines explains that in the case of some historical artefacts this approach is particularly complicated, as they have been restored and supplemented with new parts from the time of their restoration. Some pieces have been altered to such an extent that they are rather reproductions than authentic works. If these works were to be placed in a museum, they would gain in importance as works of art.[175] His competition work from 1994/96 is the result of first attempts at copying,[176] a playful reception and appropriation of antiquity. At the same time, the work is a reference to the practice of supplementing and reworking antique jewellery common in earlier centuries.

Indeed, since the seventies, he repeatedly referred back to classical antiquity in his own artistic practice, and references to artistic and technical solutions of ancient goldsmiths can be found in his work. Small blossoms and bell shapes, such as those found on Etruscan disc earrings from the 6th century BC (fig. 24, Metropolitan Museum New York), appear in many of Baines' works. In this way he creates an artistic connection to his chosen cultural home, classical antiquity. He constructs his assemblages in additive steps. He combines single self-contained objects or object parts to form new constructions, some of which are meant to be viewed at 360 degrees. He uses granulation both on the surface and as three-dimensional structures growing into space. In 1992 he used gold and silver to create the "Adventures of the Archegos" (fig. 25, owned by the artist).[177] He also incorporated parts from computer circuit boards and Coca-Cola cans[178] into the small, approx. 4 x 6 cm large brooches of

[173] Baines 2010, CV pp. 114 - 117.
[174] Baines 2005, pp. 11, 12, 17.
[175] Braesel 2010 and Baines 2005, p. 37.
[176] Baines 2005, p. 40 et seqq.
[177] Baines 2010, p. 32.
[178] Soumalis 2011, p. 11.

this series. The brooches are decorated with symmetrical and asymmetrical, two- and three-dimensional ornamental, flower-like structures. Granulation, beaded wire and corrugated metal sheets are the main components. In the brooches the artist combines a postmodern architectural machine aesthetic with his predilection for antiquity. Archegos, the Greek term, indicates a guide in difficult times; someone like Ulysses, who sets off for unknown adventures.[179] The artist probably also sees himself as one: he sets out from Australia to travel back into the past. His work based on the antique repertoire of forms culminates in the "Gold Box" from 1992-93 (fig. 26, Art Gallery of South Australia). The rectangular box with a pointed roof measures 7.3 × 11.6 × 4.4 cm and is constructed by making gold and silver into a hollow shape. In its form the golden box is reminiscent of reliquary shrines of the Middle Ages. It is made of corrugated gold plate. The top of the box, like the small brooches from 1992, is decorated with hundreds of three-dimensional flower-like, granulated and chiselled decors. The richly structured surface immediately evokes Etruscan gold work. In this piece, Baines illustrates a very unique conception of his idea of conveying knowledge and history, technique and form. Baines has almost dissected the antique jewellery and incorporated the individual components into his work. This is again a playful and naive reception of antiquity, mixed with a postmodern jewellery style. Playing with historical references and alleged authenticity became a central theme of his jewellery works in the 1990s.[180] Between 1994 and 1996 Baines created the aforementioned competition work and in 1997 he crafted "A Vesseled History No. 1" (location unknown). The title alone refers to his experimental archaeological-artistic research. It is a bowl-like, golden decorative disc with a diameter of only 2.3 cm. The small object is carefully beset with three-dimensional granulation and from the centre sprouts a red aluminium flower made from the cut-up material of a Coca-Cola can.[181] In this small object the artist combines a technique and a vocabulary of forms from antiquity with a product from the contemporary consumer world. Michaela Braesel writes: *"The historical motifs are combined with materials and objects from his own present time and are thereby decontextualized. In his works, Baines questions notions of historical reliability and certainty"*.[182]

In 2004, "Robert Baines. The Discoverer of Ancient Goldsmithing" displayed in the museum context of the Antikensammlungen the results of his practice-oriented research on ancient granulation and filigree work. He exhibited numerous copies based

[179] Joppien 2010, p. 63.
[180] Soumalis 2011, p.11.
[181] Baines 2010, picture caption, p. 69.
[182] Braesel 2010, n.p.

on originals together with his own contemporary work.[183] The visitors were confused, and this was probably intended by Baines.[184] How much can one rely on a museum presentation? What is original, what is a reference, what was ultimately discovered and by whom? According to Sophia Errey, questions of historicity and location are essential in Baine's work. His jewellery concepts are always readable on several levels. They are about personal experiences, significance of material and cultural content. This combination provides the viewer with a wide range of experiences and provokes diverse and ambivalent reactions.[185]

Against this background, I would like to present Baine's most elaborate conceptual granulation work. The numerous copies he made for his dissertation served as the basis for the work "The Goldwater Hoard from Phoenician Settlement at Freshwater Point on the Queensland Coast" from 1997 - 2005 (fig. 27, owned by the artist). In 2009, the hoard find was published in the book „More Amazing Schmuck Stories by Robert Baines, Artificer Goldsmith“ [186] and was exhibited in 2010 at the Galerie Handwerk in Munich in the exhibition "Treasure Room Australia”.[187] There are about 17 more or less finished pieces of jewellery, jewellery discs, a small square box, spheres in different sizes, wire rosettes, bent filigree decorations, smooth and twisted wires. The sizes vary from very small to pieces with a diameter of 9 cm.[188] The jewellery pieces are decorated with chiselled flower motifs and elaborate granulation. The different working steps are clearly visible. An educated bourgeoisie is familiar with this kind of jewellery from archeological museums, as it recalls jewellery from Greek and Etruscan workshops of the time of the 1st millennium BC. The hoard find is mentioned as a proof of Australia's colonisation by the Phoenicians in the 7th century BC, whereby Phoenician is marked with a question mark and in brackets. “Phoenician, circa (?). Last half of the seventh century BC”.[189] This means that the origin of the golden jewellery fragments is put into question, but not the dating of the finds. Australia is rich in gold. It is therefore not surprising that the author claims that a 3000 year old gold mine was found in Queensland.[190] On the website "AAA, Australian Archeological Anomalies"[191] someone named Val Osborn reports on the discovery of a Phoenician port facility in Queensland that would change Australian historiography, perhaps even

[183] Baines 2005, pp. 4, 12 and Appendix D pp. 8 - 15.
[184] Joppien 2010, p. 76.
[185] Errey 2010, p. 17.
[186] Baines 2009, pp. 22 - 25.
[187] https://www.hwk-muenchen.de/artikel/schatzkammer-australien-treasure-room-australia-74,0,7362.html, accessed 12/6/2017.
[188] Baines 2009, p. 22 - 25.
[189] ebd, p. 22.
[190] ibid.
[191] http://www.australianarchaeologicalanomalies.com.au/AAA/osborn.htm, accessed 11/13/2017.

history worldwide.[192] Baines seizes this story for his own artistic interpretation of history and adds to it. The artist claims that it was this same Val Osborn who retrieved the hoard find and kept it secret for many years until he finally handed it over to ABC News for dissemination in 2000.[193] It seems that Baines took great pleasure in mixing the contemporary with the past, his own story with tradition, and inventions with scientific archeological knowledge of history. The incomplete pieces of jewellery become a vehicle for a narration of artistic appropriation and reinterpretation – an appropriation of objects and their style, their technique and above all a reinterpretation of their history. Some pieces clearly refer to Etruscan provenance. In particular, Baines reconstructed disc earrings and basket earrings from the 6th century BC true to the original (fig. 23 and fig. 24). Joppien tries to find Baines' motivation for this appropriation by asking himself whether the artist, who has been involved with granulation since the beginning of his career, regrets that there is such a great distance between Mediterranean antiquity and the world's youngest discovered continent – both a geographical and a historical distance, which he might try to bridge with his work?[194] Baines creates his own roots. He appropriates the past, deconstructs and trivializes it, but he also enters into an intimate dialogue with it.[195] The artist uses the optically and haptically experienceable jewellery as a medium of contextualisation, in order to convey the constructed narrative. In his work, he questions fixed concepts of historicity, archaeology, truth, material and history of technology, fiction and fake. What is interesting here is the fact that the artefacts who are part of the find were originally built by Baines as copies of ancient originals for an artistic-scientific investigation and then, in connection with the Phoenician hoard find, became originals that are supposed to prove a fictitious history. Even if examined with an electron microscope, the pieces would be able to convey the impression of authenticity, since Baines used granulation methods already known in antiquity. The fake as a concept outlines a strategy here, which draws attention to a double status. It corresponds to the category of the original work of art and also to that of the forgery.[196] Traditions, according to Barbara Deppert-Lippitz, cannot be negated, but the artistic codes that have been established throughout history can be transformed and used to express something completely different.[197]

[192] Baines 2009, pp. 22 - 25.
[193] Baines 2009, p. 23.
[194] Joppien 2010, p. 77.
[195] Errey 2010, p. 34.
[196] Römer 2001, p. 17.
[197] Deppert-Lippetz 1997, n.p.

Again and again the term unsettling is used in connection with Robert Baine's work.[198] In that regard, Stefan Römer points out that *"forgeries and also fakes seem to pose a particular threat because they call into question the system of designation by name and its archiving as a truth system. The institution of art is threatened by this as well, as it is based on the distinction of certain stylistic forms in relation to a place of production and to the social formation of their appearance."*[199] And he continues: *"The fake shakes the foundations of the traditional concept of art, because it introduces added value where value was previously excluded. This value is created by a strategic shift."*[200] Shifts and ambivalences or rather ambiguities are cause for unsettlement.

At the end of the 1990s Baines also began to craft more freely arranged sculptural works in filigree. In these large-scale works he makes once again use of an antique vocabulary of forms. On pages 29 - 34 of his dissertation, Baines shows photos of an Etruscan fibula made of silver and two gold bracelets, which are crafted out of undulating, looped filigree wire (fig. 2). It is exactly the same type of wavy lines that Baines uses in his contemporary filigree works.[201] For his wirework pieces he does not use the ancient technique of metallic bonding based on colloidal soldering. In this case, the adequate solution is using powder solder.[202] This technique was also used for the bracelet "Java-La-Grande".

In 2006 Robert Baines published a small book: "Bracelet, Java-La-Grande", "The Jewellery Space between the Voyages of Vasco da Gama in 1498 and James Cook in 1770". Once again he is dealing with the history of Australia. This time the bracelet "Java La Grande" plays the leading role (fig. 28, Museum of Applied Arts & Sciences Sydney). The bracelet measures 9.9 × 7.4 × 8.9 cm and was exhibited for the first time in 2005 at the Museu Nacional de Arte Antiga in Lisbon, in the exhibition “Closer".[203] Java-La-Grande was what the first Europeans in the early 16th century called the continent they sailed past – so close that it was still in their range of vision. Baines tells a story according to which the Portuguese reached Australia via India and landed there. He claims that from there they brought back wood fragments of a stranded Portuguese caravel and an iron key of the same provenance. The material proof for the story is represented by the bracelet. The rusty iron key is carved into the head of the jewel, which is worked like a reliquary. The shrine is flanked by four red plastic kangaroos. Additionally, fragments of mahogany wood from the stranded ship are

198 In Judith O'Callaghan, Sophia Errey and also in a short conversation with Petra Hölscher from the Neue Sammlung in Munich and his Munich gallerist Olga Zobel.

199 Römer 2001, p. 17 et seqq.

200 Römer 2001, p. 275.

201 http://galleryloupe.com/exhibitions/68, accessed 12/6/2017.

202 https://www.youtube.com/watch?v=wlD6OjWsgTo, Interview of Robert Baines by Glenn Adamson, exhibition Perceptions at the Gallery Loupe 2016, accessed 11/10/2017.

203 Baines 2006, p. 9 and https://collection.maas.museum/object/416402, accessed 11/13/2017.

worked into both sides of the key reliquary. The outlandishly assembled narrative and evidence is supported by Baines with illustrations of electron microscope examinations and stylistic comparisons with other works from the Museu Nacional de Arte Antiga.[204] For example, two reliquary shrines made of gold and silver of Indo-Portuguese origin from the 16th century (fig. 29) are cited. Baines has taken up the form language of these shrines and used it for the design of the bangle, in order to be able to draw conclusions about the relationship between the two, leading up to the claim that the bangle and the shrines could have been made by the same craftsperson.[205] A portrait of a lady from around 1620 to 1640, which is on display at the museum, is reproduced by Baines in the book accompanying the bracelet. On this photomontage the person portrayed wears the bangle "Java-La-Grande" on her right wrist.[206] The artist claims that this painting is further historical evidence of the Portuguese landing, as the hoop contains typical Australian artefacts and was in the possession of the depicted lady.[207] Baines studied the vocabulary of motifs of the filigree technique of antiquity and of the 16th century intensively and has adopted it for himself. He took up twisted wires, beaded wire, rosettes formed from filigree, hemispherical granulated elements, flat-rolled wires laid in waves and other elements and used them for the large bracelet.[208] The forgery is verified by alleged reliquary material and objects and paintings from the museum are used to substantiate the authenticity of the forgery.[209] As an additional artifice he even uses the typical technique of the time to produce his pieces. He refers to the treatises of Benvenuto Cellini of 1568, in which he describes the production of filigree with powder solder and admires the fineness of such filigree.[210] Considering the history of granulation and filigree, the technical process Baines used for the bracelet alone logically represents the most appropriate technique for a work that is to be dated back to the 16th century. At that time, colloidal soldering as a process was no longer common in Europe and granulation and filigree became coarser and are rarely used separately. Since he appropriates 16th century techniques and form language, and combines them with contemporary elements such as plastic kangaroos and red paint, Baines fuses past and present to create his very own artistic language. Errey writes that Baines ironically questions common historiography and extends the function of jewellery as a purely aesthetic accessory. The juxtaposition of materials, styles, and

[204] Baines 2006, pp. 18, 29, 37.
[205] Baines 2009, p. 34 et seqq.
[206] Baines 2006, p. 29.
[207] ibid. p. 36.
[208] ibid. p. 34.
[209] Baines 2005, p. 86.
[210] Baines 2005, p. 37 and Fröhlich 1974, p. 18.

narratives, Errey says, holds subversive potential.[211] According to Baines, the red kangaroos and the red colour applied as if it were peeling off serve the purpose of subjecting the piece of jewellery he has crafted imitating and copying historical forms to a different kind of observation. This also applies to other pieces of jewellery in his oeuvre, in which he incorporates red details or which he covers completely with red polymer compounds. The viewer is not captivated by the value of the material or the gemstones, but is invited to discover a new value. That what initially appears as outlandish brings a new configuration with it. The artist claims that he does not want to create a new pseudo-history or a new myth, but that he wants to ask the question, what if...? History remains unchanged, but it becomes part of a game. The creation of a new type of jewellery design is a vast field. Redesign does not mean erasing the past, but rather to return the present work to the past[212] – in Baines' case into a self-constructed one. The artist, who calls himself a "goldsmith artificer",[213] stresses the importance of the fakes being clearly recognizable as his work. He does not hide behind the deception. The red details function as his personal signature on his works. He sees himself in the tradition of the historical models of the art of goldsmithing that he repeatedly quotes, goldsmiths such as Bezaleel from the Old Testament or the medieval monk Theophilus Presbyter, who was also a goldsmith, and the Renaissance artist Benvenuto Cellini.[214] Baines sees himself, in the spirit of Paragone, in competition with his great role models.

The title of the 2004 exhibition should be read as an allusion to Baines' adopted artistic home and to the artist's discovery of granulation and filigree for his own work – techniques that had opened up new possibilities of interpretation beyond technical invention. The artist sees himself as a creator, as someone able to even trump antiquity and to become the discoverer of the ancient goldsmithing technique.

4.4 David Huycke, New Methods

Eventually, David Huycke (*1967) finds a way to build large three-dimensional granulation works without substrates in the traditional technique, albeit using modern methods. Their minimalist form language clearly places them in the first decade of the 21st century. Stylistic parallels to works by Laurenz Stockner (*1971) from South Tyrol and Annette Zey (*1964) from Germany are evident. In his technique, however, Huycke goes his very own way. The announcement of the Granulation Competition in 1996 was the initial spark for the Belgian silversmith to get involved with the technique of

[211] Errey 2010, p. 33.
[212] Baines 1997, n.p.
[213] Grierson 2011, p. 19 and in the title of his book: Baines, Robert: More Amazing Schmuck Stories by Robert Baines, Artificer Goldsmith, Melbourne 2009 and in other publications.
[214] Joppien 2010, p. 68 and Baines 2005, pp. 29, 32, 86, 89.

granulation.[215] His knowledge of granulation was only rudimentary, but he liked the challenge of dealing with a process that was new to him. The first experiments which proved successful were submitted to the competition.[216] "Pearl Sphere" are two round, 5 and 7 cm high bowls made of silver with diameters of 13.5 and 16.5 cm (fig. 30, location unknown). One of the bowls is pickled white and the other one is patinated black.[217] Both bowls are entirely made out of up to 3 mm large silver spheres arranged irregularly. The spheres of the bowl objects are metallically bonded to each other and not to a stabilizing and shaping substrate. Like Christiane Förster, Huycke does not use the spheres to ornamentally decorate a surface, but the spheres themselves form the object. The spheres are support, structure and decoration in one. "Pearl Sphere" is part of a series of bowls of various sizes, with a diameter of 10 to 26 cm. The largest of the bowls consists of about 10,000 spheres.[218] "Pearl Sphere" was also the beginning of a research project on the technology of granulation that lasted almost a decade and a half. Huycke published the results in 2010 in his practice-oriented dissertation: "The Metamorphic Ornament: Re-Thinking Granulation. Een onderzoek naar de transformatiemogelijkheden van granulatie naar sculpturaal zilverwerk".[219] At the Z33 House for Contemporary Art in Hasselt, about forty sculptures and objects engaging with the granulation technique were exhibited, accompanied by the publication on the subject.[220] The art historian Liesbeth den Besten explains that David Huycke is one of those well-educated craftsmen who combine their love of traditional techniques and materials with a contemporary and artistic expression. With his work he has succeeded in proving that granulation is relevant in contemporary art. It is possible to use it in an innovative way. He is looking for alternative applications of granulation which go beyond the decorative surface technique and explore its constructive options[221] for sculptural silversmithing with freely structured granulation. All the possibilities offered by traditional techniques are consistently explored. The artist compares his approach to the composition of a painting. The spheres are at the same time the canvas, the paint and the subject of the painting. The purported decoration turns into the structure and becomes the independent carrier of the spatial work.[222] Huycke, who's form language is harmonious, clear and geometric, and avoids any surface decoration –

[215] Huycke 2000, p. 7.
[216] http://www.sightunseen.com/2010/11/david-huyckes-granulation-series/, accessed 11/21/2017.
[217] Granulation 1996, p. 55.
[218] Nanfeldt 2003, n.p.
[219] Hycke, David: The Metamorphic Ornament: „Re-Thinking Granulation. Eine Untersuchung der Transformationsmöglichkeiten von Granulation in skulpturalen Silberschmiedearbeiten", Hasselt and Leuven, 2010. I would like to thank Rudi Sand for his help with the translation from Dutch. The same goes for all other footnotes in which I quote David Huycke's dissertation.
[220] http://archief.z33.be/en/search?keys=David%20Huycke, accessed 11/10/2017.
[221] den Besten 2011, p. 158.
[222] Huycke 2010, p. 15.

except for the structures needed in the working process – tries to combine the traditional technique with his own contemporary silversmith work. In this repertoire of forms, working with a decorative goldsmithing technique appears at first glance to be unusual, but the harmoniously geometric and exact spherical shape fits in very well with David Huycke's artistic language.

This form and the physical properties of the spheres determine the appearance and character of the objects. The fact that liquid metal always forms into geometrical bodies – namely spheres – due to surface tension and cohesive force is a fascinating phenomenon well-known since ancient times. Due to their shape, these bodies arrange themselves into a regular pattern on a flat surface or in a concave curvature following the principle of densest gap filling, namely into hexagonal endless patterns or, within a curvature, into a linear curve pattern similar to the arrangement of the seeds in the inflorescence of sunflowers.

Granulation is a virtually unknown technique in the field of silversmithing. Well-known are the golden Etruscan bowl from the Victoria and Albert Museum, which is decorated with 137,000 granules of only 0.32 mm in diameter, or the liturgical items from the 13th century onwards, on which granulation and filigree were combined for decorative purposes.[223] In 1949 Elisabeth Treskow crafted a chalice for the Benedictine Abbey Maria Laach, whose node is decorated with a homogeneous gold granulation covering the whole surface (fig. 31).[224] Objects and vessels made entirely of spheres that are not attached to a carrier do not exist. Among other things this is due to the fact that the spheres are very small and, as for instance in Christiane Förster's competition work, do not hold together in a stable manner when they are used for constructions that are meant to be self-supporting. Moreover, even in self-supporting objects the individual spheres must be repeatedly heated almost to the melting point in order to achieve the metallic bond, so that the objects risk collapsing.

David Huycke's spheres are no longer tiny granules, they are ten times larger than the spheres used by the Etruscans. They measure about 3.2 mm in diameter. The traditional manufacturing method with pulverized coal is also no longer viable, as the spheres' dead weight is too high so that they would fall through the coal and melt into a large lump. Huycke crafts the granules in ceramic moulds specifically developed by him. The spheres, which are later melted in the furnace inside these moulds, are polished to a high gloss in a polishing drum and electrolytically copper-coated.[225] To prevent the objects from collapsing under their own weight, Huycke builds concave refractory concrete moulds in which the spheres slide together at the lowest point,

[223] Wolters 1983, pp. 215, 242.
[224] Joppien 1990, p. 162 and ill. p. 76.
[225] Huycke 2010, pp. 99 - 112.

touch each other and can then be welded together with a soft reducing flame.[226] The mould constitutes the supporting recipient and determines the overall form of the object. The metallic bond between the spheres guarantees the stability needed for the object to bear its own weight. The repertoire of forms of the granulated spherical objects is derived from Huycke's typical minimalist silversmith works, aesthetically focused on technical aspects. At first Huycke thought that he could only build hemispheres, namely bowls in concave form, from spheres. Later, other possibilities presented themselves, such as cylindrical forms and almost completely closed spheres.[227] The shape can be resized, but for technical reasons it is not possible to change the shape itself. It must always expand upwards. If it were to become narrower upwards, the finished object could no longer be released from the form. This is how the vessel objects from the series "Pearl Sphere" from 1996 and the object "Lace Sphere" from 2006 (fig. 32, Edinburgh, National Museum of Scotland) were created. For "Lace Sphere" Huycke prepared hundreds of individual rings made of silver spheres and then assembled them to form a spherical object with a diameter of approx. 25 cm. The small ring that was found in the excavations of Ur (fig. 1) served as the model for these small rings.[228] Here Huycke quite deliberately refers back to the first and oldest granulation find, which led to the discovery of a new technique in the art of goldsmithing, and in doing so again refers to his new discovery, his "Inventio". Huycke as well cannot operate without referencing antiquity.

The artist also experimented with prefabricated double spheres and constructions made out of three spheres.[229] The prefabricated units allow him to build structures with interruptions and, in his own words, open up to a world of disorder or chaos within a self-organizing system.[230] This self-will, this self-organisation, however, had to be disrupted. The object "Edge of Chaos" (fig. 33, location unknown) from 2007 is the result of a search for chaos.[231] This object, too, was created using a form and was assembled from prefabricated modules comprising three spheres each. "Edge of Chaos" comes with a regular, smooth exterior due to the concrete form, with one sphere placed next to the other, and a chaotic texture of irregularly arranged spheres on the inside. The transition from order to chaos, from control to loss of control manifests itself at the upper rim.[232] The object's counterpart "Pearl Chaos" from 2006, on the other hand, is one big chaos, inside and out. Here the artist has welded spheres

[226] http://www.sightunseen.com/2010/11/david-huyckes-granulation-series/, accessed 11/21/2017.
[227] Huycke 2010, p. 256.
[228] ibid. p. 137.
[229] ibid. p. 139.
[230] From an unpublished Word document, which David Huycke sent me by e-mail on 7/4/2017.
[231] Huycke 2010, p. 139 et seqq.
[232] ibid. p. 139.

in a wild jumble onto the smooth exterior as well. The silver object patinated black weighs over 4 kg.[233] A considerable mass, both in terms of the number of spheres and of the weight of the object, is gathered in this piece.[234] Ultimately, according to the artist, the object consists more of a three-dimensional volume than a three-dimensional surface.[235] When he speaks of volume, he means mass or quantity. The same applies to "Fractal Piece" (fig. 34, location unknown) from 2007, made of silver, with a diameter of 16 cm. However here Huycke goes one step further. This is a spherical object made of spheres, which in turn are made of spheres. "Fractal Piece" is composed of about 20,000 individual spheres with a total weight of 4.5 kg.[236] The largest elements can be found within the smallest elements and vice versa. In nature, there are countless examples of this phenomenon, which the mathematician Benoît Mandelbrot described in his fractal theory, and the title of the piece alludes to this theory. A fractal is a geometric pattern that exhibits a fractured dimensionality and also a high degree of self-similarity. This is the case, for example, when an object consists of several reduced copies of itself or produces copies of itself. These copies are also called satellites. On the edges of these satellites the same structures that can be found on the corresponding spots of the mother structure appear once again.[237]

Almost all of Huycke's objects are patinated black in a final process. The artist believes that this characteristic declares the objects as non-functional, in contrast to traditional functional silversmith work. The sculptural character of the works is thus emphasized.[238] Huycke cannot work with spheres with a diameter larger than 3.2 mm, because the weight of the individual spheres would make it impossible to melt round spheres.[239] Objects can also not be built without a mould when using traditional techniques, as they would collapse under their own weight. Huycke believes that the limits of the traditional technique have already been reached.

After having explored all the possibilities of constructing objects from metal spheres, he turned to objects through which he could investigates the "world of granulation"[240] with its technical, formal and conceptual structures.[241] The sphere itself became the main topic. He tried to find other conceptual and poetic qualities and experimented beyond the traditional technique with masses and proportions, different forms and materials, matt and reflective surfaces and mathematical laws in order to translate them into

[233] ibid. p. 141.
[234] Huycke 2010, p. 151.
[235] Unpublished document.
[236] Huycke 2010, p. 151.
[237] http: //ben.design/fraktale-in-der-natur/, accessed 11/3/2017.
[238] Huycke 2010, p. 121.
[239] ibid. p. 104 et seqq.
[240] ibid. p. 258.
[241] ibid. ill. pp. 182, 184.

spherical sculptures and, according to the artist, to find a mathematical poetry or a more universal idea.[242]

Under these self-imposed conditions he created two sculptures, "Order & Chaos" # 1 (fig. 35, location unknown) and # 2 (fig. 36, location unknown), respectively in 2008 and 2009.[243] They are two-part objects whose aesthetic impact is based primarily on the contrast between a closed spatial construction and an open transparent and chaotic other half. One half is formed by a hollowed, blank silver sphere with a fine hammer texture. The other half consists of a chaotic spherical arrangement of cast stainless steel spheres, which are metallically joined together by means of a gas-shielded welding process. The two unequal halves are joined at one point. The sculpture from 2009 is additionally covered with a layer of white polyurethane. The plastic forms a shiny shell and at the same time serves the function of stabilizing the fragile composition.[244] According to Huycke, the shimmering colour is also intended to convey the impression of flowing liquid metal.[245] In "Chaos & Order" # 2 the chaotic formation is much larger than the chased half. It is interesting to note that in the second sculpture the volumes of the two halves are identical. If the chaotic structure were to be melted together to form a sphere, it would have the same size as the chased silver sphere, since a sphere has the smallest surface area in relation to its volume of all forms.[246] Here the artist plays with a homogeneous geometric surface in the shape of a sphere as opposed to a heterogeneous arrangement and the surface of many individual spheres. It represents an effort in translating a mathematical principle that becomes material in an aesthetic object, takes shape and is visualized and experienced by the viewer. It is the result of the artist's years of involvement with granulation and its technical laws.

5 Summary

This paper has demonstrated how, after its rediscovery in the 19th century, the art of granulation, which had lain dormant for many centuries, has once again enjoyed a technical and artistic renaissance in the 20th and 21st centuries. From the middle of the 19th century onwards, an interesting new development emerged. During the period of historicism, antique and antique-looking jewellery was considered modern. People were especially fascinated by the lavish splendour of Etruscan granulation. The Castellani company met the demand for opulent archaeological jewellery and Augusto

[242] http://www.sightunseen.com/2010/11/david-huyckes-granulation-series/, accessed 11/21/2017.
[243] Huycke 2010, p. 182 et seqq.
[244] ibid. pp. 183, 185.
[245] ibid. p. 185.
[246] ibid. pp. 183, 185.

Castellani in particular endeavoured to rediscover the supposedly lost technique of granulation. At the beginning of the 20th century, Johann Michael Wilm in Germany succeeded in recreating the old process of colloidal soldering and in applying it in the same way as the Etruscans had already done in the first millennium BC. Elisabeth Treskow, the only woman among the rediscoverers, also referred back to antiquity with her granulations. For her, the visualization of the ancient world was a symbol of timeless, classical beauty and an artistic retreat. In the course of her long career she adapted granulation to the changing styles of the 20th century and to her own jewellery style. Treskow made the technique popular. In the sixties and seventies, other artistic and methodical approaches emerged in addition to craft-focused jewellery creation. Base materials inspired the goldsmiths of the time. Granulation went out of fashion again, new impulses failed to appear. In 1996, the Granulation Competition organised by the Goldschmiedehauses in Hanau represented a further attempt at reviving the technique, and it turned out that young goldsmiths in particular were prepared to take not only new creative but also new technical paths. The enormous amount of work involved in crafting jewellery and utensils out of thousands of tiny spheres seems to have motivated goldsmiths more than it has deterred them. The joy in excessive and boundless experimentation, and in a generous use of material, time and imagination is the common feature of all these works. The creative as well as the chemical or physical limits posed by the granulation process have been extended. Christiane Förster and Giovanni Corvaja freed granulation from its role as mere surface decoration and looked for three-dimensional solutions using modern materials and methods. While Corvaja's works consist of ever thinner and smaller golden elements, David Huycke uses relatively large spheres to build expansive objects, solely working with spheres that are welded together. As part of his artistic research, Huycke adds a mathematical-poetic interpretation to the process. Robert Baines, the one who's work is more closely related to antique models, also appropriates them literally. First he examines technique and construction of antique museum pieces microscopically, and then he copies the jewellery using the methods and tools which were available in antiquity, demonstrating that he is able to match the quality achieved by goldsmiths in antiquity. In a final step he incorporates the copies into fakes constructed by him, thus turning them into originals. Stefan Römer calls this procedure an appropriation of art through art.[247]

It is interesting to note that none of the artists presented renounces a reference to antiquity, even if different motives can be identified. The goldsmiths of antiquity are still considered to be unsurpassed in the art of granulation and every contemporary work is automatically compared with its historical models. The technique, long forgotten and

[247] Römer 2001, p. 16.

considered particularly difficult, is obviously so strongly mythologized and charged with meaning that a comparison with the masters of antiquity is almost inevitable.

Perhaps this is the reason behind the re-rediscovery of the traditional granulation technique. On the one hand, that what was newly conceived is brought in relation with that which has survived the millennia. On the other hand, however, the goldsmith artists, just like their colleagues in the fine arts, also strive to be both discoverers and creators, and to compete in the field of craft as well as in that of art.

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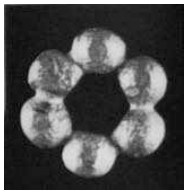
7 Illustrations and Index of Illustrations

Fig.1



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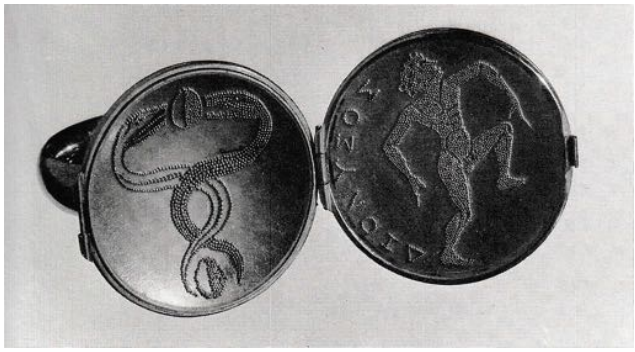

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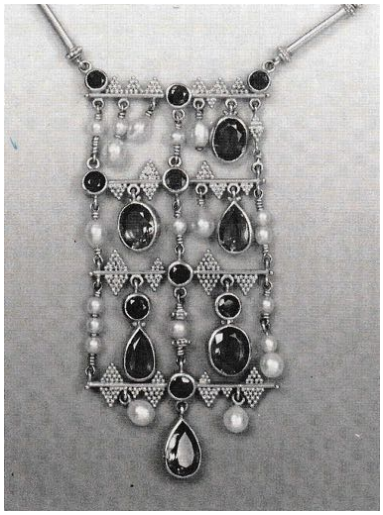

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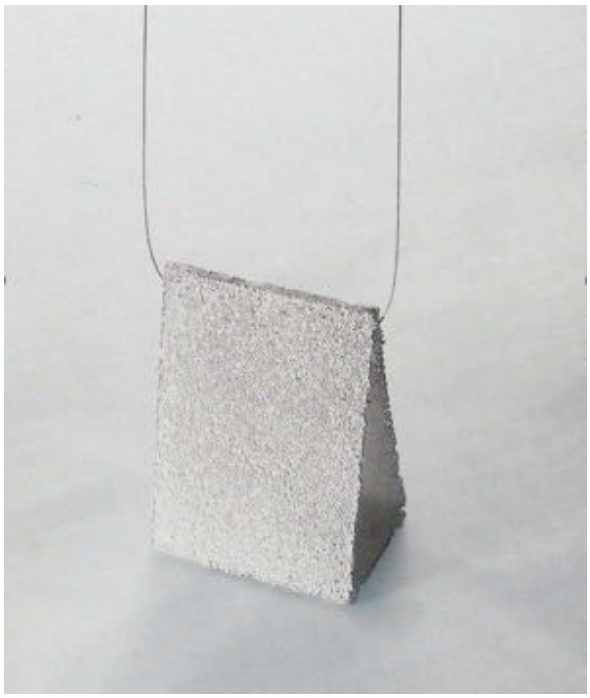

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III.1: Royal Tombs of Ur, ring, gold, diameter approx. 2 mm, c. 2550 - 2400 BC, ill. in Ogden, Jack: Jewellery of the Ancient World, New York, 1982, p. 62.

III. 2: Etruscan bangle, gold, 700 - 675 BC, Staatliche Antikensammlungen München, photo: © Ute Kirchhof.

Ill. 3: Etruscan pendant with hunting scenes, gold, 675 - 650 BC, © Staatliche Antikensammlungen und Glyptothek München, photo: Renate Kühling.

Ill. 4: Etruscan bowl, gold, 7,5 x 10,9 cm, 700 - 650 BC, site of finding Palestrina, Victoria and Albert Museum, London, Museums number 241-1894, © Victoria and Albert Museum, London.

Ill. 5: Etruscan Pan mask, gold, 1st millennium BC, Louvre Paris, ill. in Rosenberg, Marc: Geschichte der Goldschmiedekunst auf technischer Grundlage, Frankfurt, 1918, p. 4.

Ill. 6: Castellani, Pan mask, gold, height 4,7 cm, width 3,4 cm, National Museum of Ireland Dublin, ill. in Rosenberg, Marc: Geschichte der Goldschmiedekunst auf technischer Grundlage, Frankfurt, 1918, p. 5.

Ill.7: Augusto Castellani (execution), Snake Bangle, Michelangelo Caetani (design), gold, rubies, emeralds, ø 7,8 cm, Rom c. 1860 - 1865, Schmuckmuseum Pforzheim [MF 59 | Inv. No. 1976-2], © Schmuckmuseum Pforzheim, photo: Günther Meyer.

Ill. 8: Elisabeth Treskow, ring, gold, chrysoberyl, 1931, location unknown, © Museum für angewandte Kunst Köln (photo archiv Elisabeth Treskow), photo: Gertrud Hesse / Alber Renger-Patzsch.

Ill. 9: Elisabeth Treskow, ring, gold platinum Sapphire Moonstone and pearls, height 2,5 cm and ø 1,9 cm, 1929, Museum für angewandte Kunst (Inv.-Nr.G1085), © Rheinisches Bildarchiv Köln, rba_c018753, https://www.kulturelles-erbe-koeln.de/documents/obj/05134009, photo: Marion Mennicken

Ill. 10: Elisabeth Treskow, bracelet, gold, width 2,6 cm and 6,4 x ø 5,2 cm, 1934, privately owned, © Rheinisches Bildarchiv Köln, rba_L011034_19, https://www.kulturelles-erbe-koeln.de/documents/obj/05747637, photo: Marion Mennicken

Ill. 11: Elisabeth Treskow, brooch, gold and chrysoberyl, 1938, location unknown, © Museum für Angewandte Kunst Köln (photo archiv Elisabeth Treskow), photo: Gertrud Hesse / Albert Renger-Patzsch.

Ill. 12: Elisabeth Treskow, capsule ring, 585/- gold, height 2.8 cm and diameter of capsule 2.3 cm, 1942, Museum für angewandte Kunst Köln (Inv.-Nr.G1148) photo exterior: Pura Ferreiro, photo of the inside © Rheinisches Bildarchiv Köln, rba_L006418_29, https://www.kulturelles-erbe-koeln.de/documents/obj/05134015, photo: Marion Mennicken.

Ill. 13: Elisabeth Treskow, grape brooch, gold, diamonds and pearl, 1941/1942, Schmuckmuseum Pforzheim [MF 114 | Inv. No. 1976-20], © Schmuckmuseum Pforzheim, photo: Günther Meyer.

Ill. 14: Elisabeth Treskow, brooch, gold and white and black pearl, ø 4 cm, 1963, Schmuckmuseum Pforzheim [Inv. Nr. 1963/202 | BM Kat 663], Schmuckmuseum Pforzheim, photo: Günther Meyer.

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Ill. 16: Elisabeth Treskow, brooch, gold, sapphires and fire opal, ø 4,4 cm, 1967, Museum für Angewandte Kunst Köln (INV.-Nr.Ov20), © Rheinisches Bildarchiv Köln, rba_d031871_01, https://www.kulturelles-erbekoeln.de/documents/obj/05730650, photo: Marion Mennicken.

Ill. 17: Elisabeth Treskow, necklace, gold, precious stones and pearls, 1975/76, privately owned, © Rheinisches Bildarchiv, rba_L011006_18, https://www.kulturelles-erbekoeln.de/documents/obj/05747817, photo: Marion Mennicken.

Ill. 18: Byzantine earrings, gold, 10-11th century, MAK Köln, photo: Pura Ferreiro.

Ill. 19: Christiane Förster, pendant, silver with plastic and glass mixture and steel cable, 1996, property of the artist, © Gesellschaft für Goldschmiedekunst e.V. Hanau, C. Hafner GmbH + Co., Pforzheim, photo: Karlheinz Wilker.

Ill. 20: Giovanni Corvaja, brooch, gold, 60 x 50 cm, 1996, property of a Belgian gallery, © Gesellschaft für Goldschmiedekunst e.V. Hanau, C. Hafner GmbH + Co., Pforzheim, photo: Karlheinz Wilker.

Ill. 21: Pol Bury, brooch Threads on a disk, gold, ø 8.2 cm, 1970, Jacque Bugin for Galerie Maeght Paris, edition of 30, © VG Bild-Kunst Bonn 2018, photo: © Didier Ltd London.

Ill. 22: Robert Baines, ear ornament, copies after antique pieces from the 7th century BC with additions, gold with silver, copper, plastic 4,3 x 4,9 cm, 1994 or 1996, location unknown, © Gesellschaft für Goldschmiedekunst e.V. Hanau, C. Hafner GmbH + Co., Pforzheim, photo: Karlheinz Wilker.

III. 23: Etruscan a baule type earrings, gold, 550-450 BC, Victoria & Albert Museum London, Museums Nr. 3347-1856, © Victoria & Albert Museum London.

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Ill. 25: Robert Baines, Adventures of the Archegos, brooches, gold and silver, 1992, max. 2 x 2 x 4 cm, property oft he artist, photo: Garry Sommerfeld, ill. in Robert Baines: Metal, exh. cat., Sydney, 2010, p. 32.

Ill. 26: Robert Baines, Gold Box, 1992/93, Melbourne, fine gold, gold alloy, silver alloy, 7.0 x 12.3 x 4.5 cm, South Australian Government Grant assisted by the Commonwealth Government through the Australia Council, its arts funding and advisory body 1994, © Art Gallery of South Australia, Adelaide 945A22A.

Ill. 27: Robert Baines, The Gold Hoard from the Phoenician Settlement at Freshwater Point on the Queensland Coast, gold, 1997- 2004/2008, property of the artist, photo: Garry Sommerfeld, ill. in Baines, Robert: More Amazing Schmuck Stories by Robert Baines, Artificer Goldsmith, Melbourne, 2009, p. 23.

Ill. 28 : Robert Baines, Java La Grande bracelet, 2004-2005, gold plated silver, plastic, iron, wood, 9,7x7,4x8,9 cm, Museum of Applied Arts & Sciences Sydney. Ill. in https://collection.maas.museum/object/416402, accessed 12/6/2017.

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Ill. 30: David Huycke, Pearl Sphere, silver, ø 13,5 and 26,5 cm, 1996, © Gesellschaft für Goldschmiedekunst e.V. Hanau, C. Hafner GmbH + Co., Pforzheim, photo: Karlheinz Wilker.

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Ill. 32: David Huycke, Lace Sphere, silver, 26 x 25 cm, 2007, National Museum of Scotland, Edinburgh, David Huycke: The Metamorphic Ornament, Re-Thinking Granulation, Dissertation, Leuven and Hasselt, 2010, p. 36, © David Huycke.

Ill. 33: David Huycke, Edge of Chaos, silver, 12 x 16,5 cm, 2012, David Huycke: The Metamorphic Ornament, Re-Thinking Granulation, Dissertation, Leuven and Hasselt, 2010, p. 140, © David Huycke.

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Ill. 35: David Huycke, Order & Chaos # 1, silver, steel, polyurethane, 32,5 x ø 17,5 cm, 2008, David Huycke: The Metamorphic Ornament, Re-Thinking Granulation, Dissertation, Leuven and Hasselt, 2010, p. 182, © David Huycke.

Ill. 36: David Huycke, Order & Chaos # 2, silver, steel, polyurethane, 28 x 20 x ø 19 cm and 11 cm, 2009, David Huycke: The Metamorphic Ornament, Re-Thinking Granulation, Dissertation, Leuven and Hasselt, 2010, p. 184, © David Huycke.

Statement of Authorship

I hereby declare that I am the sole author of this master's thesis and that I have not used any sources other than those listed in the bibliography and identified as references. I further declare that I have not submitted this thesis at any other institution in order to obtain a degree.

Pura Ferreiro

Munich, January 18th, 2018