

Second Time Around: A Look at Bottle Reuse

ABSTRACT

Until recently, glass bottles were generally used more than one time. This study investigates customs of bottle reuse in the United States during the 18th and 19th centuries, with particular attention to the secondhand bottle business and returnable bottle systems. Effects of bottle-manufacturing machinery and reasons for the decline of bottle reuse are discussed. The implications of reuse for the analysis of bottles from archaeological sites are considered.

Introduction

Bottles are seductive. Bottle shapes and markings often indicate function and provenience, inviting archaeologists to guess the tastes, wealth, connections, and habits of the people who used the bottles. Nevertheless, archaeologists know that empty bottles were often reused for different purposes. Consider an empty soda pop bottle, embossed with a Philadelphia address, found at a house site in rural Pennsylvania. The occupant of the house might have received the bottle filled with homemade catsup from a relative in New York city. Reuse must be considered whenever bottles are found, and it complicates analysis.

The following account traces the history of bottle reuse in the United States from the 18th century, when bottles were relatively scarce and valuable, through the development of complicated collection systems during the 19th century, to the decline of bottle reuse following World War I. It is possible to see the extent, and the limits, of bottle reuse, and some patterns for specific bottle types and different geographic areas. This information should help to interpret bottles from archaeological sites. Furthermore, the history of bottle reuse is part of the history of trash disposal, a basic concern in all archaeology.

Bulk packaging in ceramic and wooden containers was the norm during the 18th century. Glass bottles were relatively expensive, and the demand was greater than the supply. Most bottles were imported, a costly process. American glassworks produced some bottles, but they were hampered by shortages of capital and skilled labor and by inadequate transportation. In 1800 only eight glassworks are known to have been operating in the United States (McKearin and Wilson 1978:7, 28–68, 229).

New and old bottles were more than containers for other goods; they had trade value and property value. Brewers, snuff manufacturers, druggists, and other entrepreneurs who needed bottles to market their products gave cash or goods for new and old bottles (McKearin and Wilson 1978:229, 260, 262, 289). Peter Barbour offered money or snuff for bottles in the *Boston Gazette* in 1756 (Dow 1927:280–81). Jonathan Nash advertised “a good price” for quart bottles for his New York brewery in 1769 (Baron 1962:61). In 1779, Harmon & Lewis of Philadelphia offered “the highest price for empty claret bottles” (McKearin and Wilson 1978:223). Merchants attempted to conserve their supply of bottles by offering lower prices when bottles were returned. In May 1774, a New York brewer offered a dozen bottles of beer for 10 shillings, or 7 shillings if the bottles were returned (Baron 1962:62). A dealer in Hartford, Connecticut, in 1797 reduced his price for a dozen bottles of porter from 16 shillings, 2 pence, to 12 shillings when the bottles were returned (McKearin and Wilson 1978:230). In another approach to the shortage, customers provided their own bottles, as seen in this 1766 advertisement from the *Virginia Gazette*: “Any person who sends bottles and corks may have them carefully fitted and corked with beer and porter at 6s. or with ale at 4 s. the dozen” (Baron 1962:62). Sam Hudson sold cider in the same manner in Philadelphia during the Revolutionary War, when bottles became even scarcer (McKearin and Wilson 1978:230).

Seals were applied to wine and liquor bottles to

identify them as private property. Wine merchants used bottles with seals bearing their initials to designate ownership and to insure return of the bottles for refilling. Among affluent gentlemen, who could afford to custom order bottles from England, sealed bottles were fashionable for private use (McKearin and Wilson 1978:204). The chattel value of bottles is also evident in household inventories, which frequently list empty bottles. The estate left by Samuel Ruggles in 1716 included a small case with eight bottles among the hall furnishings. The 1763 inventory of the estate of Robert Oliver listed a case with small bottles in the setting parlour, and a case with two bottles in the dining room. Inventories list bottles in cellars, garrets, back rooms, and out of doors, often in large quantities: one-half gross (72) in the 1737 estate of Jacob Williams, one gross (144) in the 1732 estate of William Tailor. In the 1771 inventory of the estate of James Foster, $1\frac{1}{2}$ gross (216) quart-size bottles were valued at 48 shillings. By comparison, two brass kettles were valued at 40 shillings in the same estate (Cummings 1964).

Archaeological excavations have shown that bottles could be kept for decades before they were discarded. Wine bottles excavated from the John Custis house well in Williamsburg were at least 20 years old when they were deposited (Noël Hume 1974:188). A trash pit at Rosewell mansion in Virginia was filled sometime between 1763 and 1772, but most of the bottles (from a total of more than 350) were manufactured between 1725 and 1750 (Noël Hume 1962:172). At Wormslow plantation in Georgia, wine bottles manufactured between 1735 and 1760 were found in trash pits with artifacts post-dating 1770 (Kelso 1979:95).

The Growth of Supply and Demand

After the War of 1812 the supply of bottles more closely approached the demand. Bottle imports from England resumed at the end of the war. At the same time, the domestic glass industry was encouraged by protective tariffs, a greater supply of capital and skilled labor, and new roads and canals. In 1820 there were at least 33 glasshouses

operating in the United States (McKearin and Wilson 1978:68–70, 230; Scoville 1948:7, 50). By 1880 there were 169 glasshouses in operation, with an annual output of bottles approximately seventy times greater than in 1820 (Scoville 1948:7, 64). Innovations in bottle manufacturing increased productivity. Full-size piece molds, adopted in America circa 1810, facilitated uniformity and speed (McKearin and Wilson 1978:216, 219, 293, 410). Refinements in the division of labor culminated in the shop system, introduced around 1860 and dominant after 1870. During the same period, workers began to be paid by the piece instead of by the day, and the limit on the day's output was abolished (Scoville 1948:22; Anonymous 1905a:6). After 1880, productivity was augmented by the adoption of gas fuel, the tank furnace, and the annealing lehr (Scoville 1948:28–29, 76–77, 176–77, 337). In 1892, semi-automatic machinery was introduced into the production of wide-mouth glass containers (Scoville 1948:155). In 1899, U.S. glass container production totalled 7,780,000 gross, compared to 1,480,000 gross just twenty years earlier (Davis 1949:221; Anonymous 1955:3).

Growth in bottle manufacturing was accompanied by a decline in bottle prices (McKearin and Wilson 1978:223–24; Scoville 1948:48, 213, 249). Lower prices combined with changes in American life to expand the bottle market. Urbanization and a rising standard of living expanded substantially the markets for products that were formerly produced at home, such as liquor and canned food, and for products that were previously consumed in small quantities, such as patent medicines and carbonated beverages. Glass container use grew along with the increased demand for packaging of all kinds. With the development of roads, canals, steamboats, and railroads, more packaging was needed to protect and preserve goods during shipment. Sealed glass containers helped to assure consumers that the contents were pure and sanitary. Brand names on bottles reinforced consumer confidence. Packaging was also adopted to make it easier for customers to bring home and store their purchases.

Glass bottles were common by the end of the

19th century. What was the effect on their value? In 1899, beer, soda, and whiskey bottles were valued at \$3.75 per gross, roughly half their cost earlier in the century, but this was still expensive compared to other products (Scoville 1948:213). The skilled labor required in glassblowing kept the cost high: in the 1870s the wages of skilled glassmen were one-third to two-thirds greater than the wages of other skilled craftsmen, and two to three times greater than the wages of ordinary laborers (Scoville 1948:32–33). Furthermore, the demand for bottles had grown so much that it was still greater than the supply. To meet this demand in 1899, a number of houses petitioned the bottle blowers' union to operate part of the summer, when glassworks traditionally closed due to the heat (Anonymous 1899a:1). More than a billion new bottles were produced that year, but old bottles retained enough value to be saved and used again.

The Secondhand Bottle Business

In the first decades of the 19th century, people continued to reuse bottles much as they had during the 18th century. In the 1830s it was still customary for consumers to bring empty bottles directly to merchants in return for cash (McKearin and Wilson 1978:232, 289). Druggists continued this custom into the 20th century, charging customers for new prescription bottles, then refunding the charge if the bottle was returned, or omitting the charge if the bottle was refilled. Customers also brought their own bottles to druggists to be filled; sometimes these were medicine bottles, sometimes they were not (Anonymous 1903a:487; Hague 1913:135; Leslie 1840:211; Anonymous 1899b:11; Anonymous 1902a:18). Merchants such as druggists who used large numbers of bottles kept many as permanent store furnishings, refilling them as needed. The "shop furniture" used by druggists was even passed on from father to son (Munsey 1970:174). Similarly, bars and saloons served whiskey from bottles but purchased it by the barrel. It was the bartender's job to fill bottles from the barrel, as described in an 1869 manual:

"The most unpleasant duties of the bartender are in the morning, when the bottles and decanters, reduced by the draughts of the day and night previous have to be refilled; the tumblers, used just previous to closing, washed, and everything put in order for the day's operations (Anonymous 1869; preferatory).

These simple cycles of bottle reuse were overshadowed by the growth of large businesses devoted to the trade in used bottles. As American commerce developed, the distance between manufacturers, merchants, and consumers increased, and middlemen moved in to facilitate the transfer of goods between them. In this case, used bottle dealers transferred empty bottles from consumers back to merchants and manufacturers. Information on the origin and early development of the secondhand bottle trade is elusive. First, there had to be enough used bottles to make the business profitable. A dealer named George Bartholf claimed to have started the first used bottle business in New York City in the late 1840s (Anonymous 1928:109–10). By 1878, soda bottlers were organizing against secondhand bottle dealers who unethically sold their bottles (Anonymous 1878:36). The secondhand bottle trade in Pittsburgh was reportedly founded in 1883 (Anonymous 1899c:7). The largest bottle dealer in Detroit started out in 1885 (Anonymous 1957:6). By the 1890s the secondhand bottle business was firmly established and thriving in America's cities.

In an 1896 report, New York City's Department of Street Cleaning described a flourishing business in used bottles:

The trade in old bottles, for example, is enormous, several large establishments being devoted to it. At one store I was told that 5,000,000 bottles were kept in stock, that carload lots were received from different large cities, and that expensive exports were made to Europe (Department of Street Cleaning 1896:70–71).

In 1908 the secondhand bottle trade in New York state handled an estimated 2,000,000 gross bottles a year, at a value of \$4,500,000 to \$6,500,000 (Anonymous 1908a:32). Dealers received bottles from servants and employees who recovered them from private residences, restaurants, saloons, and hotels. Hotels were an impor-

tant source, regularly collecting empty bottles even from the guest rooms and sending them to dealers by the wagon load. Many bottles arrived at the secondhand bottle dealer via pushcart men and junk shops. Large numbers of bottles were recovered from the dumps (Department of Street Cleaning 1896:34, 70–71; Anonymous 1903b:74; Anonymous 1905b:1; Anonymous 1899d:18). In New York city, “scow-trimmers” collected bottles from the waterfront garbage dumps. They set aside registered bottles belonging to soft drink and beer bottlers, and sold the remaining “mixed” bottles to bottle dealers for \$1.50 a barrel. In 1896, New York’s scow-trimmers collected approximately 500 barrels of mixed bottles a week, or 26,000 barrels a year (Department of Street Cleaning 1896:117).

Secondhand bottle dealers paid from one-half to two cents each for bottles around the turn of the century and sold the bottles for fifty cents less per gross than new bottles (Anonymous 1903b:74; Anonymous 1905b:1). Customers for used bottles were varied and widespread. In 1899 Jacobson Brothers of Pittsburgh sent an eight carload shipment of wine and champagne bottles to Puerto Rico and Cuba (Anonymous 1899c:7). The market for wine bottles was particularly good since few were manufactured in the United States. Secondhand bottle dealers distributed used European wine and champagne bottles to American wineries and to the fruit juice and gaseous water industries in upstate New York (Anonymous 1903b:74; Anonymous 1934a:10; Anonymous 1908b:13). Distilleries, bucket shops, and saloons provided a ready market for used whiskey bottles; illegal refilling of branded bottles with cheap whiskey was widespread (Anonymous 1903b:74; Anonymous 1908c:17). The South Carolina Dispensary, a legitimate customer, used as many secondhand whiskey bottles as possible for economy (Anonymous 1905c:88). Empty liquor bottles were also traditionally used in the sale of linseed oil, turpentine, and similar products (Anonymous 1938a:7). Embossed patent medicine bottles were purchased by the original medicine manufacturers or by imitators, and were used for bluing and ammonia (Anonymous 1903b:74; Blanc 1913:39). Large ink

and mucilage bottles were returned to the manufacturers; cologne and perfume bottles went to the cheap scent manufactories on New York’s East Side (Anonymous 1903b:74).

The Returnable Bottle System

The returnable bottle system complemented the used bottle business in the recovery of empty bottles. Returnable soda water bottles were used in New York city as early as the 1840s but did not become common until bottled soda became popular following the invention of the Hutchinson stopper in 1879 (McKearin and Wilson 1978:242–43; Riley 1958:97–98). Similarly, returnable beer and milk bottles became common after the 1870s. Lager beer was first bottled successfully in 1873, and the first known delivery of milk in glass containers was in 1878 (Anonymous 1909a:4; Munsey 1970:191). Under the returnable system, bottles were considered the legal property of the bottler, and customers were obligated to return them to the bottler for refilling. Bottles were embossed with the bottler’s name, and frequently the reminder “This Bottle Not To Be Sold” or “This Bottle To Be Washed And Returned” (Wilson and Wilson 1968:170–77; McKearin and Wilson 1978:179, 242). Returnable bottles were practical when distribution was localized, as was generally the case with soda pop, beer, and milk. Their advantage was elimination of the cost of the bottle from the price of the product. Products such as patent medicine were expensive enough to absorb the price of the bottle, but a few cents added to the price of a bottle of soda would hurt sales. In the early 1900s a bottle of soda sold for 5¢; selling the bottle with the contents would have added an additional $2\frac{1}{2}$ ¢ (Scoville 1948:213). The returnable bottle system seemed sensible for these inexpensive, rapidly-consumed products, but it established “the bottle question” as the number one bottler headache.

The *National Bottlers’ Gazette* called the bottle question “the monstrous evil which every year saps the life from this otherwise prosperous trade (Anonymous 1882:3). In 1883 bottle loss was

estimated at roughly 65 percent (Anonymous 1883:25). An 1896 report on the bottling business in the United States reported a total capital investment of \$41,573,469 and an annual loss in bottles of more than \$3,500,000 (Department of Street Cleaning 1896:119). To fight bottle loss, bottlers banded together in trade associations. The Pennsylvania Bottlers' Association, the Maryland Bottlers' Association, the Missouri Bottlers' Association and their counterparts throughout the United States secured the passage of state laws protecting the property rights of registered trademark bottles. They organized the recovery of bottles from other bottlers, private households, and dumps, setting up central bottle exchanges and clearing houses where bottles were sorted and returned to their rightful owners. Bottle exchanges received the most bottles from member bottlers who acquired other members' bottles mixed with their own empties. With many small soda and beer bottlers operating in one area, empties were inevitably scrambled. The exchange was foremost a means of getting these bottles back to their proper owners.

Bottle exchanges also directed the recovery of bottles lost to careless and illegal users. In an 1855 advertisement in the *Savannah Daily News*, one bottler warned: "I hereby caution all persons particularly those engaged in bottling against either buying, selling, using or in any way depriving me of my bottles bearing my name John Ryan" (Schmeiser 1968:8). Seventy years later the *National Bottlers' Gazette* was still deploring the activities of the "bottle louse" who used competitors' bottles (Carr 1926:122). The bottle louse had plenty of opportunity to appropriate bottles left for collection or simply abandoned by customers. Dishonest dairymen ensured a supply of milk bottles by collecting their competitors' empties from the doorsteps when they made their morning deliveries (Hagerman 1912:68). Saloons sold a large proportion of the bottled soda in the 19th century, and the bottling trade papers bitterly criticized the "always careless and too often unscrupulous" saloon keeper who sold soda and beer bottles to used bottle dealers, who sold them in turn to the bottle louse (Anonymous 1878:36). The Trade-Mark Act of 1876 prohibited the refilling of

bottles that had registered trademarks blown in the glass, and subsequent state laws prohibited the sale of these bottles (Anonymous 1878:36; Peters 1902:24). By 1906, twenty-one states had laws imposing fines for dealing in registered bottles (Anonymous 1906a:30). The laws reduced, but did not eliminate the sale and reuse of registered bottles, and bottle exchanges hired detectives to track down violators (Anonymous 1905d:66; Carr 1926:122). Under the protective laws, bottlers were able to seize their property in raids and prosecute the violators. In 1921, within four months, the Massachusetts Bottlers' Exchange took more than 60,000 bottles in raids and prosecuted 30 bottlers for illegally using registered bottles (Anonymous 1921:34). Though dramatic, raids actually brought back fewer bottles than member exchanges and dump collections.

Large numbers of beer and soda bottles were lost to housekeepers who kept them for their own use, particularly in the fall (Anonymous 1900:56). "That period of the year when the good housewife begins to bottle her ketchup and make her preserves is at hand, and it is also the season when the Pennsylvania Bottlers' Protective Association makes its greatest efforts to prevent the bottles of its members from being utilized for purposes that necessitate hiding them in cellars and closets until gentle spring comes around again" (Anonymous 1902b:84). The shapes of beer and soda bottles made them particularly popular for home preserving. In 1901 the Pennsylvania Bottlers' Association found in Philadelphia homes over one million bottles filled with ketchup, sauces, corn beer, root beer, fruit wines, and other "exhilarating drinks" (Anonymous 1902b:84). Bottlers seldom prosecuted housewives, but they did confiscate the bottles (Anonymous 1902b:84; Anonymous 1905d:66). In the 20th century, bottle loss to home preserving declined, except during Prohibition. In 1922 the *National Bottlers' Gazette* attributed a shortage of soft drink bottles almost entirely to their use for home brew (Anonymous 1922:18).

Bottles taken by housekeepers and competing bottlers were lost to their legitimate owners, but they were still in use. Many bottles, however,

were simply discarded. A bottle detective observed in 1905:

Beer bottles are treated very much the same as boxes in which fried oysters are taken home. As soon as the box is done with it is thrown to one side to find the ash heap and finally the dump. The same is true with beer bottles. Many a man will take home a bottle or two of beer with his box of oysters and when the bottle is emptied it is thrown out with the oyster box (Anonymous 1905d:66).

Whereas saloon keepers legally or illegally returned bottles for refilling, consumers were more likely to throw bottles away. Archaeologists excavating late 19th century dumps in Atlanta found only fragments of beer bottles at a tavern dump but found whole bottles at domestic dumps (Dickens and Bowen 1980:54). Bottle exchanges followed the example set by used bottle dealers in recovering bottles from city dumps. In the 1890s a contractor for the New York Bottlers' and Manufacturers Association paid the scow-trimmers 50¢ a barrel to collect soda bottles, which he washed, sorted, and delivered to the exchange (Department of Street Cleaning 1896:119–20; Anonymous 1899:18). In 1895 the New York Association recovered 1,132,018 beer, soda, and siphon bottles from New York city and Brooklyn dumps. Milk bottlers were recovering 100,000 bottles a year from the New York dumps during the same period (Department of Street Cleaning 1896:119–20). In 1905, 453,475 milk bottles and 1,915,354 beer and soda bottles were recovered from the New York dumps (Anonymous 1906b:36; Anonymous 1906c:34). The New York Association found that dump bottles accounted for a consistently higher percentage of small soda bottles than of other bottles. In 1909 dump bottles accounted for 7% of the siphon bottles recovered, 20% of the quart-size bottles, 27% of the weiss beer bottles, 41% of the lager beer bottles, and 62% of the soda bottles recovered. Customers were understandably more careless with the smaller, cheaper bottles (Anonymous 1909b:46–48). By the early 1900s, all of the state associations were recovering bottles from the dumps.

Reuse and Disposal ca. 1900

In 1900 a bottle manufacturer wrote:

In no other country in the world is the consumption of glass bottles so great as in the United States. The reason for this is to be found in the greater material prosperity of the people of this country as compared with those of the old world. Here it is not the custom to preserve a bottle after it has once served the purpose for which it was originally intended (Tatum 1900:8).

Bottlers and bottle dealers recovered many bottles only after they were discarded, and recovery was far from complete. Used bottle dealers operated primarily in cities, even as far west as San Francisco, but the cost of collecting and shipping bottles from sparsely populated areas was generally too high to make the business profitable. Similarly, long distance "shipping brewers" found it too expensive to retrieve bottles used to ship beer across the Rocky Mountains (Cochran 1948:177; Kurtenacker 1914:58). In western mining towns, empty beer and liquor bottles were so abundant that in some towns they were used to build houses and sidewalks (Starry 1968:20–23; Baron 1962:254). In others they were just dumped. Even within the cities, bottles did not always make it to the city dumps, where they might be recovered, but were frequently broken or deposited in backyard dumps and vacant lots. A bottle detective described this scene in 1906: "In the various empty lots, especially those adjoining flat houses, many bottles, the greater number of them broken, can be found. It is so much easier to throw bottles out of the window." He noted that few bottles bearing the dates 1903 and 1904 were still in use (Brand 1906:28).

Consumers discarded empty bottles because they accumulated more than they needed. Housewives still used large quantities of glass containers for storage, home brewing, and preserving, but the number of bottles coming into the home was increasing. In 1910, twenty glass containers were produced for every person in the United States (Anonymous 1910a:1). Some of these glass containers contained prepared foods that the housewife formerly made herself, so the need for glass containers in the home was decreasing while the

supply was increasing. A thrifty homemaker observed in 1916: "There is a vast array of bottles and jars accumulated in the course of a few months in the average home, in which pickles, cream cheese, dried beef, and various other kinds of edibles are sold, and there is a vast array of uses to which they can be put instead of being thrown away." (Farmer 1916:89-90). That same year, *Scientific American* noted that a very large portion of the bottles manufactured annually in the United States were thrown away after one use (Anonymous 1916a:56). Even where bottles were redeemable for cash, many people did not bother to redeem them. As the New York City Department of Street Cleaning reported:

Old bottles are handled in every junk-shop, besides forming the sole stock in trade of a considerable number of dealers, large and small. But although they can be used over and over again, and are always exchangeable for cash, bottles are to be found in every load of garbage that reaches the dump (Department of Street Cleaning 1896:117).

Impact of the Bottle Machine

In 1903, when Michael Owens began marketing his automatic bottle manufacturing machine, the *New York Post* estimated that half of the bottles used in a year were lost and half were used again (Anonymous 1903b:74). Machine manufacturing did not at first affect this balance, although the effects on cost and productivity were immediate. The first Owens machines produced 35.4 gross pint beer bottles in an $8\frac{1}{2}$ hour day, while a shop of glassblowers and assistants produced 15 to 20 gross in the same time. Furthermore, the Owens machine could operate around the clock to produce at least 100 gross pint beer bottles in 24 hours. Productivity increased in subsequent models of the Owens machine; a 1917 model produced about five times as many bottles per day as a 1905 model. Greater productivity and the elimination of skilled bottle blowers combined to reduce the cost of production. Machine operators were paid \$.20 an hour in 1906, compared to glass blower wages of \$7.00 a day. The total labor cost for one gross of pint beers produced by an Owens machine between 1903 and 1907 was approximately \$.10, compared

to \$1.50 by manual production. In 1916, factories using glassblowers paid 51.49% of the sales value of their annual product in wages. Owens machine licensees paid 31.38% of their product sales value in wages and machine royalties (Scoville 1948:65, 155-56, 159-62, 205, 211).

By 1917, when the Owens Bottle Machine Company opened the first completely mechanized glass factory, Owens machines accounted for 50% of the glass containers produced in the United States (Meigh 1960:25; Scoville 1948:184). There were also more than 300 semi-automatic bottle machines in use. Comparatively simple and inexpensive, semi-automatic machines were more practical for small orders and helped to fill the gap in machine supply created by the Owens Bottle Machine Company's limited licensing policy. Gob feeding devices that could be attached to semi-automatic machines to make them fully automatic were available for jars in 1915 and for bottles in 1918 (Scoville 1948:162, 180-89; Meigh 1960:36-38). In the 1922-23 glassblowing season, automatic machines, either Owens or gob-feeding, produced 80% of the glass containers made in the United States. In 1924-25, automatic machines accounted for 90% of glass container production (Davis 1949:213).

When machine manufacturing began, the growing bottle market readily absorbed the additional output. Machine manufacturing actually increased the demand for bottles by producing bottles that were notably more uniform in weight and capacity than bottles hand blown into molds. Uniform size assured both retailers and consumers that they were not being cheated in the sale of bottled products and encouraged the use of glass containers in place of bulk containers. While the growing demand was thus helping to prevent over-production, the Owens Company was limiting the number of its licensees toward the same end (Scoville 1948:212, 214). In 1909 the president of the bottle blowers union reported optimistically: "Even with all the machines in operation last season, and every bottle maker in the country employed, the stocks of ware now on hand are lighter than at any former time" (Anonymous 1909c:1). Instead of lowering prices, machine

users turned lower production costs into extra profits, even charging 50¢ to \$1.00 more per gross because of the superior quality of their product (Scoville 1948:212; Anonymous 1910b:1; Anonymous 1909d:10).

In 1909 this balance began to falter. The bottle blowers took wage cuts of 20% in 1909 and another 20% in 1912, hoping to preserve the market for handblown bottles by reducing the price. Owens licensees retaliated by reducing their bottle prices (Scoville 1948:212–13). In 1911 the Owens Bottle Machine Company reported average price reductions for the company and its licensees of 10 to 20% over 1908 (Anonymous 1911a:1). One licensee, the American Bottle Company, reduced its pint beer bottles from \$3.75 to \$2.60 per gross before World War I ended the price war. During the war years, 1914 to 1918, prices rose throughout the glass industry, though less rapidly than prices in general (Scoville 1948:213–14).

Meanwhile, machines with ever-increasing productive capacity were steadily replacing the bottle blowers. Overproduction was inevitable. In 1911, the *National Glass Budget* reported that there would be a delay in the resumption of bottle blowing following the summer break: “The longer a general resumption is delayed, the better it will be for the market as the year advances, since there is a producing capacity in excess of consumptive requirements” (Anonymous 1911b:1). In 1919, glass container production reached 22,295,000 gross, more than three times the number of glass containers produced in 1899 (David 1949:221). The Owens Company discontinued a machine that produced three hundred four-ounce prescription bottles per minute because its output was too great for the market (Anonymous 1942:10). Nevertheless, in 1934 the automatic bottle machines in use were capable of producing 100,000 bottles a day, or 700,000 a week, and *Modern Packaging* reported: “You seldom have call for a full week’s production on any single bottle, except in such exceptional instances as that caused by the legalization of beer and liquor” (Anonymous 1934b:35). In 1936, standard twelve-ounce returnable beer bottles cost \$2.80 per gross, the equivalent of \$1.73 in 1911 dollars (Anonymous

1936a:3; U.S. Bureau of the Census 1975: 210–11). By comparison, pint beer bottles in 1911 cost \$2.75 per gross (Scoville 1948:213). Machine manufacture accelerated the steady increase in bottle supply and decrease in bottle value that began during the 19th century, bringing the industry to the critical point where the supply of bottles surpassed the demand.

Decline of the Secondhand Bottle Business

Bottle manufacturers had always viewed used bottle dealers as a nuisance, but the competition took on new meaning with the arrival of machine manufacturing and overproduction. When the bottle blowers felt threatened by machinery, they channeled much of their anger toward their old enemies the bottle dealers. In 1905 the Glass Bottle Blowers Organization of the United States and Canada resolved to send a circular to all labor organizations in the country, asking them to encourage their families and friends to break all bottles before throwing them away (Anonymous 1905b:1). In the end, neither the bottle blowers nor the bottle dealers could compete with the bottle machines. While machine manufacturing was reducing the cost of producing new bottles, rising labor costs were increasing the cost of recovering old bottles. In *Municipal Refuse Disposal*, the American Public Works Association cited the high cost of labor for collecting and sorting materials as the primary cause of the decline of all forms of waste salvage (American Public Works Association 1961:308–9).

While the price advantage of used bottles was slipping, legislation to regulate the liquor industry crippled the secondhand bottle trade. Liquor bottles and imported wine bottles were the staples of the secondhand bottle business. In 1914, 2,689,000 gross liquor bottles and flasks were manufactured in the United States. The Eighteenth Amendment was ratified on 29 January 1919, and went into effect the following year. By 1919 liquor bottle production had already dropped to 993,000 gross (Barnett 1926:89). With liquor bottles practically eliminated, many bottle dealers undoubt-

edly went out of business, like the Kansas junk dealer who had to quit the bottle business in 1916 after Prohibition took effect in his state (Anonymous 1916b:73). On the other hand, there was a great demand for bottles suitable for bootleg liquor. Before 1920, the consumption of bottled liquor increased where local prohibition laws forced the closing of saloons (Anonymous 1910c:3). When Atlantic City began to enforce its Sunday Closing Law in 1913, the beaches became littered with bottles: "In a search made from Young's Ocean Pier to the Million Dollar Pier by one of the employees, 232 flasks of the pint and half-pint variety were discovered. This condition prevails only on Monday, following 'dry' Sundays" (Anonymous 1913:38). During Prohibition, bottle dealers who were able to maintain supplies of suitable bottles and were willing to deal with bootleggers must have flourished.

On 5 December 1933, the Eighteenth Amendment was repealed. Liquor boards prohibited the sale of bulk liquor in casks in the effort to establish tight control and prevent the resurgence of anything resembling the old time saloon (Anonymous 1933:32). Liquor was sold only in bottles, and well-established bootleggers took up the old practice of refilling the branded bottles of legitimate dealers (Anonymous 1935a:23; Anonymous 1935b:12). In 1934, a Federal Alcohol Control administrator estimated that one gallon of illegal liquor was sold for every legal gallon (Anonymous 1934c:13). On 1 January 1935, the federal government enacted legislation prohibiting the resale, purchase, or use of used liquor bottles, even by the original filler. All liquor bottles were embossed "Federal Law Forbids Sale or Re-Use of This Bottle." Used bottles were supposed to be destroyed. Before mid-January, one million empty liquor bottles were seized in a raid on three New York secondhand bottle dealers (Anonymous 1935a:23; Anonymous 1935d:92). By August the price of bootlegged bottles had reportedly increased 500%. Sales of legal liquor and new liquor bottles increased: 5,663,000 gross liquor and wine bottles were shipped for domestic consumption in 1935, 7,447,000 gross were shipped in 1936 (Anonymous 1935d:483; Anonymous 1936b:3;

Glass Container Manufacturers Institute 1960:54). By 1938 the law was pronounced successful in largely curtailing bootlegging (Anonymous 1938b:705). As an aside, *Business Week* noted: "So far no one has worried about the problem of final destruction. The old liquor bottle may become as bothersome an outcast as the dulled razor blade" (Anonymous 1935a:23).

After 1935 the secondhand bottle business survived on a greatly reduced scale. In 1938 New York city's used bottle dealers did a million dollar annual business, a fraction of their sales volume at the beginning of the century. They dealt primarily in wine bottles, with a large share of food and beer bottles (Anonymous 1938c:16). Used bottle dealers tried to collect and sell the nonreturnable beer bottles introduced in 1935. These special lightweight beer bottles were strong enough for one filling but not necessarily for two; some broke when returned to the fillers (Anonymous 1940a:12; Anonymous 1940b:15). Lightweighting was applied to other glass containers, and, combined with the use of faster filling machinery, may have contributed to the decline of the used bottle business.

Public health was another contributor. People had long been concerned about using bottles recovered from dumps. In the early 1900s, some customers required secondhand bottle dealers to deliver their bottles packed in boxes as if they were new bottles from the glass factories (Anonymous 1903b:74). In 1899, the Pennsylvania legislature passed a law prohibiting the collection of bottles from refuse and the sale of any goods in previously used bottles (except for milk, soft drink, beer, and prescription bottles). The stated purpose of the bill was to protect the public health, but the state's important glass manufacturing industry was reported to be behind the bill (Anonymous 1899c:7; Anonymous 1905e:54). Although this particular law was not enforced, it shows an awareness of possible health hazards from bottle reuse. In the 1930s, state pharmacy boards began issuing regulations requiring new bottles for all liquid prescriptions (Husa 1941:653).

After World War II, new methods of waste collection and disposal further discouraged the recovery of old bottles (Darnay and Franklin

1972:14, 22, 98). In 1961, *Municipal Refuse Disposal* cited only one company that salvaged bottles, and their efforts were limited to returnable deposit bottles (American Public Works Association 1961:308–9). Apart from some trade in returnables, the used bottle market no longer existed. In the late 1960s, when consumers concerned about solid waste began voluntarily bringing their used bottles to recycling centers, the bottles were crushed and used for cullet.

Deposits on Returnable Bottles

During the period when the used bottle business was declining, the returnable bottle system was actually growing stronger through the use of deposits. As early as 1877, the trade journal *Carbonated Drinks* proposed a deposit system as the solution to the bottle loss problem (Anonymous 1877:3). No one questioned the wisdom of deposits. Without them, only a sense of honesty and responsibility motivated customers to return bottles, and this had proven insufficient. Customers actually had more incentive to sell bottles to dealers than return them to bottlers. A deposit provided incentive for return and defrayed the cost of the bottle when it was not returned. But bottlers delayed adopting a deposit system for fear that they would lose business, particularly if neighboring bottlers continued to “give bottles away” (Anonymous 1931:118). When significant numbers of bottlers began to charge deposits they usually adopted the system at the state or regional level to minimize unfair competition. In 1903 Milwaukee brewers began charging deposits on all bottles leaving the city (Anonymous 1903c:70). The Bottlers Association of (Washington) D.C. began placing a 2¢ deposit on every bottle in 1906 (Anonymous 1906d:31). Nebraska bottlers adopted a deposit system in 1909, followed by Kansas bottlers in 1911, and so forth (Anonymous 1911c:51). The trade journal *American Bottler* chronicled the spread of deposits and their benefits. One example cited was a Massachusetts brewery which used an average of 16.6 bottles to bottle a barrel of beer before they began charging depos-

its, and only 13.8 bottles per barrel with deposits (Nicholson 1916:39).

Deposits were widespread in the soft drink industry by the 1920s. Under the 1934 National Recovery Act Code of Fair Competition for the Bottled Carbonated Beverage Industry, deposits became mandatory (Carr 1926:122; Anonymous 1934d:39). The Code required a deposit no less than one-third of the replacement value of bottles and cases (Anonymous 1934e:11). In practice, 2¢ per bottle became normal. Following repeal, the brewing industry adopted deposits as standard practice, although they posed a problem for long-distance shipping brewers (Anonymous 1934f:3). Dairies were also using deposits in the 1930s, particularly for milk purchased at retail stores (Anonymous 1938d:3, 7; Anonymous 1946:65). Combined with more organized systems of pick-up and delivery, deposits reduced bottle loss far more effectively than bottle exchanges and dump collections, which were generally discontinued. When a Virginia bottler recovered bottles from the city dumps in 1949, the *National Bottlers Gazette* reported it as a curious incident (Anonymous 1949:39). Bottle loss was 3 or 4% in 1947, not insignificant, but still a fraction of the loss typical at the turn of the century (Comptroller General of the U.S. 1980:40).

Decline of Returnable Bottles

Returnable bottles for soda pop, beer, and milk were at their strongest during the 1930s and 1940s. The value of a 2¢ deposit encouraged bottle returns during the Depression; materials shortages enforced returns during World War II. In 1947, beer bottles travelled an average of 32 round trips from brewer to market, and soda pop bottles travelled an average of 24 round trips (Comptroller General of the U.S. 1980:40; Organization for Economic Cooperation and Development 1978:39). Yet it was during this period that nonreturnable containers began to threaten the use of returnable bottles. Paper milk bottles were used as early as 1902, but it was the square paper carton, introduced in 1934, that became a serious competitor to glass (Anonymous 1902c:68; Anonymous 1934g:50; Anony-

mous 1935e:125; Anonymous 1936c:16). Non-returnable bottles and cans for beer were introduced in 1935 (Beer Can Collectors of America 1976:3; Anonymous 1935f:3). After World War II, nonreturnables progressed rapidly and steadily. By 1952, nonreturnable containers accounted for 30% of packaged beer and 37% of packaged milk (Anonymous 1959:79; Anonymous 1953:14). In the soft drink market, the progress of nonreturnables was slower; nonreturnable bottles were first used for soft drinks in 1948, and soft drink cans were not used successfully until 1953 (Anonymous 1948:107; Anonymous 1961:25). In 1978, nonreturnable containers accounted for 62% of packaged soft drinks and 89% of packaged beer (Comptroller General of the U.S. 1980:31). In 1976, nonreturnables already held 98% of the packaged milk market (Serchuk 1978:37).

Conclusions

When reuse is taken into account, as it must be, site interpretation based on bottles is more difficult. At the least there is the possibility of time lag between the dates of manufacture and disposal of bottles, reducing their usefulness in dating sites. Trade networks based on names and places marked on bottles are subject to error because bottles were often reused by different people in different locations. Furthermore, bottles can no longer be seen as an easy guide to consumer behavior. The relationship of what people consume to what they discard to what the archaeologist ultimately finds is complex. When efficient bottle collection systems are present, the evidence that a person drank a lot of soda pop, for example, would be removed or reduced. Of course an archaeologist would not base conclusions only on the absence of physical evidence. However the presence of a bottle, such as a wine bottle, does not necessarily indicate that wine was consumed for the bottle might have contained something else.

Despite these difficulties, archaeologists can still use bottles in site analysis. To begin with, awareness that reuse is a possibility will help to avoid simplistic interpretation. When a bottle must be

dated, archaeologists should look for wear such as scratches and abrasions to indicate how long a bottle was used, as well as the way it was used. Wear patterns on bottles could be analyzed as they are on ceramics. Bottles can help to determine trade networks when conclusions are based on a sample rather than on isolated instances, particularly when evidence from bottles is combined with evidence from other artifacts and from historical research. For example, historical research shows that in the early 20th century the South Carolina Dispensary used secondhand liquor bottles, an important clue to archaeologists at early 20th century South Carolina sites. When commercial and industrial sites are excavated, archaeologists should note the variety of packages found there; excavation of a dairy site might yield bottles from other dairies in the area, or from other areas. Although the shape or label of a bottle is not an automatic indicator of its contents, in some cases traces remain of the last product it held, traces that can be analyzed. Again, historical research provides clues: European wine bottles were used to bottle fruit juices and gaseous waters in upstate New York, liquor bottles were customarily reused for paint products, and so forth. Site-specific historical research should provide more clues.

There are some rough guidelines as to where bottles were more likely to be reused than discarded. Bottle dealers were most active within and between cities. In contrast, large numbers of beer and liquor bottles shipped full to frontier mining towns were discarded when empty. Commercial users seem to have been more inclined than consumers to return bottles, at least at urban sites. One might hypothesize that at rural domestic sites, where packaged products were less common than in cities, bottles had greater value for reuse in the home. Analysis of dump sites has shown that small bottles were discarded more readily than large bottles.

If bottles seem less useful in determining dates, trade networks, and consumption patterns, consider that the decision whether to reuse or discard a bottle is itself an aspect of consumer behavior. If an archaeologist observes that the occupants of a site were discarding whole, usable bottles, that

may reveal something about those occupants. Perhaps they were too wealthy, or too careless, to care about redeeming bottles for cash. It could be a sign that scavengers and bottle exchanges were absent in that particular area. Conversely, absence of usable bottles in a trash deposit might be linked to immigrant status; there is historical evidence that European immigrants were more accustomed than Americans to reusing bottles (Department of Street Cleaning 1896:119; Tatum 1900:8). Multiple use reduces the certainty of bottle interpretation, but it adds dimension. With more careful and sophisticated analysis, the result can be a richer, more complete knowledge of an artifact and the society where it was used.

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