> can be had very easily. The worker sitting in front of the melting pot spears a gather of liquid glass onto a pointed piece of iron wire which simultaneously provides the coral with a hole and, through rapid turning, gives it its round shape, and then lets it fall into a cooling pot that stands at some distance from the fire (Leng 1835:503).

According to Altmütter, solid beads were "formerly often called glass corals" (Altmütter 1841:99):

> Occasionally one can observe that not only solid, but also hollow beads blown from thicker glass, cut and faceted, are made to imitate genuine cut corals when they are blown from crystal glass, and finally coated on the inside with red-colored wax (Altmütter 1841:106).

Loth (1859:73) states: "Glass corals are made of blown beads, which one coats on the inside with colored wax."

Karmarsch and Heeren (1880:44) add: "Glass corals are glass beads which are made from glass that gets the desired red color of corals through the addition of tin oxide, copper sulfide, and iron oxide."

Even language researchers, the etymologists, have a great deal to offer us: Pierer says that "corals" means the same as "little glass beads" (Pierer 1851, 11:853) and, in addition to attributing the paternoster with the names "Our Father" and "rosary bead," he also applies a third meaning: "necklaces of large and small beads or spheres or coins made into pendants or long tube beads" (Pierer 1851, 8:711).

The language dictionary compiled by the Grimm Brothers contains a flood of variations on the word "coral," stemming from various languages and periods, such as "*coralle, corallus, koral, korall, koralle,* coral;" then "*kralle, chroll, kralen, kraal, koraal, grall, krall, korelle, korel, corelln, krellen, karellen, krelle, korällelein, krallel*" (Grimm 1873, 5:1795).

In a later Grimm volume we find under the keyword paternoster: "1) our father; 2) the larger round bead (representing the Lord's prayer) in a rosary and also the latter itself; 3) a) in architecture, beaded molding, beaded frieze" (Grimm 1889, 7:1502, 1503). Consequently, "paternoster" confronts us as a bead in a rosary and the bead confronts us again in beaded molding. It only remains to add that the French *patenôtrier*, the German *Paterlmacher*, is sometimes used to mean the lamp blower and the bead winder.

COLORS AND COLORING, METALIZING, IRIDIZING, AND LUSTERING

The colors of "artificial" pearls are the result of the material used and the way it is handled, as well as the result of components which – like colored strings in colorless crystal beads (Plate 17B) – are not an integral element of the beads but influence their color all the same.

A complete color scheme would, of course, have to take into account all the possibilities of diaphaneity – from transparent to translucent to opaque in many stages – and also the technology of coloration, since this, too, brings about different effects: coloring in the batch, single and multiple overlays, colored linings, surface coloring, iridizing, lustering, and a great deal more. An objectively correct color nomenclature for beads is vastly more difficult to work out than norms for sizes. For that reason, many of the company sample cards list the colors mostly in numerical form (Plates 2B, 6B-C, 7B-C). The fact that every company had its own color scale with special number systems, goes without saying.

The "main colors" of the Biedermeier period are found on a chart compiled by Ferdinand Unger of Liebenau (Technical Museum Vienna, TH 34341). There are three categories:

> Series B (for glass beads with 3 facets): sapphire blue, dark blue, crystal, topaz, pale green, dark green, amethyst, brown, black, opal white, opal blue, alabaster .
>
> Series G (for fine composition beads): light ruby, dark ruby, light garnet, dark garnet, lemon yellow, chrysoprase, deep pink, opal, alabaster, opal blue, lapis lazuli.
>
> Series I (for extra fine glass beads): crystal, sapphire, dark blue, chrysolith, aquamarine, emerald, amber, topaz, amethyst, dark ditto, brown, black.

The range of colors for beads is almost infinite; the color scale for a single company was able to include hundreds of colors, so that getting all the shadings of a single basic color together would also have resulted in hundreds of different gradations of hues. Extensive, if not complete, is a color card from the Redlhammer Company on which many color variations (Plate 3C) are shown for the 0-bead (ca. 4.5 mm in diameter). For the most part, the Redlhammer cards are constructed so that the shape of the bead is shown (usually at the top) in various sizes (Plates 1D, 2A), while the specific shades of color for that particular bead appear below (Plates 2D, 3B). Some bead-mosaics provide a kind of color chart by themselves (Plate 3A) and a mix of colors becomes a matter of principle in necklaces made from late Riedel beads (Plate 14D).

The beads and bugles of all imaginable origins, arranged according to hue, give an idea of the many shades a color can have. Assembled by Maria Reiter over many years, her collection of small embroidery and knitting beads and bugles presents excellent illustrative material on the theme of colors in glass beads, even though only a small selection is shown here: white, gray, purple, blue, light green, dark green, yellow/orange, and pink/red (Plates 3D-5C). Venetian and Gablonz beads are close neighbors here, as are beads from the 19th and 20th centuries.

Striped, overlaid, and polychrome beads are shown in the assortment in Plate 5D and the colors of the larger, pressed, so-called Bohemian beads (also called "pipe" [*Röhrenperlen*]) are likewise shown in Plate 6A. An exhibition and a publication (Neuwirth 1993) have already been devoted to the colors of glass, their formulations, and special characteristics. The material there regarding hollow glass can be applied to solid glass beads as far as coloration in the batch, overlays, etc., are concerned, although special technologies have also been developed for solid glass beads.

Extensive color charts still exist today for tubes and bugles which contain hundreds of button-like samples. Those from Riedel in Polaun (today in Kufstein, Austria) and from the Hessenglashütte in Oberursel have been preserved in the Gablonz Archive and Museum, Kaufbeuren-Neugablonz. The developments in Historicism and Art Nouveau produced ever new subtleties, so that soon only the specialities were mentioned; Simm & Co., Polaun, for example, offered items "in all existing glass colors, especially in black, opal, blue opal, lapis, and bright yellow" (Arnold 1909:89). A list of glass rods with color names from the year 1940 has been handed down to us. All the color names are not given here because of the great number; a selection follows, however:

"Fine transparent colors:" Anna-yellow, rose, gypsy brown, hyacinth, new ruby, brilliant yellow, Anna-green, Montan blue, smoky topaz, violet blue, steel green, gray, ruby, lilac, champagne yellow, pink overlay, solid pink.

"Opaque colors:" opaque white, porcelain, ivory, turquoise, greenish turquoise, opaque green, "spath" green, opaque reseda green, opaque blue, gendarme blue, bluish gray, new blue, raven blue, night blue, opaque purple, pea green, Isabella, doe brown, vivid green, opaque gray, Japan yellow, pale pink, storm gray, linden green, lapis, enamel A and B.

"Opaque colors in yellow, red, brown:" opaque yellow, old and new, lemon, orange, coral, Marocco red, porcelain yellow, coral "B," rowan red, reddish-brown tango, Terra di Siena, chocolate, tea rose yellow, banana yellow, opaque pink, dark opaque pink, flesh pink, coral.

"Alabaster and alabaster colors:" alabaster white, rose alabaster, alabaster turquoise, chalcedony, alabaster blue, alabaster green, chrysoprase, alabaster yellow, alabaster yellow-orange, amber alabaster, lilac alabaster, jasper, carnelian.

"Opal and opaline colors:" white opal, opaque amber (cloudy amber), blue opal, aquarine opal, topaz opal, reseda-green opal, violet opal, Anna-green opal, Anna-yellow opal, gray opal, rose opal, brilliant opal, pink opal, lead opal.

"Satin-sheen rods:" satin-sheen rods, monochrome, smooth; satin-sheen rods combined, ribbed and moonshine.

"Agate rods:" amber agate, mother-of-pearl agate rods – solid color and striped, agate rods [listed with numbers].

"Rods of hollow and pressed glass:" antique colors, smoke, beryl, Japan topaz, antique Waterford, water blue, lilac, antique pink, violet blue, light violet, dark violet, iserin yellow, iserin rose, iserin blue, champagne yellow.

The mention of "striped rods" and "bicolored and tricolored rods" should permit a conjectural correlation between this list and the rod display of the Hessenglashütte at Oberursel (Plate 7D). A 1963 price list for rocailles from the Ludwig Breit Wiesenthalhütte glassworks in Schwäbisch-Gmünd has survived. It lists the following colors: "crystal, black, green, blue, amethyst, topaz, aquamarine, gray, amber, hyacinth, garnet, chalk, alabaster, opaque green, opaque blue, turquoise, opaque violet, opaque gray, opaque yellow, opaque orange, coral, opaque brown, opaque pink, and ivory;" 2-cut beads came in "crystal, black, topaz, green, blue, aqua, amber, hyacinth, garnet, coral, opaque yellow, opaque orange, opaque green, opaque blue, turquoise, Atlas white, Atlas aqua, blue, green, topaz," and bugles were supplied in "black, opaque white, coral, Atlas white" and in "certain opaque colors."

In addition to the list from 1940 in the Gablonz Archive and Museum (Kaufbeuren-Neugablonz), there is also a very interesting *Fachwörterbuch der Gablonzer Artikel in 5 Sprachen* ("Specialized Dictionary of Gablonz Articles in 5 Languages") which was made available to me. It was published in 1923 by the Cercle Polyglotte and no doubt intended for and used by the strongly export-oriented industry. It contains a two-page alphabetical color equivalence table. Only the German-English equivalents are presented here (Table 1).

Table 1. German-English Bead Color Names (1923).

German	English	German	English	German	English
achat	agate	heliotrop	heliotrope, lavender	rosalin	rose
alabaster	alabaster	himmelblau	sky	rot	red
amethyst	amethyst	iris	iridescent	rotbraun	red-brown
aquamarin	aquamarine	jaspis	jasper	rubin	ruby
aschgrau	ash-colored	karminrot	carmine	saphir	sapphire
bernstein	amber	königsblau	royal blue	schwarz	black
blutstein	blood-stone	kreideweiss	white as chalk	silber	silver
braun	brown	kristall	crystal	smaragd	emerald
braungelb	tan	kupfer	copper	stahl	steel
bronze	bronze	marineblau	navy, marine	taubenblau	dove-colored
carneol	cornelian, carneol	mondschein	moon-shine	topas	topaz
chrysopras	chrysoprasus	mondstein (sphinx)	sphinx	türkis	turkoise
corall	coral	montana		ultramarin	ultramarine
crême	cream	neurot	cherry red	violett	violet
elfenbein	ivory	nilgrün	nile green	weiss	white
fleischrot	incarnate, flesh colored	onyx	onyx	ziegelrot	brick-red
gelb	yellow	opal	opalescent	zitronengelb	lemon
gold	gold	orange	orange-tawny	dunkel	dark
granat	granat	oxid	oxid	hell	light
grau	grey	nilgrün	nile green	satt (weiss)	full (white), opaque
graublau	greyish blue	platin	platinum	durchsichtig	transparent
grün	green	reseda	reseda	matt	dull, frosted

Bead Coloring and Decoration

The delicate designs that appear to have been painted on a bead are in fact created with the thinnest of glass filaments formed into lines or dots and melted on, uniting with the bead surface as low reliefs (Plate 24A). Other techniques of decoration or coloration are not as durable and are particularly susceptible to mechanical damage and the effects of light. Some producers or finishers take the precaution of pointing out these characteristics (Plates 6D, 7A).

The technologies for decorating beads know innumerable variations, the most important being: painting, external coloring, color lining, gilding, silvering (mirror-coating), interior gilding, platinizing, iridizing, and lustering. For simplification, Parkert divides them into two groups: "surface decoration" and "inserted decoration" (Parkert 1925:152).

Painting

During the Biedermeier period, painted gold decoration on beads must have been especially popular: little gold stars adorn white and colored beads (Plate 18C) and thin-lined stylized leafy spirals wind around delicate hollow beads (Plate 21D). During the 1840s, Anton Blaschek was supposed to have decorated beads with little crosses or stars in gold and silver; they were melted in and then burnished (Parkert 1925:140; Posselt 1907:4).

It was natural for the Gablonz glass smallwares industry to use painting for decoration as well, probably already as early as the beginning of the 19th century, also in the sphere of influence of the refining and finishing districts of Haida and Steinschönau in northern Bohemia. Benda places the beginning of blown-bead painting in Gablonz in the 1820s, with constantly increasing importance into the 1860s and beyond. Next to Gablonz, Wiesenthal is supposed to have had the largest number of glass painters at its disposal. Most of the painters came from the area around Haida where they were chiefly put to work painting blown-glass beads: "At present almost all types of glass smallwares are decorated with painting, such as buttons, brooches, earrings, medallions, etc." (Benda 1877:285).

Bead painting, a highly developed artistic skill, eventually faded into the background. The increasing use of machinery from the late 19th century onwards to manufacture and color beads certainly did not encourage this method of decoration.

External Coloring

Glazing beads with the help of heat was already described in 1818:

> However, if they are to be coated with a glaze, this takes place over the fire in an iron vessel right after one sees that the pieces are suitably round. For the glaze, a prepared metal lime is used that suits the required color; you pulverize it very fine, add some calcinated borax so that it liquefies quickly and slowly sift it over the hot beads, stirring constantly and vigorously so that the powder adheres to each little bead; the mild heat causes the pulverized glass to melt, it adheres firmly to the bead and gives it the required color (Loysel 1818:305).

For comparison, Graeger (1868:120, 121) describes a method of coloring with "fugitive colors:" after the beads have been rounded in the tumbling drum, a finely ground colored enamel, along with some borax to make it melt more easily, is also added to the drum. This material "adheres to the softened surface of the bead, melts and finally, while one keeps it moving incessantly, clothes it with a colored coating."

Coloring the surface by dipping (etching) was established during the 20th century. This technique makes it possible to achieve shades of color that are practically impossible in batch-colored glass, but their durability is short-lived. Nevertheless, the range of colors is fascinating, especially when we take a look at the stained transparent or opaque beads (Plates 6D, 7A). Iridizing and lustering enhances their brilliance even more.

Color Lining

Beads made of crystal or colored glass were sometimes colored by coating the interior surface with some material, usually one with a very strong color. For a long time, the most important of the paint-lined beads were probably the coral-colored ones, since it was hard to achieve the desired color in glass. The fragility of this kind of coating is demonstrated by the flaking color on a broken "fruit" bead (Plate 20D bottom). According to Parkert (1925:142), coral-like coloring materials, which were used to line "chopped beads," consisted of minium (red lead) and Turkey red, rubbed together with turpentine and dammar. "Plain, smooth, blown beads of various colors of glass... were painted inside with cinnabar to give them a coral-like color" (Meissner 1954:6).

In 1871, the Schuster & Rögner Company in Gablonz was awarded a privilege (no. 21/672) for a process which they called *perles brillantes corail*. They used raw Venetian paste and brushed it with a mixture of copaiba balsam, oil of cloves, oil of turpentine, chemical preparations ("light coral red" and "dark coral red") from J.E. Devrient in Zwickau (Saxony) and glass paste "No. X" from J. Günzel in Haida. After the beads were dried, they were fired in a retort-kiln until they became shiny; this same manipulation (application, drying, firing) was repeated once more.

The most important technique was "insert painting," "on the string" or "in the pot." Two contemporary sources around the turn of the 20th century report their experiences. Pörner has also left us a drawing showing the workshop of a blown-beadmaker (Figure 14). He writes:

> My recollections only reach back to the years 1880-1885, etc. At that time, a lot of our beads were painted; they were called paint-in beads [*Einmaleperlen*]. The workplace for this was very simple. One needed: paint, a plate, a paint-rubber,

Figure 14. Workshop of a lamp blower (hollow glass beads), signed Pörner (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

> and a pigeon feather, trimmed on top to use as a brush. This brush was dipped into the paint and then one introduced the paint into the hole in the bead, tube, etc., and thus got beads of blue, green, coral red, etc., colors. Such interior-painters (bead colorers) could be seen frequently here in these parts (Pörner n.d.:3).

Posselt's description is even more detailed. Two- and three-cut beads, polished as well, and drawn tubular beads were decorated at the beginning of the 1850s in Morchenstern by lining them with lacquer paint:

> This was done either on the string or in the pot. The following process was usual for the former method: the color was rubbed in terpentine on a glass plate and dammar was added. A length of wool yarn was dipped into this paint or brushed with it, then tied to the end of a long string of beads and pulled through the beads while being diligently turned. For lining in the pot, the beads were dropped into a pot, the color poured over them and shaken until the necessary uniformity was achieved. After the beads were removed, the paint that had settled on the surface was halfway cleaned off with a linen cloth; the thorough cleaning was done with a linen cloth that had been dipped in a solution (water and soda) beforehand and wrung out. One needed considerably more color for this pot method. It was rubbed on a big, smooth, granite stone (Posselt 1907:4, 5).

Lining whole tubes with color was done starting in 1872, according to Posselt (1907:5). Up to the end of the 1860s, glass tubes were colored by sucking the paint up into them by mouth (Parkert 1925:151). Lining beads with color and silver was widely practiced at the beginning of the 20th century:

> Beads of naturally colored glass which are partially decorated from the inside show an inexhaustible number of variations in color and are especially interesting in regard to the way they are made. One technical expression for this is "painted-in beads." We find millions of silver-lined beads, crystal beads lined inside with silver and decorated on the outside, crystal beads with a brocade pattern inside... (Schindler 1906:1719).

More durable than the paints of the Biedermeier period were the aniline dyes which were preferred after the middle of the 19th century. Parkert (1925:179) gives more exact information on varnish paints and aniline dyes that were used for coloring beads:

> Coral-red colors: "Turkey red, cochineal varnish, and minium." Aniline dyes for red colors: "Diamond

> fuchsine (Bordeaux-red tone), ponceau red (scarlet-red tone), safranine red (for coral hues).” Green colors (“malachite green and methyl green”), yellow colors (“chrysoidine yellow, orange-yellow, and amber yellow”), brown (“chestnut and Havana brown), blue (“methyl blue”), violet (“methyl violet”).

For beads with pearl essence, the aniline dye was applied using ether collodium.

Exterior Gilding

Gold and silver coating is possible on both the exterior and the interior walls. Regarding the Venetian beads coated on the outside with precious metals (Plate 24C), Altmütter (1841:102) writes that real gold or silver foil was pressed onto the surface with cotton. The surface was moistened beforehand with a solution of borax mixed with gum arabic in water or a mixture of gum arabic and gum ammoniac. These prepared beads were heated in a pan with finely ground quicklime and finally rubbed with soft leather.

On 20 October 1828, Cavaliere Marino Longo was awarded a five-year privilege “for the invention of a new way to gild and silver coat glass beads,” which was, however, rescinded in 1830 because the fees were not paid. “The beads, hanging from a string or wire, are first coated with a watery varnish of gum arabic and borax, encased with fine gold or silver foil, and then subjected to rather strong heat for one hour” (Patents 1841, 1:9).

In 1925, Parkert also refers to exterior and interior gilding on blown-glass beads; according to his reports, simple burnished gilding done as exterior gilding is “achieved with a solution of gold in sulfur balsam and oil of lavender, aided by bismuth as a flux” (Parkert 1925:165).

Dr. Ivan Weiskopf achieved reddish-gold colors as “copper coatings made by reducing the copper hydroxide through the presence of chlorides of zinc, gold, and platinum in a solution which contained cane sugar and formaldehyde” (Parkert 1925:167).

Silvering (Mirror Coating)

The following report from the 19th century concerns beads “with a metallic appearance:”

> Sometimes one also sees beads which have a metallic appearance; these are coated on the inside with the amalgam described below and are handled like the larger glass spheres whose coating is mentioned later. When the beads are made of colored glass, the coating also takes on this color. Also before the beads are coated, one can line them on the inside with a paint to which gum has been added and then the coating done on top of it. Such beads have to be made of thicker glass than the wax beads (Loysel 1818:309).

Without going into detail, Keess speaks in 1823 of “metallic composition” for making “shiny metallic marcasite or mirror [*Spiegelperlen*] beads” (Keess 1823:902). Loth also only mentions. that “the silvered beads... contain a coating of a metal mixture with a low melting point.” Leng, however, mentions melted tin:

> ... in the shiny metallic marcasite or mirror beads, metallic compositions such as are used for silver coating glass balls [are] blown in. If one takes a bead that has just been blown and is still hanging on the tube in a glowing state, and holds it in melted tin and draws some of it into the tube so that it can be blown back into the bead again, it gets a thin coating inside and shows a beautiful play of colors (Leng 1835:502).

Pörner also mentions mirror beads colored with tin:

> After the war of 1866, there was another bead that could be seen here: the so-called mirror bead. These beads were blown in a row into a glass tube, about 20 6mm-beads on the one half, the same amount on the other half, and this row [*Klautsche*] of beads was bent in the middle, heated in the flame, and lined with tin and pewter, then heated again and the residue of tin blown out again. Finally these beads were strung on threads. These beads were shiny like platinum-steel.... The beads lined with tin and pewter were completely displaced and replaced by the silver-coated beads (Pörner n.d.:3, 4).

As the sources quoted here show, beads with reflective coatings on their interior walls were known at the beginning of the 19th century as marcasite or mirror beads. The beads of a necklace by Anton Schwefel (Plate 21B) are also labeled as such (in the *Universal Lexicon* by Heinrich Zedler, marcasite is described as “a metal-like mineral,” of which there are “various kinds:” gold, silver, copper, tin, or bismuth marcasite) (Zedler 1739: column 1184).

The metal mixture used for glass beads, according to Altmütter, consisted of...

> 8 drams bismuth, 1/2 dram lead, the same amount of tin, and 9 drams pure quicksilver. The beads are blown so that they form a row 4 to 5 inches long and between each bead only as much space is left

> as is required for cutting them apart later. Such a row is heated, the lower end placed in the liquid metal mixture while one sucks on the top, as a result of which it fills up with the metal. One blows the leftover metal out again and finally cuts the tubes into individual beads. To protect one's health because of the quicksilver vapors, it would be advisable not to suck with the mouth but to accomplish the procedure with the help of a little syringe or pump (Altmütter 1841:88).

Beads made from colored, transparent glass tubes (yellow, red, blue, or violet) were also treated in this manner (Altmütter 1841:88). A number of authors agree in designating 1858 as the year in which silver lining by the warm method was introduced (Parkert 1925:140; Posselt 1907:5); Arnold (1909:90) places it in the year 1857. Using oil of cloves caused such strong odors that silver coating by the cold method (according to the Liebig process) soon took its place (Parkert 1925:140). Posselt (1907:5) names Emanuel Fischer in this connection, while Meissner points to Weiskopf who substituted the lead-tin alloy with silver nitrate:

> It was known for a long time that when the aldehyde is heated in a tube with silver ammonium nitrate, it reduces the silver oxide and the metal precipitates as a shiny coating on the inside of the tube... 6 months ago Drayton's process became known, according to which mirror surfaces can be covered with silver coating using a cold process with the help of silver ammonium nitrate and a solution of clove and cassia oil in alcohol. Also in the first quarter of the 19th century there was already a certain parallel development in the decoration of blown beads and mirror production, since this kind of bead was also coated with a reflecting lead and tin alloy.
>
> Not until after 1855 did silver coating become completely practical by using the silver coating liquids prescribed by Petitjean and Liebig; this improved method of production, the so-called cold-method silver coating, was immediately tested and implemented by Weiskopf. As a result, the bead business experienced an undreamed of upswing. Whereas before this no Austrian product had been able to boast of such widely distributed sales as the Bohemian glass bead, the metallized bead now made its triumphant march across the whole world.... The silver solution used for lining beads could be bought back then from the pharmacist, Ullrich, later also from the Weiskopf chemical factory in Morchenstern. In 1868, Hartwig Weiskopf had applied to the Gablonz district authorities for permission to manufacture chemicals... (Meissner 1954:6, 7).

According to Benda, the application of a mirror coating to drawn beads was invented in Morchenstern:

> An additional decoration is achieved by lining the inside walls of blown glass tubes with silver, whereby the beads acquire a silver mirror-like appearance, and when yellow glass is used, one similar to gold. This mirror-coating for drawn beads was invented in the year 1853, in Morchenstern, where an outside assistant taught the beadmakers... (Benda 1877:284, 285).

The early practice of sucking the silver solution into the bead by mouth resulted in agriosis, the blue to black discoloration caused by silver deposits in the skin (Parkert 1925:141). The "Moors of the Mountains" (Winter 1900:77) was the name given to these unfortunate people who suffered from this occupational disease. As a result, attempts were made to use simple suction devices with rubber pressure. The disadvantage, however, was that each bead had to be lined separately. In 1878, a toolmaker is supposed to have introduced a lining machine (Lilie 1895:165, 166). This process was improved by Parkert (Figure 15). Using the principle of communicating tubes, it was possible to silver coat the glass tubes in bundles (Parkert 1925:141, 142).

Towards the end of the 19th century, silver electroplating was also mentioned:

> Very beautiful wares are also produced by galvanic silver coating. Since glass as such does not conduct electricity, no metal would precipitate onto a naked glass surface so it is necessary to make the glass conductive beforehand. This is done with a shiny platinum coating or better, with a simple luster. This

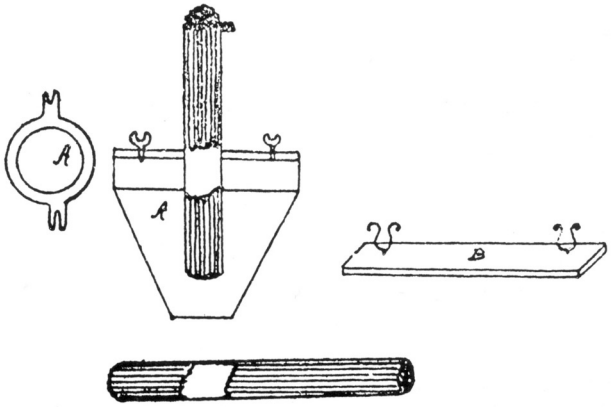

Figure 15. Device for inserting silvering into beads (Parkert 1925:141, Figure 30).

> makes the glass conductive and the electroplated beads are in no way inferior in appearance to true silver beads (S.L. 1896:606).

In 1888, Ignaz Finger from Brunn am Gebirge in Austria received a privilege (no. 38/2989) for an improvement in the "production of silver coated glass beads." He succeeded in making perfectly round silvered glass beads using the following method: each single sphere was broken off with a sharp steel device right after it was blown from a glass tube. This produced a perfectly smooth opening, whereas the beads blown in a row (*Klautschen*) had little cylindrical necks at the hole. The silvering itself was done in a bath. Afterwards Finger removed the outer coating by shaking the beads in a sack with bran and polished the outer surfaces.

Interior Gilding

Ever since they first appeared, being able to make the so-called "Parisian fine-gold beads" and "Real Gold Gilt Beads" (Gablonz Archive and Museum n.d.a) was a goal producers of blown beads wanted very much to achieve. A bead that looked like gold could be made in two different ways: by the cheaper method of lining topaz-colored glass with silver or by inserting gold into crystal glass. According to Parkert, true interior gilding was done with a gold chloride solution mixed with a soda solution to which chemically pure glycerine and water were added. According to Parkert (1925:165-167), using pale yellow transparent glass with a silver lining resulted in golden beads with a striking yellowish-red shine.

Meissner attributes the true gilding of blown beads to the Weiskopf Company in Morchenstern:

> Dr. Weiskopf put the real gold bead or fine gold bead on the market; it was an important addition in supplying the world with metallized beads from the Gablonz industry area. What had previously been a Parisian asset, Weiskopf accomplished so well that it entered into competition with the Parisian products.... Dr. Weiskopf's own business also flourished: both the true gilded blown beads and the gilded and silvered rocailles sold very well... (Meissner 1954:22, 30).

Equating the fine gold bead with the real gold bead, as Meissner does here, contradicts the terminology of other writers, as the following shows: "Zenkner, Josefsthal, and Pörner Franz, among others... made copper-like blown bugles which acquired a golden appearance after being coated with a silver lining; they called this article 'fine gold beads'" (Pörner n.d.:3).

In 1896, Gustav Schneider in Antoniwald obtained a privilege (no. 46/4066) for a "process for making gold, copper, and fine gold beads" without using gold. The outside or inside surfaces were coated with metal luster, metal salts or metal powder, silver alloys, and other preparations. Besides, Schneider differentiated between gold beads (crystal glass with interior gilding) and copper and fine-gold beads which he called composition beads (made from tubes of colored glass with a silver coating).

Platinizing

At the German-Bohemian Exhibition in Reichenberg (1906), Dr. Weiskopf & Co. of Morchenstern exhibited "crystal beads colored with aniline and externally gilded or platinized beads of black glass" (Arnold 1909:89). The Riedel company in Polaun and Josefsthal made glass canes in a transparent gray color. When beads were blown from this glass and lined with silver, one got the most beautiful steel-platinum beads very cheaply (Porner n.d.:3).

Iridizing and Lustering

Iridizing beads seems to have become common at about the same time as the iridizing of hollow glassware, namely about the time of the Vienna World's Fair (1873). Iridizing was invented around the middle of the 19th century (1856) by the chemist L.V. Pántotsek for the J.G. Zahn glass factory in Zlatno in Hungary (Neuwirth 1973:45, 1986:277-299). While Brianchon became famous in France for his iridizing, great importance was attached in the Gablonz area to the Weiskopf company in Morchenstern.

As far as seed beads are concerned, the terms "iris" and "luster" are defined in glass-bead terminology as follows (Gablonz Archive and Museum n.d.b): luster gives the bead made from alabaster glass the matte sheen of real pearls and on black glass the result is iridescence (as a reflection in rainbow colors). While the iridescent effect on beads is the same as for hollow glassware, bead luster appears to be diametrically opposed to luster on ceramics and glass, if we think of the Spanish-Moorish luster faiences, copper-luster on porcelains, and lustered Art Nouveau glasses (Lötz, Tiffany).

In a French report on the Vienna World's Fair, the beads of Bapterosses are highly praised, especially those with the *lustres nacrés* by Brianchon (Vienna 1875:50). The introduction of iridizing by Paul Weiskopf created in Morchenstern...

> a new line of business, which spread from here into the neighborhood and has held on to the present

> day. Realizing correctly that iridescent glass would come into fashion, one started iridizing mostly seed beads and a few jewelry articles (the bijouterie-wares producer Josef Ullmann in Morchenstern was the first to try iridescence on jewelry and buttons). Paul Weiskopf supplied the necessary chemicals or got them from somewhere else....
>
> Other metallic-reflection effects such as luster were used for decoration. The results of fortunate coincidences were exploited and led to specialization in the business and so this branch of work has lasted up to the present. The equipment, the iridizing drum or muffle, is fairly simple to use; a kiln was also needed for the rest of the procedure... (Meissner 1954:22).

The company Zimmermann & Weiskopf in Morchenstern, which was registered in 1876 after the death of Hartwig Weiskopf, printed business cards listing numerous "chemical products for decorating glass, porcelain and ceramic wares: vitrifiable and luster colors; chemicals for gilding, silver coating, platinizing and etching; enamel colors, aniline dyes, aniline paint dyes, adhesives, etc."

Meissner pointed expressly to Weiskopf's products and their importance:

> Iris and luster, and different metallic reflexes [Plate 10B] were very much the fashion for decorating beads and other jewelry articles, also gilding and silver coating for seed beads, and for that reason the demand for chemicals for these purposes increased enormously... (Meissner 1954:22).

In 1886, Duisburg & Co. in Gablonz and Anton Bröckner in Morchenstern were awarded a privilege (no. 36/1586) for a process for achieving a mother-of-pearl effect on glass buttons, glass beads, and similar glass products by "incorporating iridescent glass clumps, pieces of glass or glass beads into the glass batch."

Iridizing and lustering, developed during the Historicism period, became one of the characteristic Art Nouveau finishing techniques, also used for glass and porcelain beads. A display of these achievements was provided at the German-Bohemian Exhibition in Reichenberg. Here Joh. Pitter of Neudorf showed innumerable drawn beads: "About 100 of the many color effects are presented and achieve various lusters or iridescent effects by firing" (Arnold 1909:89, 90). The pressed beads from the Pitter Company were, "for additional refining,... cut, iridized, decorated with melted-on "brocade glitter" or rapidly cooled after pressing so that the surface becomes strangely crackled" (Arnold 1909:92). One can presume that this company was one of many which made use of iridescent and lustered effects, which were also very well received throughout the Art Nouveau period and into the Art Deco period between the two wars.

An excerpt from a list of products found in a contemporary source from 1930 appears to be characteristic for the period: The chemical laboratory of Anton Rössler in Gablonz, founded in 1919, produced silver nitrate and gold chloride for processing blown beads and imitation stones using the wet method, also bright gold and silver luster for exterior metallizing of glass and porcelain wares (Lodgman and Stein 1930:387).

Gustav Keil in Gablonz also had an extensive listing to point to:

> Fabrication of solid French beads. Strung beads from the plainest to the finest execution in oriental-iris for jewelers, etc., etc., wax gems and components for jewelry, iris bugles, pears, buttons, stones, single and double hole, smooth, baroque, etc., in all shapes (Lodgman and Stein 1930:414).

One of the most important companies was the glass-bead factory of J.G. Schöler in Wiesental a. N. Founded in 1884 and expanded during 1925-1927, it employed 25 executives and workers along with 80 cottage workers. Their products included:

> Glass beads and bugles of all types which are used for dress trimmings, hat ornaments, lamp fringes, ornaments, embroideries, etc. In addition to the modern glass-bead coloring works, glass beads and bugles are lustered, iridized, and electroplated in an adjacent building (Lodgman and Stein 1930:434).

BEAD SIZES

The sizes of Gablonz beads ranged "from the smallest bead visible to the naked eye, to the nut and pigeon-egg sized beads, in all colors and shapes..." (Winter 1900:8, 9). This poetic description corresponded to a system of numbering at whose center lay the null-bead (0-bead). The smaller beads ("under null") were indicated by zeroes (i.e., 0-00-000-0000) although for the sake of simplicity the manner of writing them as 2/0 (00) to 20/0 (20 zeroes) was preferred. The fact that this numbering system is not mentioned by Karklins is conspicuous. Karklins (1985:113) himself deemed the five size categories proposed by Kenneth and Martha Kidd (very small, under 2 mm; small, 2-4 mm; medium, 4-6 mm; large, 6-10 mm; over 10 mm) insufficient.

Grouping beads according to size was necessary for various reasons. The raw product for making beads (rods, tubes, and canes) had to be sorted, usually according to