

The Blaschkas' glass animal models: illustrations of 19th century zoology

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INTRODUCTION

In the period 1863-1936 the glassworkers studio of Blaschka in Dresden produced glass models on natural history subjects: invertebrate animals as well as flowers. These models were used as teaching aids. Glass is not a self-evident choice of material because of its fragility, but no other material can convey the translucency of soft bodied animals equally well. Glass models were developed by Leopold Blaschka (1822-1895) who started a business, in which his son Rudolf (1857-1939) participated in due time. This paper concentrates on the glass animal models (1).

The Blaschkas' most well known achievement is the collection of Glass Flowers of Harvard University. These botanical models, meant to teach economic botany, were made at the turn of the century (1886-1936). This collection is appreciated as North American cultural heritage and it is a well-known attraction in the New World. In Europe the existence of the glass flowers is a secret shared among connoisseurs, mainly from the field of natural history and glass enthusiasts. The Harvard collection consists of approximately 847 life-size models representing 780 species, accompanied by models of sections and details (2).

Earlier (1863-1890) father and son Blaschka made numerous invertebrate models which were sold all over the world (3). Chris Meechan of the National Museum of Wales retraced several glass animal collections in Great Britain and Ireland (4). Many other collections were refound by following leads from the archives. At the moment ca 45 collections are known to survive in Great Britain, Ireland and also in Australia, Austria, Belgium, Canada, France, Italy, Germany, the Netherlands, New Zealand, Sweden and the United States. In total more than 3500 models are known to survive to the present day.

In the second half of the 19th century specific items were added to the collections of natural history departments, among which the then newly invented glass models. The subject of glass invertebrates, used as educational aids, seems to be a light theme in the context of understanding the topics and the development of natural science at the turn of the century. These animal models show a *reflection* of the topics of 19th century zoology - an insight that revealed itself during my research of the Blaschka materials in the Rakow library, Corning Museum of Glass (USA). Here preparatory drawings, drafts of businessletters and accounts of businessresults are kept. Another set of archival materials was consulted at the Botanical Museum of Harvard University.

Leopold Blaschka was born in a dynasty of glass workers and initially he combined his artistic talents, his skills as a glassworker and his love of nature in creating glass tropical plants, many of them orchids. He undertook this activity for his pleasure only. At that time he was living in Aicha, Bohemia (presently known as Èsky Dub) and he was allowed to take for free - as study materials - orchids from the greenhouse of Camille, Fürst von Rohan (1800-1892) (5). The "Fürst" or prince was an enthusiastic collector and connoisseur of plants and owner of gardens and parks which were ranked among the most beautiful of the world at his estate in Bohemia named Sichrov (6). When Leopold moved with his family to Dresden in 1863, the prince introduced Leopold to Ludwig Reichenbach (1793-1879), director of the Dresden Botanical Gardens and of the Dresden Natural History Museum. At the request of an unknown Englishman the very first glass models were made and Reichenbach decided to exhibit these. By the time that Leopold Blaschka made these first models of sea anemones the aquarium was an accepted piece of drawing-room furniture. The keeping of living sea animals in an aquarium was a 19th century pastime, which was very popular in England and abroad as well (7). The Englishman in Dresden however preferred lifeless glass replicas of the British species, as the living organisms themselves were so perishable. At this point the thriving business of Blaschka's natural history models - glass animals - took off.

GLASSWORKERS' STUDY OF ZOOLOGY

One wonders how these glassworkers learned the bodyshapes of the invertebrate animals of seas and oceans, when living in Dresden, central Germany. But in the beginning as well as later father and son Blaschka relied heavily on zoological illustrations. The very first glass models are almost all based on Philip Henry Gosse's *Actinologia Britannica - A history of the British sea-anemones and corals* (1860). Gosse was an enthusiastic propagator of the aquarium through his publications on the subject (8). Many of the early glass models were sold to Britain, apparently because of the close relation of these with the British sea-fauna. From errors - misinterpretations - it may be concluded that the features of the real, living animals were not at all taken into account in the beginning. Perhaps the most funny misinterpretation in the early models is the representation of the image of an enlarged single tentacle, which was offered as a complete model of a sea anemone.

In the course of time the Blaschkas consulted many more descriptive taxonomic works. Almost 70 zoological references are now identified, whose illustrations account for the design of more than 300 different invertebrate models. All in all Leopold and Rudolf Blaschka offered 700 different glass models in their last catalogue. Presently known publications are listed hereunder in the bibliography. Except for one, all titles mentioned there are published in the 19th century and this is no coincidence. The invention of lithography in 1798 enabled the distribution of illustrated zoological works on a large scale. Gosse's illustrations were lithographed - he had the skills to draw these directly on the stone (9). Many of the other listed works used lithographs as illustrations as well. Moreover, the 19th century is known

for a spectacular growth in the number of known animal species (10). Certainly 19th century zoology dominates the collections glass animals, offered by the Blaschka studio. From the analysis of the archival materials it can be understood that the Blaschkas studied and copied published zoological illustrations and kept these drawings, and sometimes the originals, as a reference.

It was only later that the features of living animals were taken into account when modelling glass animals. This text draws attention to the study of real animals, but first other subjects of 19th century natural science are highlighted: the influence of expeditions, the role of Ernst Haeckel and emphasis on embryology and anatomy as expression of "Natur Philosophie".

EXPEDITIONS

The description of new species is a feature of natural history that was continued in the 19th century. Travelling naturalists explored far shores or the oceans in between, and reported their discoveries, which were studied by the Blaschkas (11). The consulted works contain attractive zoological illustrations. At this point I want to highlight the publication of Franz Eilhard Schulze (1840-1917), zoology professor in Berlin, which was published as part of the report on the Challenger expedition. The Blaschkas used both the proofs of Schulzes plates and his microscopic slides as preparatory material to the models of tissue of sponges and their spiculae (12). Another report I want to draw special attention to is the report from 1869 on tropical starfish and seacucumbers of the Dutch territories overseas, edited by Janus Adrian Herklots (1820-1872), then curator at the Leyden Natural History Museum.

ERNST HAECKEL

An important influence on 19th century continental zoology is Ernst Haeckel (1834-1919). Haeckel was a zoology professor at Jena University who illustrated his scientific works himself. Apart from that he was engaged in popularising natural history. His publication *Kunstformen der Natur* (Art Forms in Nature) (13) issued at the turn of the century, was considered to be highly influential on contemporary decorative arts (14). Ernst Haeckel was an ardent proponent of Darwinism and much of his scientific work concentrated on evolution in relation to invertebrate animals.

Haeckel too was an influence on the Blaschkas and their oeuvre. As an example of this, one specific model will be discussed. The Utrecht Society for Arts and Sciences - Provinciaal Utrechtsch Genootschap van Kunsten en Wetenschappen - awarded Haeckel in 1868 a prize for a study, *Zur Entwicklungsgeschichte der Siphonophoren*, which was published by this society in 1869 (15). This study described the embryology of a siphonophore (a colony building jellyfish), showing like an elegant case study some of the themes in Haeckel's zoological thinking on development of shape and the meaning of symmetry and asymmetry. The Utrecht University Museum keeps a glass model made in the Blaschkas' studio, showing the

same embryology, which is based on this specific publication. Other known copies are in the collections of Vienna and Cornell universities.

In other ways Haeckel inspired the production of glass models as well. His 1862 study on Radiolarians was the first to apply evolutionary thinking to taxonomy (16), and this landmark in the history of natural science is echoed in glass models of these organisms. Other Haeckel-related sources pertain to jellyfish. Unlike Gosse, whose *Actinologia Britannica* in the beginning was used as a single source, the influence of Haeckel seems to be less dominant, even if the Blaschkas portrayed several of the animal groups from his work in their models (17). The Blaschkas knew Ernst Haeckel not only through the printed materials. They met him personally and he even borrowed them illustrated scientific books from his library for their documentation. This might imply that a professional friendship between the modelmakers and the professor was maintained.

EMBRYOLOGY AND ANATOMY

One specific embryology subject was already highlighted in the entry on Haeckel, and not without reason, as it can be attributed to a specific aspect of contemporary zoology. In natural history embryology became a focal point. Ernst Haeckel's biogenetic law claimed that ontogenesis reflects phylogenesis - in other words: embryological development shows a quick replay of evolutionary development. This is a variation of a concept in early 19th century German *Natur Philosophie* - in English: "nature philosophy". Nature philosophy represents a branch of the Romanticist movement, which favoured the metaphor of the universe as an *organism* over the metaphor of the universe as a mechanism, which was favoured by earlier 18th century philosophy of enlightenment (18). The influence of *Natur Philosophie* may account for the addition of embryology models to the catalogue since 1878 (19).

In addition to models that showed embryological development, models were offered that showed anatomy, thus following another element in *Natur Philosophie*: comparative anatomy. Through tracing anatomical analogies one could speculate on the supposed relations in the animal kingdom.

Many glass models that show anatomy represent species of molluscs. The choice of molluscs is remarkable: anatomy in other taxons is not that widely shown in the Blaschkas' glass models. Possibly these anatomy models reflect specific interest in the evolution of this group, which could have been fostered by fossil finds. Many mollusc species are tied to a sea environment, and as they build shells they have amply added to fossil deposits. In palaeontology the fossil remains of bivalves and cephalopods were studied - which may have stimulated interest in these groups. Thus - possibly - a market was opened for models of mollusc anatomy as a field related to palaeontological interest. This speculation is strengthened by the presence of the Blaschkas' glass invertebrate models in the business of Robert Damon, merchant in natural history objects, who was Blaschka's agent in Britain. In his 1888 catalogue the glass models are offered, yet most emphasis there is on *shells* and *fossils* (and minerals - italics mine) (20).

STUDY OF REAL ANIMALS

Leopold Blaschka aimed at the composition of a "scientific catalogue". He wanted the models to be accurate representations of the species, to which end he studied alcohol preserved specimen sent by the Naples zoological station. In the archives of this *Stazione Zoologica* "Anton Dohrn" records are kept which document two shipments of alcohol preserved specimen, sent to Dresden in 1877 (21). Of course an alcohol-preserved specimen is of limited value when it comes to determine the appearance of an animal: the preservation fluid can affect colour, transparency and it may cause the tissues to contract. Yet these preservations will have been of some use in order to check the visual properties, described in zoological publications, as they can help to interpret these. Living animals were preferred, and according to archival materials these were sent by the Trieste zoological station at the Adriatic and from other European coasts as well to Dresden. This is documented for the period following 1880 (fig.). The animals travelled by mail when the weather was cool, but not freezing. Especially living sea anemones were often ordered and the representation of several of these species changed considerably in the course of time, apparently aiming at higher descriptive accuracy (22). In the 1885 catalogue two models are offered with a reference, which reads: "Scenen aus dem Leben der Actinien, im Aquarium beobachtet - Groups, representing the life of sea-anemones, observed from nature." (23)

It is remarkable that the Blaschkas sold models, based on their own observation, whereas the scientific standard for the appearance of the animals was set by the authoritative zoological publications. A scientific model had to be congruent with those publications, which defined the species. This obviously explains for the care put in the modelling, when the printed descriptions served as the criterion for scientific accuracy. The fact, that the Blaschkas later could successfully insert in their catalogues models, which were based on their own observations can imply that in the course of time the Blaschkas' models had gained authority in the field of zoology. An authority which scientific publications have perforce. In the case of Schulze's Challenger study of sponges (which was referred to earlier), the models were even produced before the publication was issued (24), thus rivalling the printed plates for first authority.

All in all, the subject of glass invertebrate animals, used as educational aids, is not such a light theme as it seemed to be.

SUMMARIZING OVERVIEW

Glass animal models show the Blaschkas' love for nature, and a summary of 19th century invertebrate zoology. Possibly the aquarium craze did not only foster the start of the glass animals' trade as props to set the stage in a dry aquarium as an alternative for the real thing. It may have caused - in due time - the entry of the aquarium in the Blaschkas' studio as well.

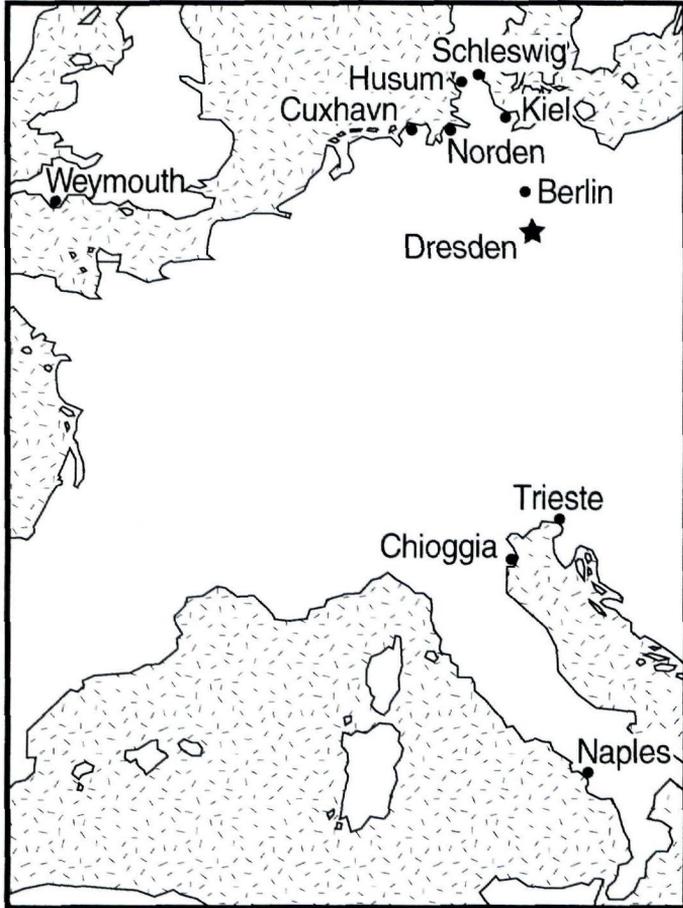


fig 4.

Locations from which aquarium animals were ordered and - probably - sent to Blaschka's studio. Alcohol preserved soft bodied animals were sent from Naples to Dresden in 1877. Once the Berlin aquarium was requested to send Plumose Anemones. Requests of living animals from the Adriatic and the Northern Seas are documented since 1880. From Weymouth and Trieste living animals were sent frequently. (Based on archives in the Rakow Library, Corning Museum of Glass and the Stazione Zoologica "Anton Dohrn.")

One can retrace the influence of Philip Henry Gosse, of expeditions and travelling naturalists including the influence of the Challenger expedition, traces of German *Natur Philosophie* and the influence of evolution theory through Ernst Haeckel. The animal models were produced in the period 1863-1890 and offered as teaching aids, but since 1886 the production of glass animals was gradually replaced by the production of botanical models. The last glass flowers for Harvard were shipped in 1936 (25).

At this next turn of the century an important role of the glass animals is their existence as illustrations of a period of blooming natural science. Apart from that they are now appreciated as autonomous fragile objects of glass art.

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NOTES

1. For a general introduction see: Henri Reiling, "The Blaschkas' glass animal models: origins of design." *Journal of Glass Studies*, Vol. 40, 1998, p. 105-126.
2. Richard Evans Schultes, William A. Davis, Hilles Burger, *The Glass Flowers at Harvard*. Cambridge (Mas.): Botanical Museum of Harvard University, 1992, first publ. 1982 (first, unnumbered, page).
3. David Whitehouse, "The Amazing Blaschkas." *The Glass Art Journal*, 1990. p. 80 presents a list of destinations.
4. Chris Meechan, "A Glass Menagerie: The work of Leopold and Rudolph Blaschka." *The Glass Cone*, No. 39, Spring 1995.
5. The most important single source concerning the Blaschkas' family history is the letter written by Rudolf Blaschka to George Lincoln Goodale (1839-1923), director of the Botanical Museum of Harvard University on January 6, 1896. (Kept in the collection of the Botanical Museum of Harvard University).
6. Cornelis Andries Backer, *Verklarend woordenboek der wetenschappelijke namen van de in Nederland en Nederlands-Indië in het wild groeiende en in tuinen en parken gekweekte varens en hogere planten*. Groningen [etc.]: Noordhoff [etc.], 1936, p. 498.
7. Lynn Barber, *The heyday of natural history: 1820-1870*. London: Jonathan Cape, cop. 1980, p. 117-121: Gosse had published his success with the marine aquarium in 1853. He propagated the marine aquarium and by 1858 sea creatures had become universal pets.
8. [ibid.]

9. [ibid.] p. 244.
10. [ibid.] p. 65.
11. Publications related to expeditions or travelling naturalists which influenced the design of the Blaschkas' models: Bergh, 1870-1875; Von Chamisso, 1819; Von Chamisso & Eysenhardt, 1821; Haeckel, 1869; Herklots (ed.) 1869; Huxley, 1851; -, 1859; Klunzinger, 1877; D'Orbigny, 1847; Pease, 1868; -, 1872; Schmarda, 1859; Schulze, 1887; Semper, 1868 (Full references see bibliography).
12. Sabine Hackethal und Hans Hackethal, "Modelle als Zeugnisse biologischer Forschung und Lehre um 1900 - Neuzugänge in der Historischen Arbeitsstelle des Museums für Naturkunde Berlin." in *Verhandlungen zur Geschichte und Theorie der Biologie* / Beiträge zur 8. Jahrestagung der DGGTB in Neuburg an der Donau 1998. Publication projected for mid-1999. Reiling [note 1], p. 125, 126.
13. Ernst Haeckel, *Kunstformen der Natur*. Leipzig & Wien: Verlag des Bibliographischen Instituts, 1899-1904. Recently reprinted as: *Kunstformen der Natur von Ernst Haeckel: Die einhundert Farbtafeln*. Mit Beiträgen von Olaf Breidbach und Irenäus Eibl-Eibesfeldt. München-New York: Prestel, 1998.
14. Jacqueline Goy et Anne Toulemont, "Meduses", *Abysses* no. 5. Monaco: Musée océanographique de Monaco, 1997. p. 123-132. Christoph Kockerbeck, "Ernst Haeckel's 'Kunstformen der Natur' und ihr Einfluß auf die deutsche bildende Kunst der Jahrhundertwende: Studie zum Verhältnis von Kunst und Naturwissenschaft im Wilhelminischen Zeitalter." in *Europäische Hochschulschriften / European University Studies*, Series 20; Vol. 194. Frankfurt am Main, Berlin, New York: Peter Lang, 1986. Erika Krauß, "Haeckel: Promorphologie und 'evolutionistische' ästhetische Theorie: Konzept und Wirkung." in *Die Rezeption von Evolutionstheorien im 19. Jahrhundert* (publ. by E.-M. Engels) / *Suhrkamp Taschenbuch Wissenschaft*, Nr. 1229. Frankfurt am Main, Suhrkamp, 1995, p. 347-394.
15. Provinciaal Utrechtsch Genootschap van Kunsten en Wetenschappen. *Verslag van het Verhandelde in de Algemene Vergadering van het Provinciaal Utrechtsch Genootschap van Kunsten en Wetenschappen, gehouden den 30 Juni 1868*. Utrecht: Van der Post, 1868, p. 47; *Verslag van het Verhandelde in de Algemene Vergadering van het Provinciaal Utrechtsch Genootschap van Kunsten en Wetenschappen, gehouden den 29 Juni 1869*. Utrecht: Van der Post, 1869, p. 28.
16. Georg Uschmann in *Epiloge* to the 1985 reprint of: Ernst Haeckel, *Das System der Medusen: erster Theil einer Monographie der Medusen*. Jena: Fischer, 1879.
17. Publications by Haeckel, identified as preparatory to the Blaschkas' glass models: Haeckel, 1862; -, 1865; -, 1969; -, 1879; (possibly) -, 1881 (Full references see bibliography).
18. Frank Zeiss, *Natuurlijke historiën: geschiedenis van de biologie van Aristoteles tot Darwin*. Amsterdam: Boom, 1995, p. 194.
19. Embryology is described in Alexander Agassiz, 1862; -, 1877; Claparede, 1863; Gegenbaur, 1855; Haeckel, 1869; -, 1881 (possibly a source); Johannes Müller, 1848; Sars, 1841; Schulze, 1878 (Full references see bibliography).
20. Robert Damon, *Abridged catalogue of shells, fossils and minerals: Revised for 1888*. Publ.: R. Damon of Weymouth (kept in zoological collections, Utrecht University Museum).
21. Archives Stazione Zoologica "A. Dohrn", Napoli: ref. no. ASZN-MIBI-1877. On March 20, November 5: shipments. Ordered on 16 Febr. and 4 Oct., 1877.
22. The sending of living animals to Dresden can be concluded from Blaschka's notebooks which contain letter drafts. These notebooks are kept in the Rakow Library, Coming Museum of Glass (Coming, NY).
23. *Katalog über Blaschka's Modelle von wirbellosen Thieren: dargestellt von Leopold Blaschka in Dresden*. Stolpen: Druck von Gustav Winter, 1885, p. 9. Copies of this catalogue are kept in National Museum of Wales (Cardiff) and Museum für Naturkunde der Humboldt Universität (Berlin).
24. Reiling [note 1], p. 125, 126.
25. Schultes e.a. [note 2]. [Editorial] review of the year 1936 with announcements for 1937 & 1938 / U.S.A.: Massachusetts, in *Chronica Botanica* 3 (1937), publ. Leiden, Holland 1937, p. 293.

