

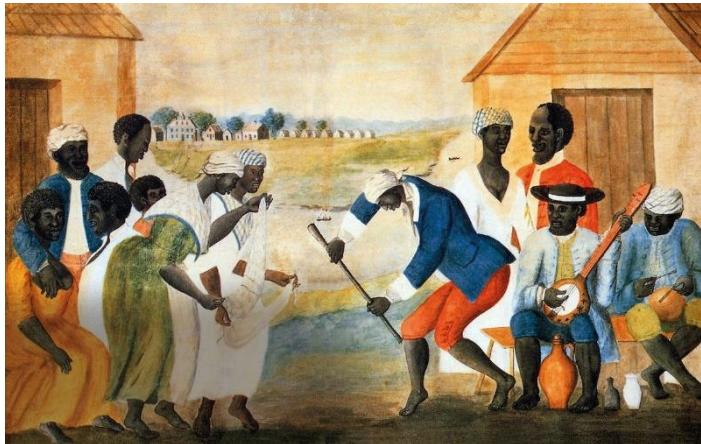
Glass

- vessel glass (containers and tablewares)
- window glass
- light bulbs
- lamp chimney
- insulators
- chandelier pendants
- jewelry parts
- beads
- marbles



Why Archaeologists Like Glass

- Personal objects
- Widely used as containers for a variety of substances



Inscribed glass vessel, Jodensavanne, Suriname

Why Archaeologists Like Glass

- Durable, like ceramics
- Changes in shape of forms and manufacturing techniques over time helps date assemblages



Why Archaeologists Like Glass

- Form, decoration, lettering can provide information on relative expense, manufacturers, and contents



Oil lamp burner with handle for carrying, Esthersrust Site

Maker's Mark for York Glass Co., York England (1830-1930), Esthersrust Site



Glass Composition/ Material

- Basic glass recipe requires three ingredients: formers, flux, and stabilizer
- **Formers** make up the largest percentage of the mixture to be melted.
 - In typical soda-lime-silica glass (e.g. bottle glass) the *former* is silica (Silicon dioxide) in the form of sand.



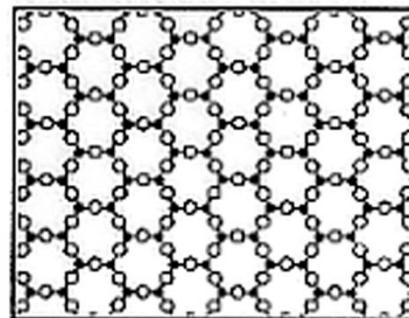


Glass Composition/ Material

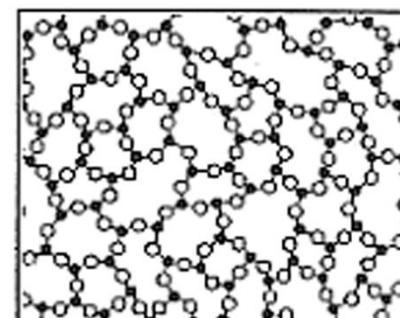
- **Flux** is a material added to lower the melting temperature of the another substance.
 - A flux is added to a batch of glass to facilitate the fusing of the silica.
 - Soda ash (Sodium carbonate, marine plant ashes) and Potash (Potassium carbonate, burned wood ash), both alkalis, are common fluxes.

Glass Composition/Material

- **Stabilizer** -- Keeps the finished glass from dissolving, crumbling, or forming unwanted crystals.
 - Calcium carbonate (lime) is a commonly used stabilizer that provides strength, keeps glass from crumbling, and makes it water resistant.
 - Lead was used as a stabilizer and clarifier for clear (colorless) tableware glass

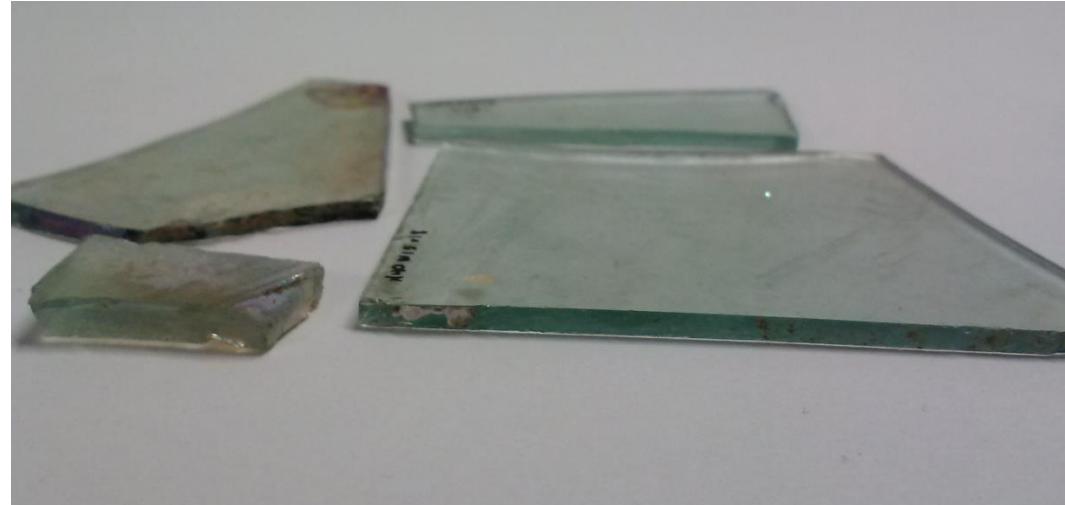


quartz



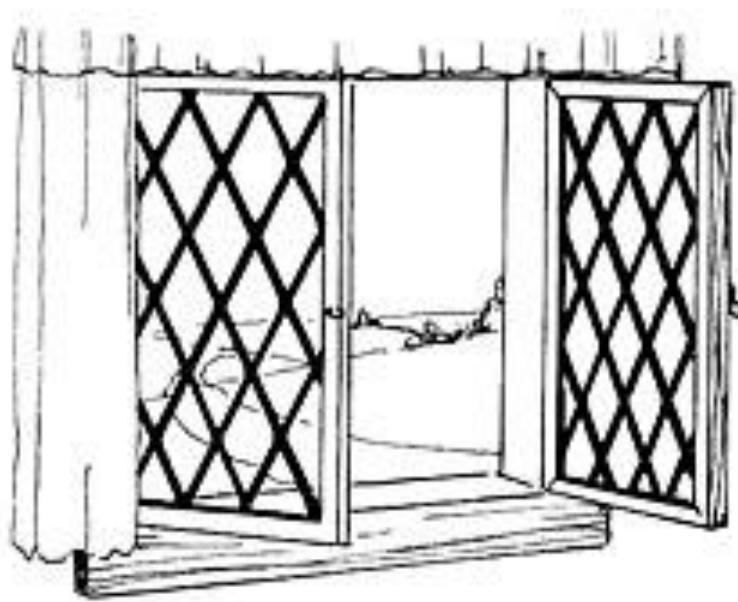
glass

Flat vs. Hollow Glass



- Flat fragments are consistent in cross section and don't "rock" when put on a flat surface
- Window glass, pressed glass plates, mirror glass

Window Type – Casement Windows



- Small panes of diamond-shaped glass called quarries held together by lead cames in an iron frame (casement)
- Can be colored green on early 17th c. sites! Be careful not to confuse with case bottle



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Window Glass Manutech – Cylinder Glass

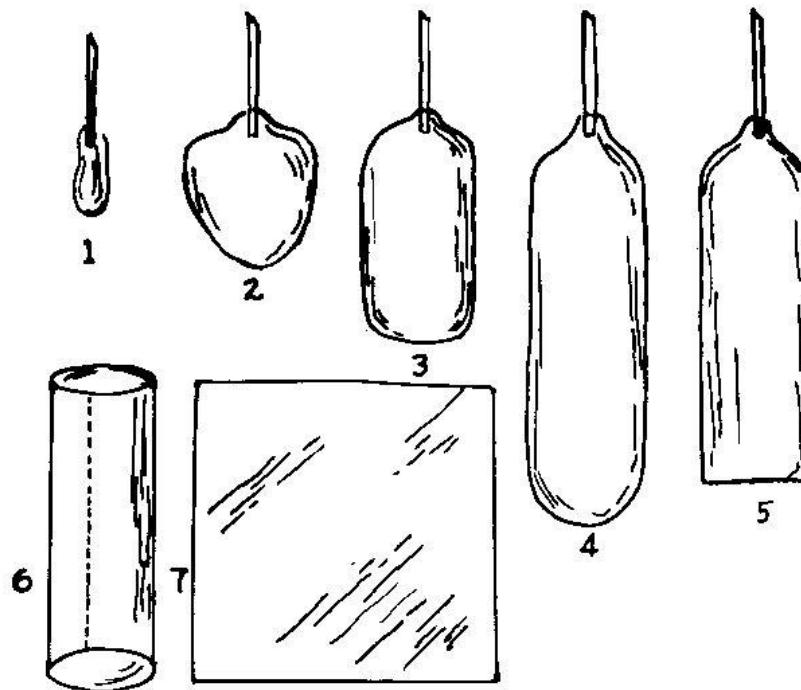
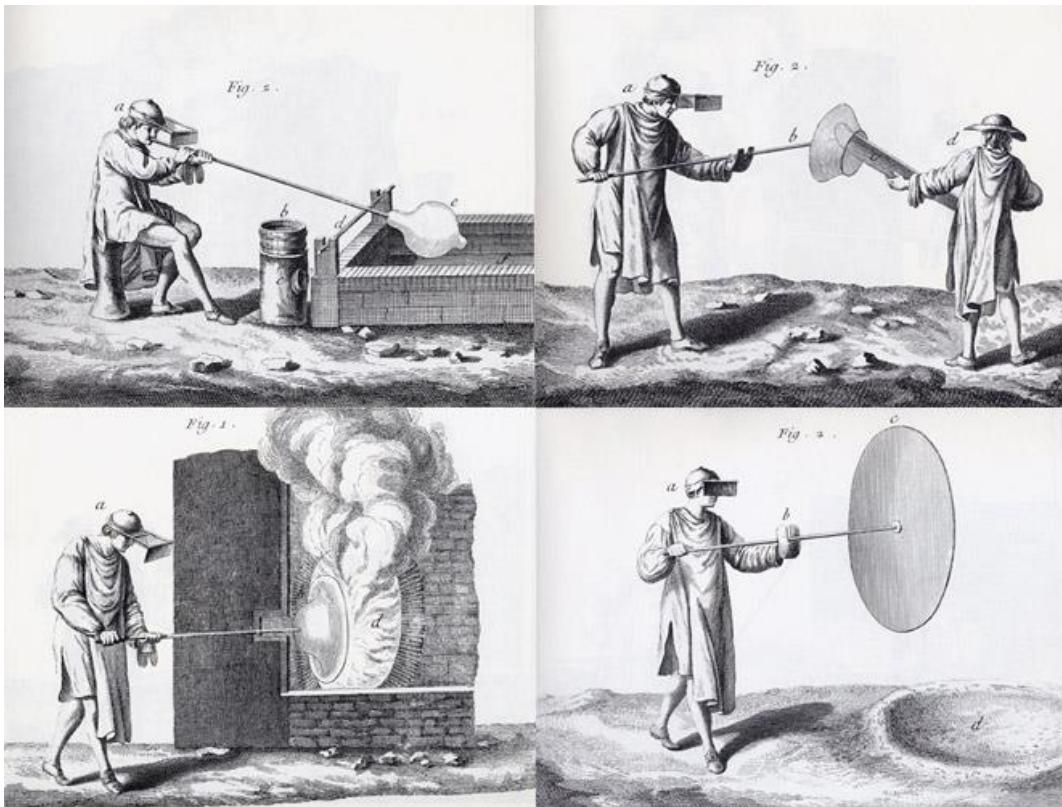


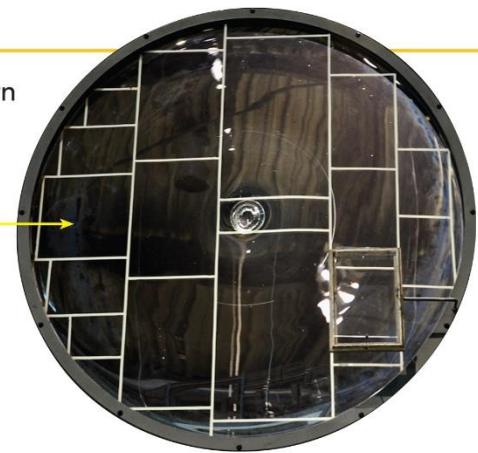
FIG. 41 Steps in the process of making window glass by the cylinder-glass method. A cylinder about five feet long and one foot in diameter was blown; then the end was cut off, the blowpipe was cracked off, and the cylinder was slit and opened out into a flat sheet. (*Photo by The Corning Museum of Glass, illustration copied from K. M. Wilson's drawing in Glass in New England, an Old Sturbridge Village booklet*)

Window Glass Manutech – Crown Glass



Technique
commonly used
from 1500s until
about 1850

Glass crown
disk with
panes
laid out



Individual panes were cut after a glass crown cooled. The best panes were near the edge, where the glass was thinnest.

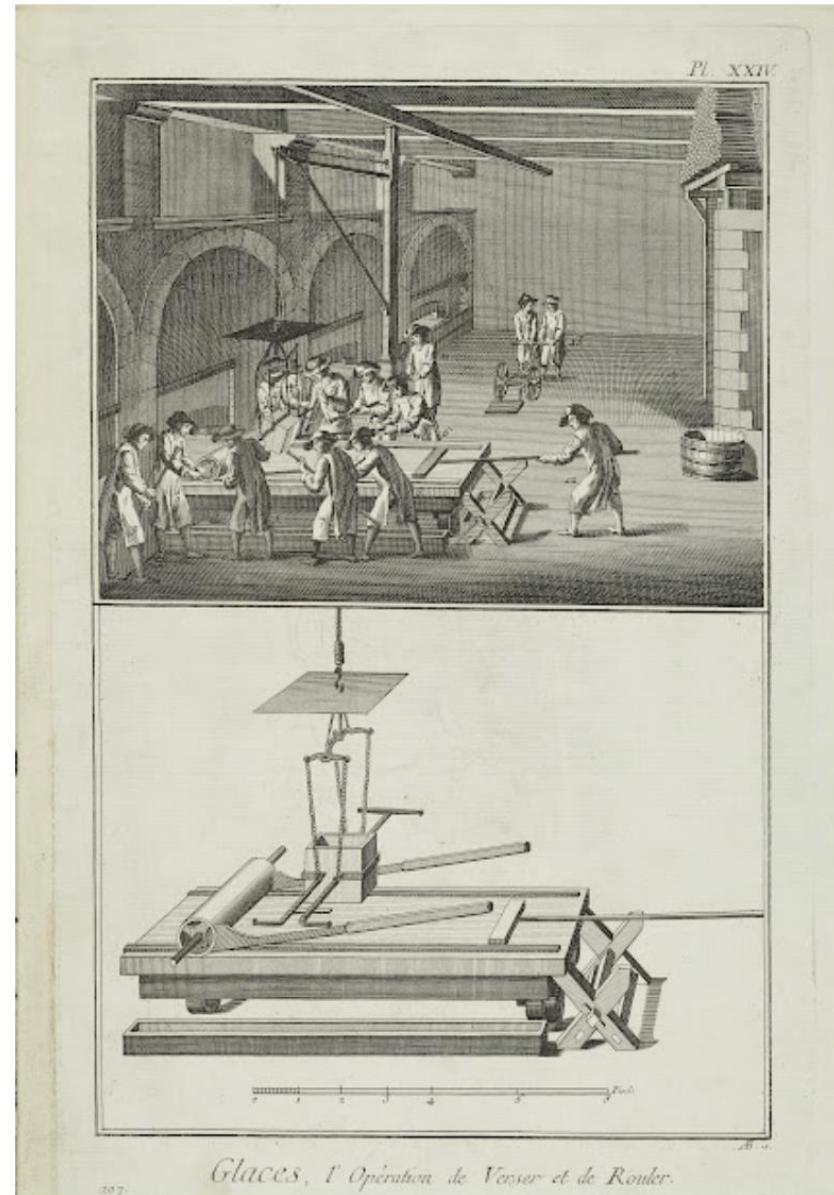
Window Type – Sash Windows



Window Glass Manutech – Plate Glass

Casting method

- Produced largest, most consistent sheets of glass
- Pour molten glass on iron/steel table
- Rolled out with steel rolling pin
- Introduced in 1830s
- Mechanized method used now



Vessel vs. Non-vessel Glass

- Glass beads and buttons are cataloged in their respective tables
 - Utilitarian glass objects such as:
 - window glass
 - light bulbs
 - lamp chimney
 - insulators
 - chandelier pendants
 - jewelry parts
 - marbles, etc.
- are cataloged in the **General Artifacts** module



GLASS VESSELS

Glass Color

- Can tell you something about the composition of glass/function of the object, but use with caution



Olive green cylindrical wine bottle from Mount Vernon House for Families, Aqua Soda/Mineral bottle with conical base from Esthersrust, Colorless cut stemware from the DNA site

Colorless Glass

At least four types of composition:

- Leaded (added lead oxide, also known as potash lead)
- Soda lime (soda as flux, lime as stabilizer)
- Potash lime (potash as flux, lime as stabilizer)
- Manganese decolorized glass



Leaded stemware,
West Kitchen Yard,
Dry Well, & MRS 1,
Monticello



Leaded, Fluted Tumbler,
West Kitchen Yard,
Monticello

Leaded Glass

- Added to colorless glass to improve clarity, increase strengthen and reflectivity
- Use shortwave UV light to determine whether glass contains lead
- When UV light shines on a vessel, the lead in the glass temporarily absorbs some of the light and then reflects a small amount of light that is of a different wavelength (color)
- To enter into DAACS glass must fluoresce “ice blue” (not purple blue)



Leaded glass stopper
from Drayton Hall,
SC under shortwave
UV light

Leaded Glass Forms

- Tablewares (late 17th through 19th century)
- Pharmaceutical bottles/vials (18th-19th century)
- Lighting (lamp chimney, globe etc. – 19th century)
- Plate glass

Colorless Glass

At least four types of composition:

- Leaded (added lead oxide, also known as potash lead)
- Soda lime (soda as flux, lime as stabilizer)
- Potash lime (potash as flux, lime as stabilizer)
- Manganese decolorized glass



18BC27 Federal Reserve,
Jefferson Patterson
Maryland Archaeology
Conservation Lab

Decorative motif
common on drinking
glasses from 2nd half of
18th century



Colorless Glass

Three types of composition:

- Leaded (added lead oxide, also known as potash lead)
- Soda lime (soda as flux, lime as stabilizer)
- Potash lime (silica and potash as flux, lime as stabilizer)
- Manganese decolorized glass

Manganese Decolorized Glass

- Silica (main component of glass) can have iron impurities that give glass a green tinge/cast
- Manufacturers added manganese dioxide added to remove green tint (converts iron from reduced to oxidized state)
- Manganese is reduced when originally added but when exposed to UV light (e.g. sunlight) over long periods of time becomes oxidized again
- Glass becomes a light purple color, > manganese = black
- Solarized glass should be cataloged as colorless/clear, not purple because that is the original glass color



Glass with Color

- Other additives include metallic oxides that can change the glass color
 - Iron – aqua, dark green (is often a natural additive)
 - Copper - light blue
 - Cobalt - dark blue
 - Gold - deep red, like rubies (1820s)
 - Various metallic oxides - Opaque white (pre-1870), yellow, ivory, greens, blues, turquoise, black (post-1870)



Patination/Weathering

- Unstable nature of glass leaves it vulnerable to corrosion
- Exposure to water causes alkali components to leak out
- Leaves behind distinct thin layers that alternate with air (laminar structure)
- Interfere with direct transmission of light – causes iridescence
- The layers may be uniform and compact, or flaky, fragile, and discontinuous – weathering crust, also known as patination
- <https://blog.cmog.org/2011/09/14/glass-corrosion-weathering/>
- <https://www.cmog.org/article/weathered-archaeological-glass>



Glass Color

- We do sort glass by color
 - Use basic color sheet to match colors
 - The only colors we use to help differentiate form or time period are “Sprite Green” and “Brown” – used to ID modern soda and beer bottle glass



Glass Vessels in DAACS

Tableware

- Tumbler
- Decanter
- Drinking vessel
- Sandwich plates
- Stemware
- Candy dishes

Container

- Bottles of all sorts (alcohol, mineral, water, medicine, poison, perfume/cosmetic, ink)
- Vials
- Jar
- Lid liner
- Flasks
- Bell Jar

Lighting (goes in Gen Arts)

- Oil lamp burner
- Lamp chimney

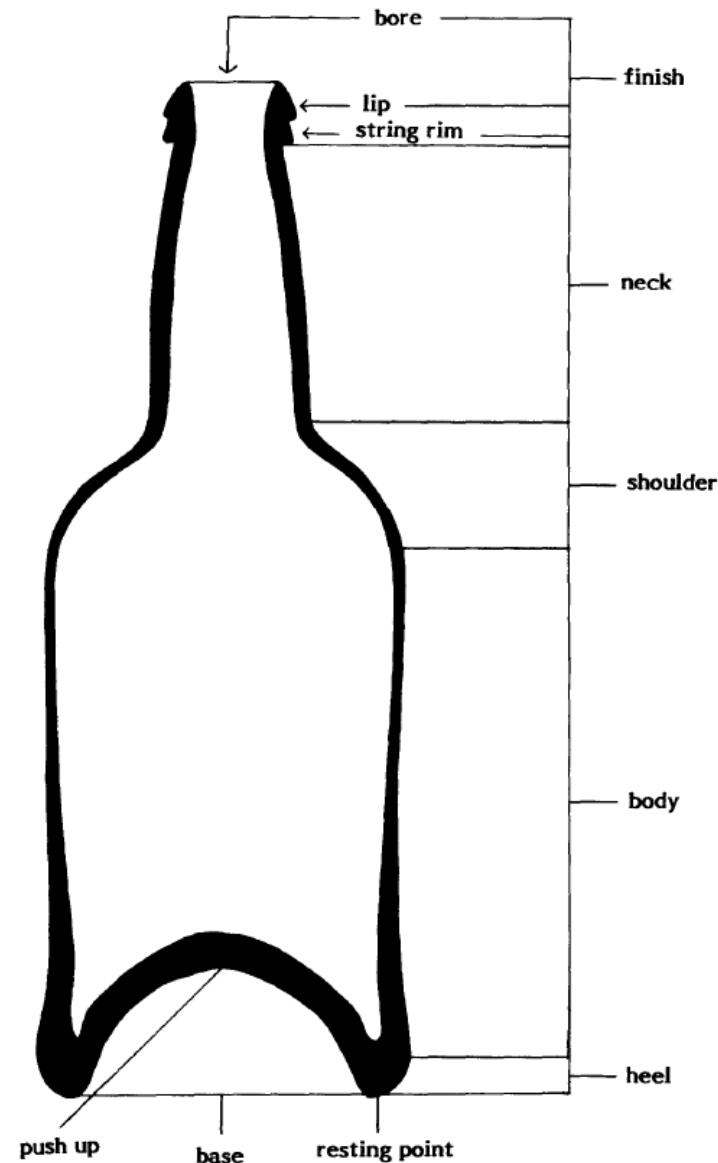
Flat vs. Hollow Vessel Glass



- Vast majority of what you will see is hollow
- Exceptions:
 - Salvers (handle-less tray for drinks/desserts)
 - Pressed glass plates (sandwich plates)
 - Jar lids

Glass Forms - Bottles

- Majority of glass recovered from sites of slavery in DAACS are hollow bottle/container fragments



Glass Forms – Wine style Bottles

- Olive green bottle glass that likely held wine, spirits, or other consumables
- Shape changes over time – shaft and globe, onion, cylindrical

Mid 18th/Early 19th c.



Late 17th/Mid 18th c.



Mid/Late 17th c.





Glass Forms – Case Bottles

- Stored in wooden cases
- Also held liquids/spirits
- Used 17th – 19th c.
Depending on century can vary dramatically in size
- Mold blown – Squared off corners, flat sides
- Short cylindrical neck, can have a variety of finishes

Case bottle, Estersrust site,
Suriname



Case bottle, Estersrust
site, Suriname

Glass Forms – Case Bottles

- Case bottle – flatter base (vs. more conical kick ups with WBG)
- There can be a gentle concaveness, especially for pointed ends but still tends to be more flat
- Shoulders have less of a gentler curve than wine, more abrupt
- Neck is squat
- Flat side vs curved
- Uneven taper across flatter fragments

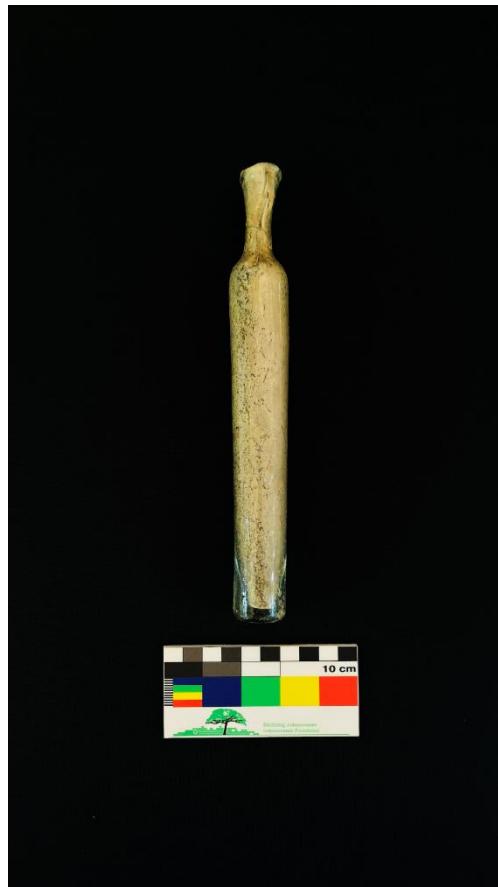
Glass Forms – Alcohol/Spirit Bottles

- Other types of alcohol bottles

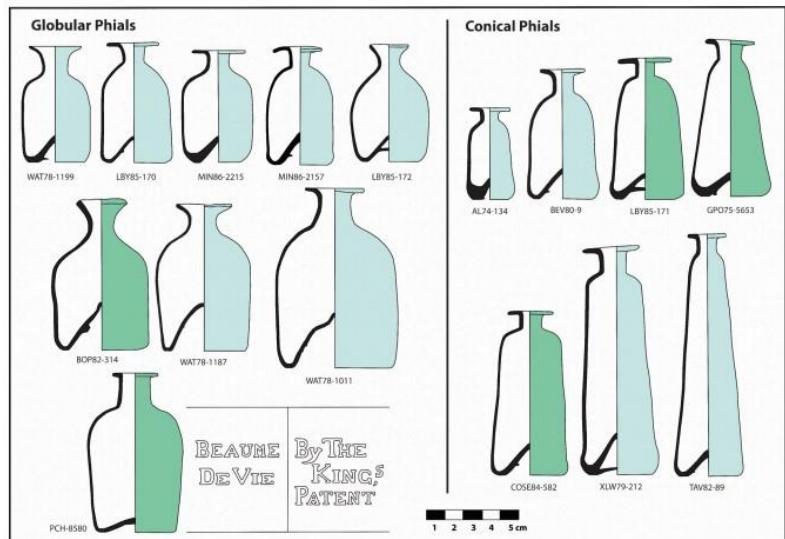
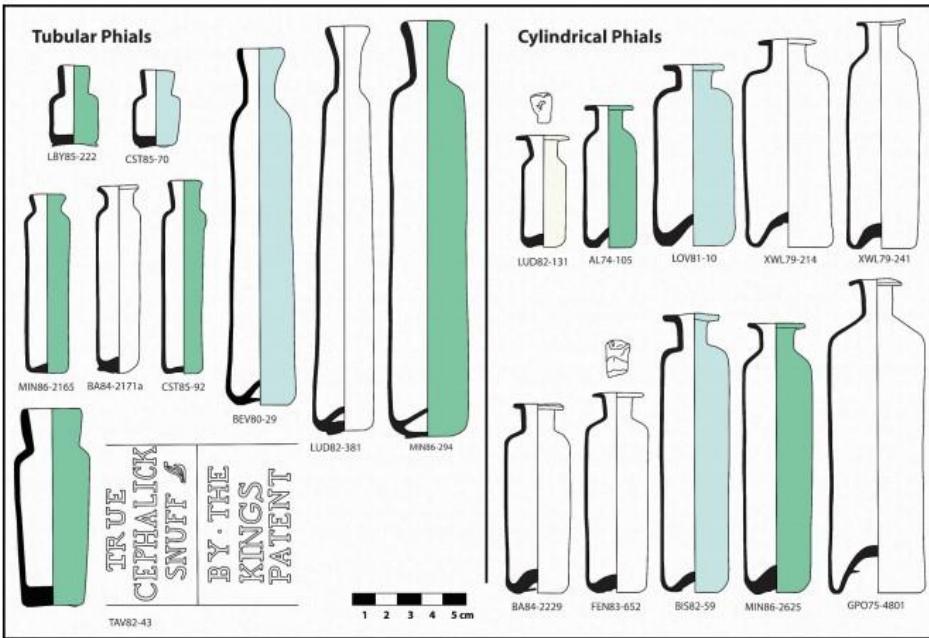


Glass Forms - Bottle/Vial, Pharmaceutical

Containers for medicinal substances



Pharmaceutical vial,
Jodensavanne Site, Suriname



Glass Forms – Bottle/Vial, Pharmaceutical

- Containers for medicinal substances, patent medicines, druggist/prescription bottles (bitters, tonics, sarsaparilla, balsams)



Glass Forms – Mineral, Water, Soda Bottles

- Blob finishes (for internal stoppers – popular 1840s-70s)
- Hutchinson stoppers – popular mid-1880s-1910s
- Round/torpedo bottoms (popular 1800s)
- Lettering/Embossing can give clues



Glass Forms -- Condiments/Food



Gothic style
pickle and
condiment
bottles –
common mid-
late 19th c.



Glass Forms - Cosmetic/Perfume Bottles



Glass Forms -- Ink Bottles



Glass Forms - Flasks

- **Flasks:** common 1815-1875 in the States
 - often “figured” (historic figures or scenes)



Non-bottle Forms

- Jars
 - "Mason" fruit jars which utilized a zinc screw cap that was typically lined with a milk glass liner



Non-bottle Forms

- **Container unid.**: sherds that are
 - Hollow
 - not tableware (i.e. not leaded, no obvious decoration, no evidence of stemware, drinking glass, tumbler etc).
 - Cannot be identified as bottles or jars (i.e. lacking neck, shoulders, expanding rim lip threading on rim/lip for jar)

Glass Forms - Lighting – Oil Lamps



Lamp chimney with oil lamp burner



Oil lamp burner with handle for carrying --
Esthersrust Site, Suriname

Glass Forms - Tableware

- **Stemware:** often leaded and decorated, usually colorless
- **Tumbler:** A type of drinking glass
- **Tableware:** often leaded and decorated, usually colorless, catch-all category for when specific forms cannot be determined e.g., tumbler or stemware



Stemware, leaded glass
from



Roemer, Esthersrust
Site, Suriname

Glass Manutech: Free Blown

- **Free blown:** blown and shaped by hand **without the use of a mold**, usually in several phases



FIG. 2. The manufacture of free-blown bottles. From left to right: the glassworker inflates the parison (note the simple one-piece or dip mould at his feet), the kick or pushed in base is formed, the string rim is applied, and the neck finished (from Diderot's *Encyclopaedia*).

Glass Manutech: Free Blown

- Identifiers: General lack of symmetry, no mold seams, simple globes, elongated shapes



Shaft and globe wine bottle
(middle 17th c)



Onion wine
bottle
(late 17th c)



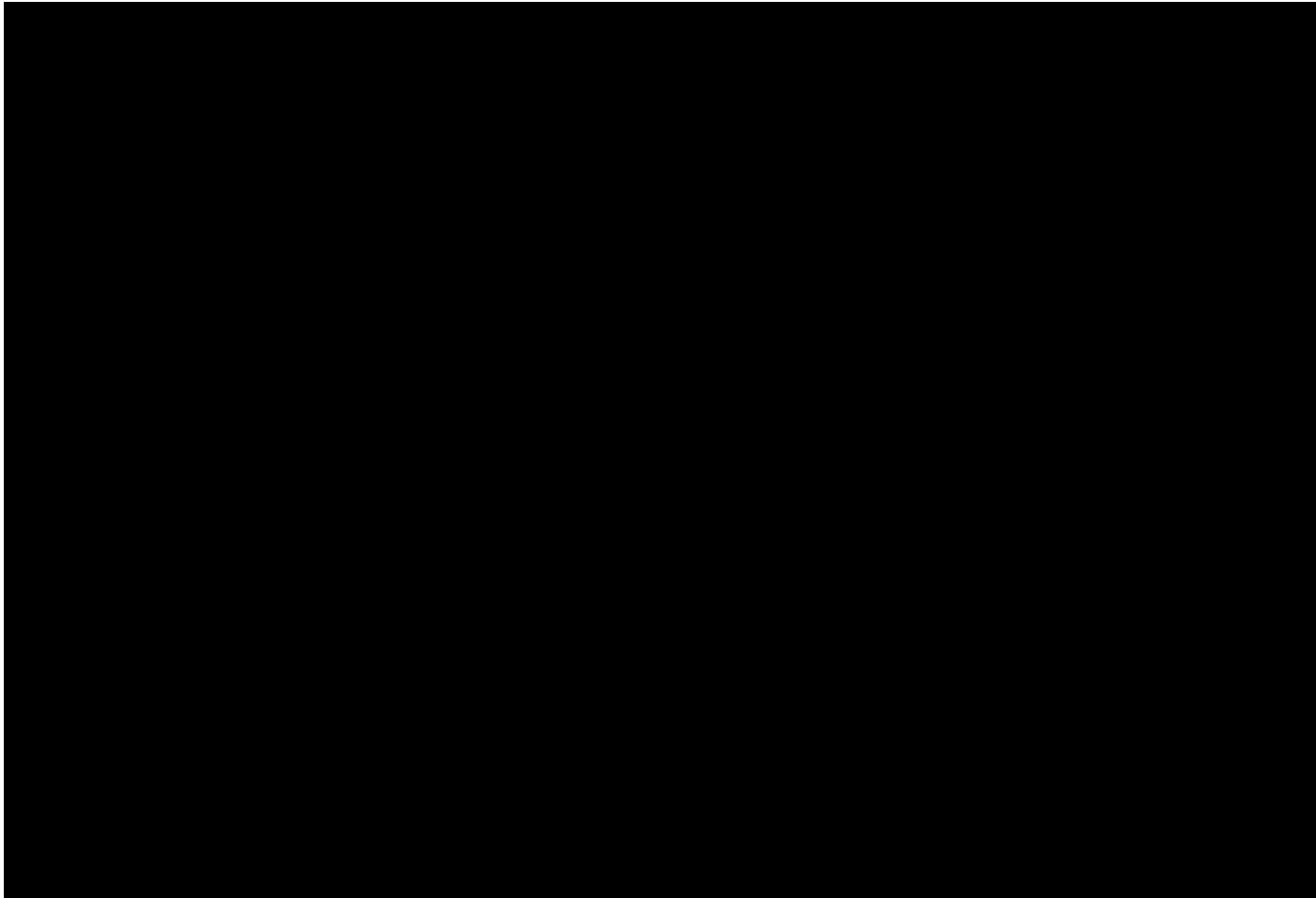
Onion-shaped wine bottle,
Jodensavanne, Suriname

Glass Manutech: Mold Blown

- Glass may be blown by mouth into a wood, clay, or metal mold to give it form, decoration or both.



Glass Manutech: Mold Blown



Glass Manutech: Mold Blown

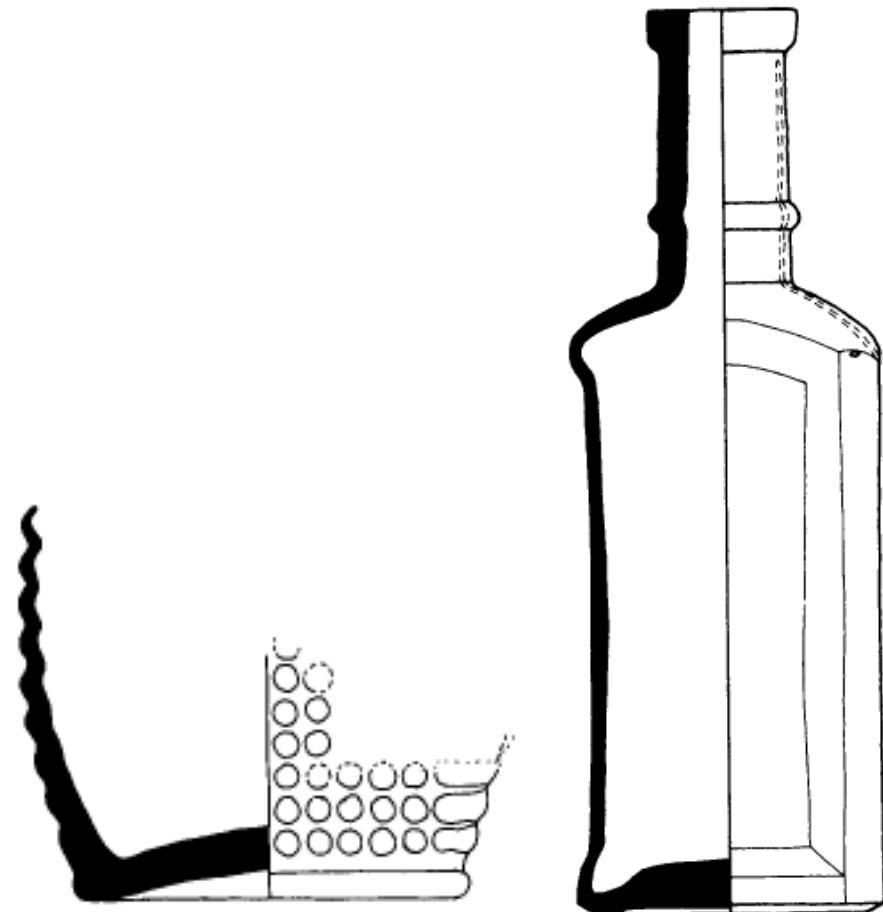
- Characteristic mold attributes:
 - Presence of a mold seam
 - Presence of molded lettering
 - Regular body shape, sharp corners angular side and bases (e.g. case bottles)



Poison bottle,
Jodensavanne

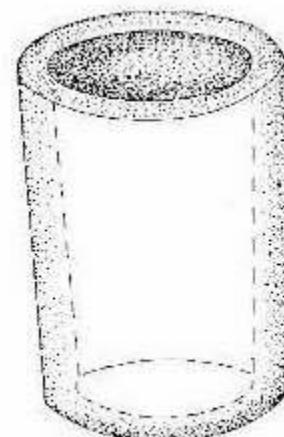
Types of Molds: Contact Mold

- Most common
- Interior and exterior are parallel to one another
- Interior follows any pattern of the exterior (convex, concave)
- In DAACS includes dip, two-part and three-part molds



Mold types: Contact Mold

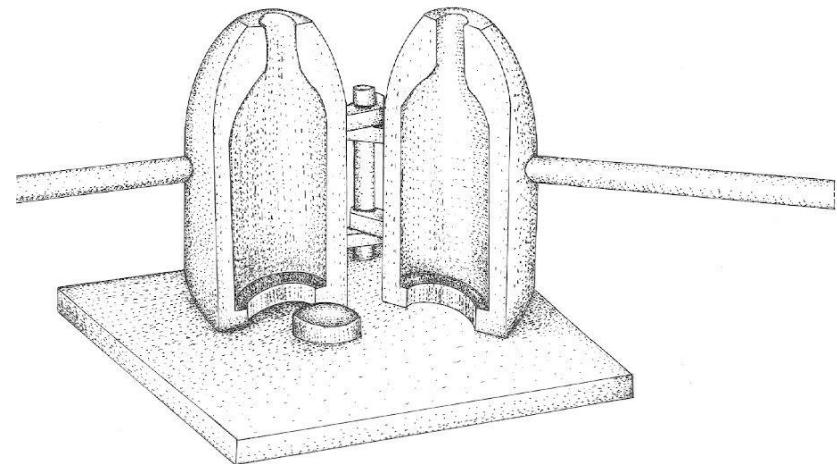
- Dip mold – dip glass into 1 or 2-part mold and pull out vertically
- Common 18th/early-mid 19th c.



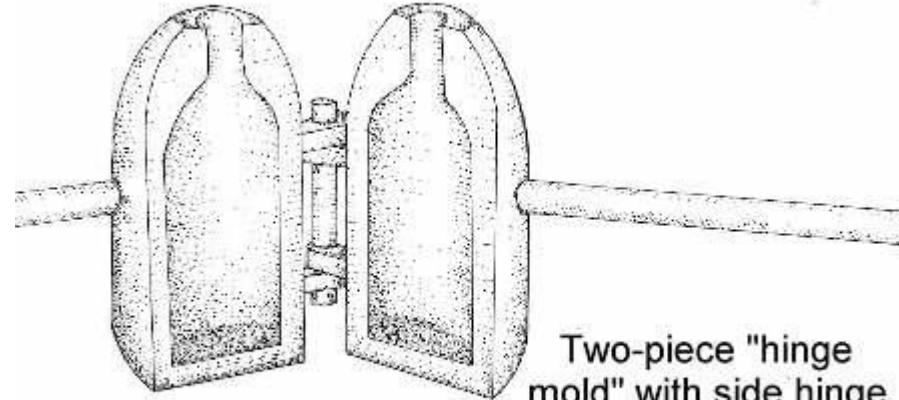
Dip-molded
bottle from
Esthersrust Site,
Suriname

Mold types: Contact Mold

- 2-piece open and shut molds
 - Post bottom
 - Cup and post bottom



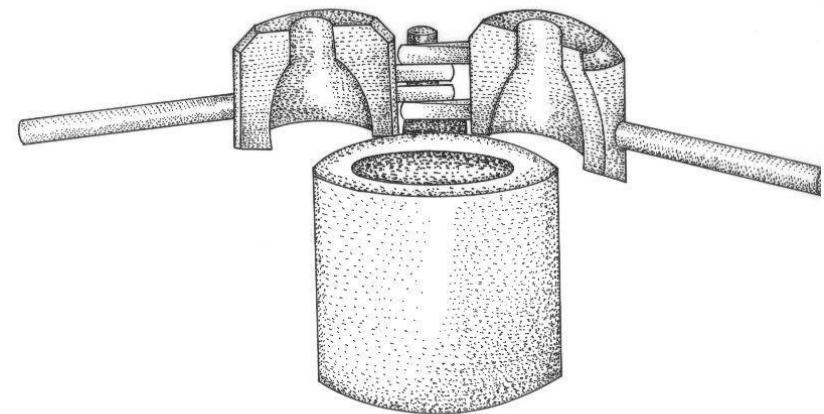
Two-piece "post bottom" mold with separate base plate.



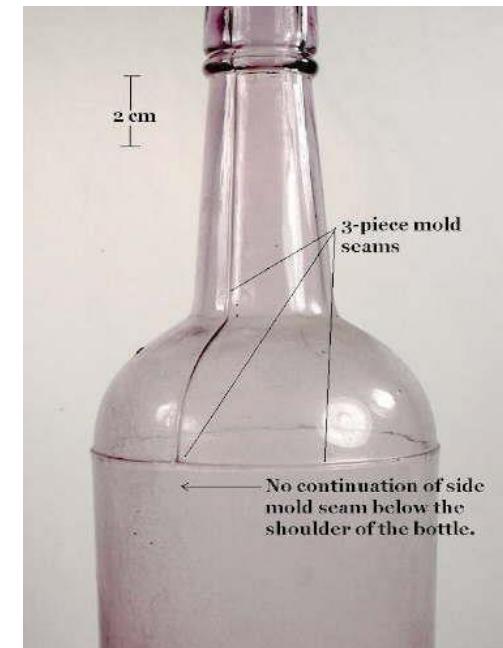
Two-piece "hinge mold" with side hinge
(there were also bottom hinge versions)

Mold types: Contact Mold

- Ricketts mold – 3 part, patent filed in 1821
 - Allowed shaping of neck and shoulders, as well as body – mold seam visible on shoulder
 - Could also be used to emboss words and symbols on glass on shoulder
 - 1820s-1920s



Three-piece mold





Glass Manutech: Mold Blown

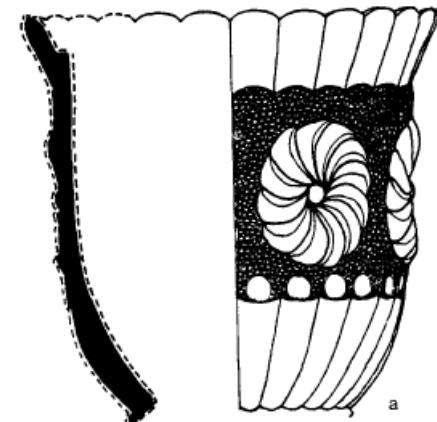
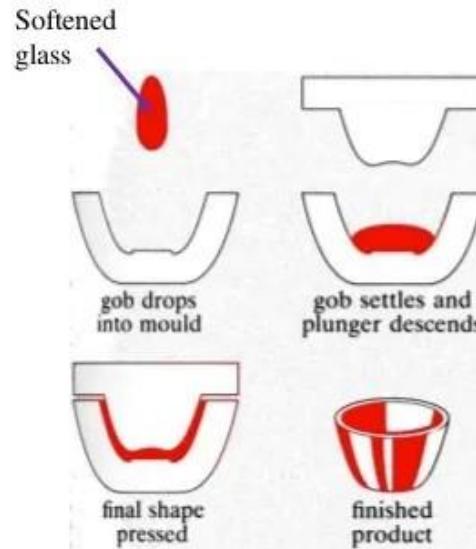
- The finish is particularly helpful for differentiating between mold blown and machine-made vessels
- Up until the invention of the semi-automatic bottle machine, finishes had to be applied or tooled by hand
- If the bottle finish lacks a seam that goes over the lip, it is molded not machine made

Mold Types: Press Mold

- Introduced in 1740, popular for tableware mid-19th/20th century
- Use of a hand- or steam-operated press/plunger to force hot glass into mold



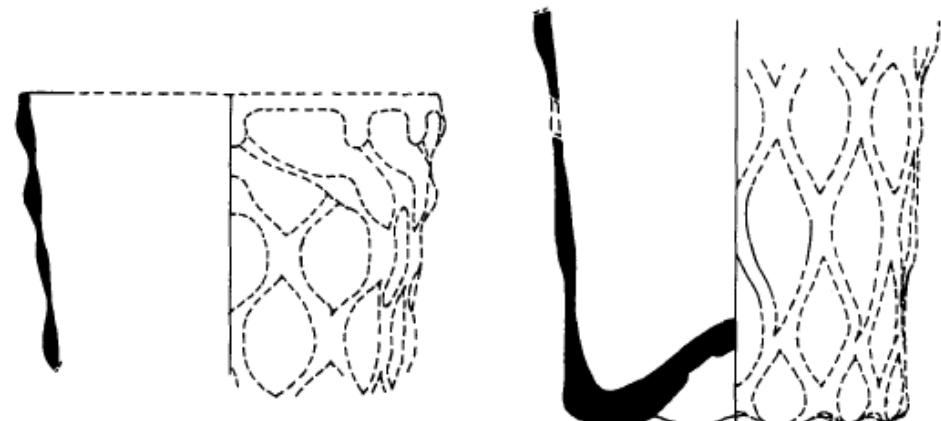
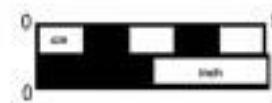
Pressed Glass Processing



Pressed glass tableware, Esthersrust
Site, Suriname

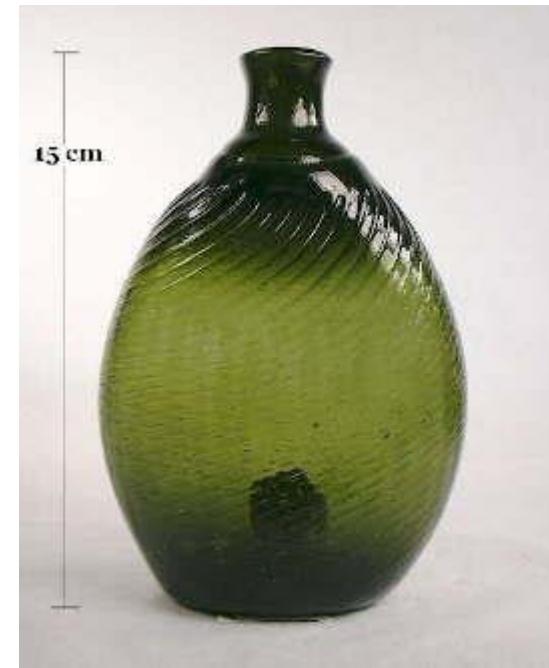
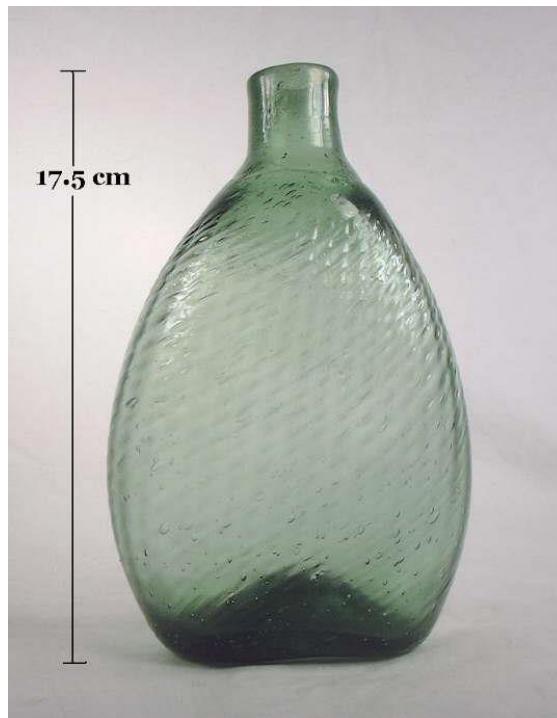
Mold Types: Pattern Mold

- Pattern on inside of mold transferred to vessel surface
- Glass vessel removed from mold and either blown out or twisted
- Used from Roman times up to present



Mold Types: Pattern Mold

- Typically found on tablewares or flasks, but also used on bottles frequently in 1st half of 19th century
- Often ribs, ribs/flutes, or rib/panels



Pattern-molded finish,
Esthersrust Site,
Suriname

Pontil Marks

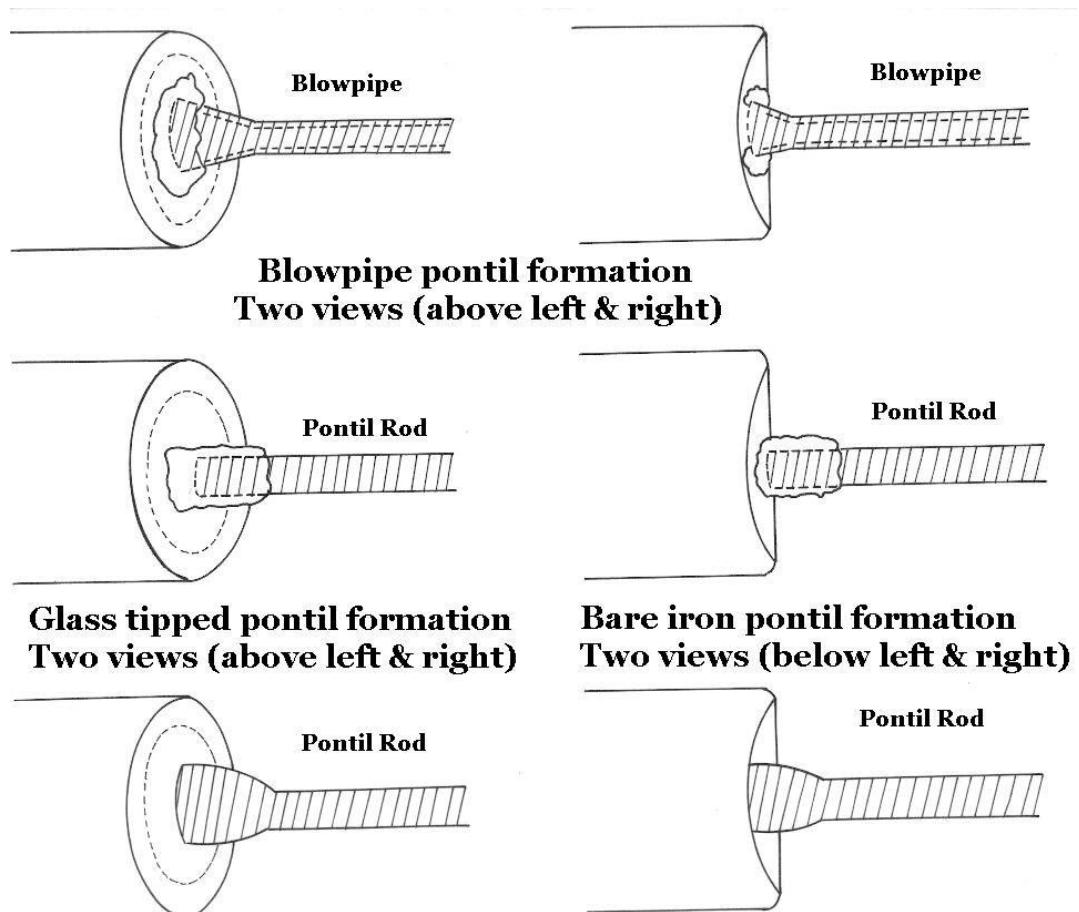
- Mark made by pontil rod
- Rod is attached to base of vessel to enable tooling of rim/finish



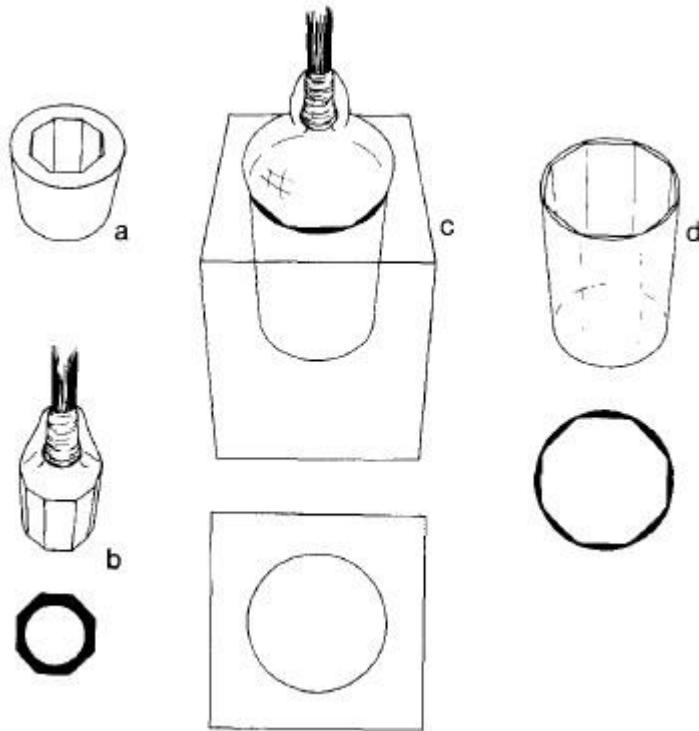
Case bottle base with pontil mark from DNA site, Suriname

Pontil Marks

- Mark made by pontil rod
- Rod is attached to base of vessel to enable tooling of rim/finish



Types of Molds: Optic Mold



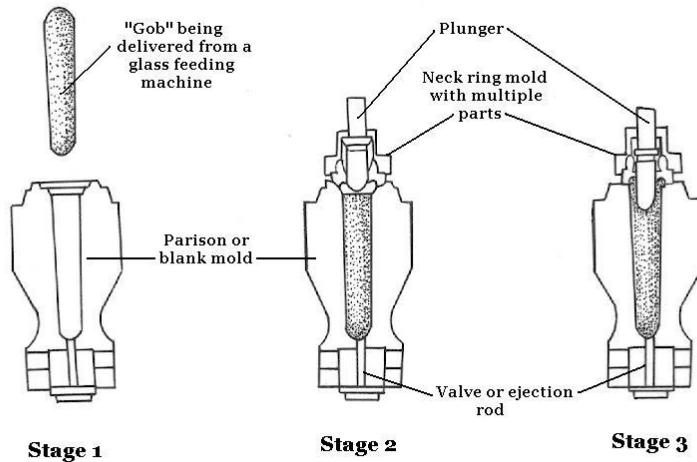
- Least common,
typically found on
tumblers
- Smooth exterior
and molded interior



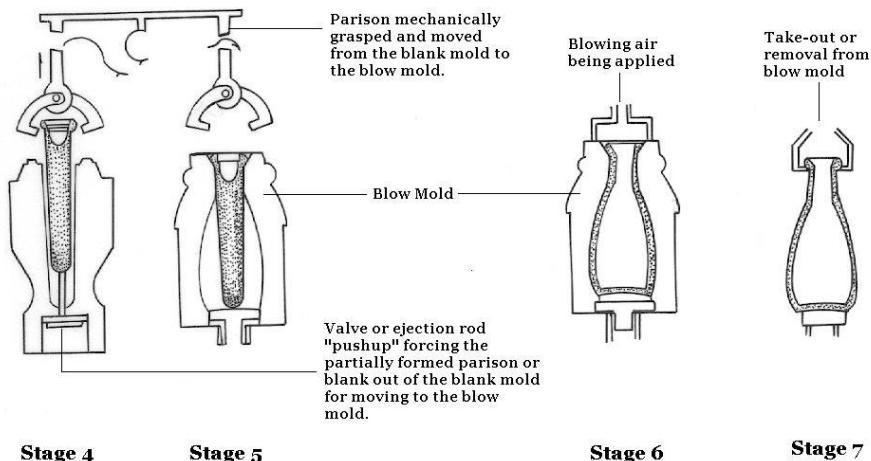
Glass Manutech: Machine Made

- Shaped by air pressure supplied by a machine
- Three main phases:
 - Earliest machines 1880-1905
 - Owens and other automatic machines (1905-50)
 - IS machines (1950+)

**Press-and-blow machine cycle - first three stages
(Lynch Milk Bottle Machine - based on Tooley 1953)**

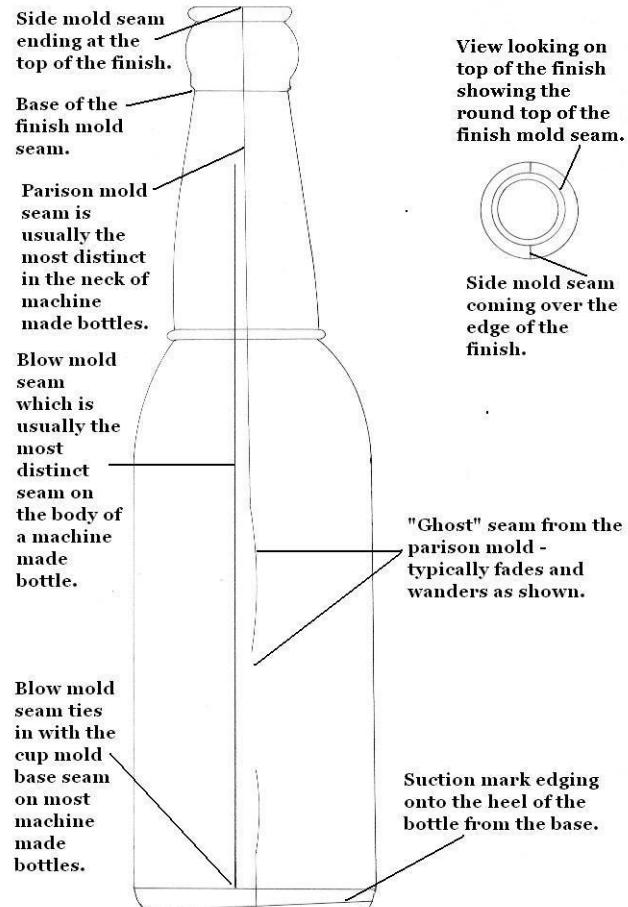


**Press and Blow Machine - Final four stages
(Lynch Milk Bottle Machine - after Tooley 1953)**



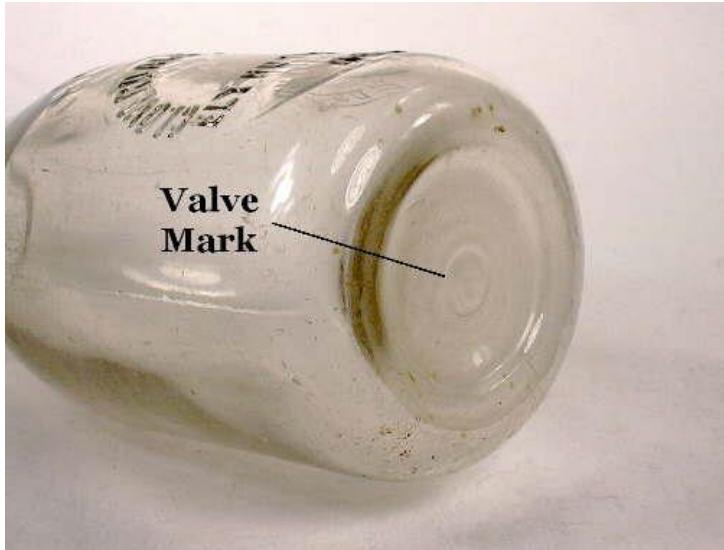
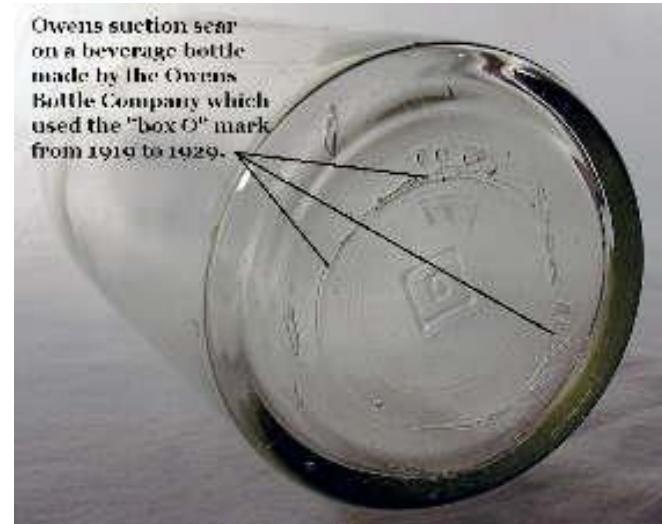
Glass Manutech: Machine Made

- Mold seams found on all parts of the vessel; including the neck, finish, and seam at lip



Glass Manutech: Machine Made

- Owens scars
- Valve marks
- Stippling on base
(similar to modern beer bottles)



Glass Manutech: Machine Made, Likely

- Use this term to record fragments of glass that are lacking diagnostic characteristics of machine manufacture but exhibit other attributes that are suggestive of machine-made glass including:
 - the uniformity of the vessel thickness
 - lack of free or mold-blown characteristics
 - exhibiting modern glass colors (i.e. sprite green).
 - it is also relevant to consider if the fragments are found contextually with lots of other glass that is diagnostically modern

Tableware Glass Decoration

- **Cut**

- One of the more expensive since done by hand
- Look for irregularities in decoration (e.g., flutes of different widths)
- Edges tend to stay sharp



Cut stemware from DNA site, Suriname

- **Wheel engraved**

- Design does not go deep into surface
- Look for striations visible within design



Table and Bottle Decoration

- Molded
 - Lettering, some sources use “embossed”
 - Molded patterns



Molded tableware
vessel stopper,
Esthersrust Site,
Suriname