

Brass Guns & Balchin's *Victory* (1744): the Background to their Casting

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The 41 bronze cannon discovered and recorded by Odyssey Marine Exploration on the surface of the wreck of Balchin's *Victory* in the western English Channel are unique examples preserved from a First Rate Royal Navy warship active in the early Georgian period. The quantity of the guns and their unity from a single dedicated batch manufactured by Andrew Schalch at the Royal Brass Foundry in Woolwich are unparalleled in surviving collections. Furthermore, they are extremely rare examples of hybrid guns designed by Colonel John Armstrong based on the former Borgard system and a template obtained from the French.

Balchin's *Victory* was built and equipped at a seminal moment in the history of gun founding. The ship was the last fitted with a full complement of purpose-made brass cannon. Those onboard the First Rate *Royal George* and *Britannia*, by contrast, were a cosmopolitan collection of antique English cannon and prizes seized from enemy ships over the course of decades.

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1. The Background

At the end of the Second Dutch War (1665-67) it was clear to the Royal Navy that the iron guns in service were not adequate for the demands of the new style of naval warfare, which expected opposing fleets to fight in line at a distance as opposed to in a general melee. In 1670 the Board of Ordnance introduced a new series of guns more suited to this style of naval warfare, which would prove to be an outstanding design and would continue in service for the next 100 years. This series of 1670 was cast in all sizes up to and including the largest calibre (Trollope, 2005), the 'cannon of seven', which was used to arm some of the new First Rate warships (the earlier name for a 42-pounder that referred to the 7in of the bore's diameter).

The drill required gun teams of up to 14 men for a 42-pounder to work in coordination to maintain the gun in action at the best rate possible. The performance of the guns at the range where a hit was likely allowed the 42- and 24-pounders – when fired at a flat trajectory with a point-blank range of some 250 yards (Kinard, 2007: 113) – to smash through the timbers of the opposition and cause havoc, with the solid shot knocking over men, guns and causing a shower of deadly splinters to spread across the danger area. Shots from 42-pounders or 24-pounders would make a hole that could cause a disastrous leak if located at the waterline or below. The 12-pounders and 6-pounders were designed to cause damage to the upper deck levels.

While the iron guns had needed an upgrade to the new enhanced design, the same was not true for the brass equivalents. The greater tensile strength of brass when compared to brittle iron, and coupled with the fact that many of the brass guns cast after 1587 had been cast with excess metal to control the violence of the recoil, made it unnecessary to manufacture new brass guns after 1670. Such brass guns that were already in circulation continued in use.

Brass cannon, however, had inherent deficiencies as described in Captain Franc Stoney and Captain Charles Jones's *A Text-Book of the Construction and Manufacture of the Rifled Ordnance in the British Service* (London, 1872: 29-31):

"Bronze, or rather that particular kind called "gun-metal", consists of an alloy of about 90 parts of copper and 10 of tin... it is deficient in hardness, being readily indented and abraded by the projectile, and expanded by the force of the explosion, this softness being increased as the material becomes heated from continuous firing..."

The want of uniformity in large bronze castings is due to the fact that copper and tin do not form one definite alloy in the proportion of ten to one (the theoretical proportion in gun-metal), but will form numbers of alloys varying in the richness of either metal. The specific gravity and temperature of fusion of the two metal being also very different, it follows that they separate more or less from one another while cooling, and thus are formed those tin spots and porous patches which have hitherto led to the failure of this material..."

From 1670 solely for prestige purposes, and to make use of perfectly good brass guns still in circulation, four out of the seven contemporary First Rate Royal Navy warships retained their brass armament. This consisted of English guns dating back to as early as 1587, plus French, Dutch and the occasional Spanish cannon captured in the various wars of the 17th century.

Historically, when First Rates with brass ordnance were rebuilt the brass guns were retained for the new ship, while those with iron ordnance received a new cast set. As the predecessor to Sir John Balchin's *Victory* had been a Second Rate equipped with iron guns, a new set of brass or iron was required for the new *Victory*, which was to be both a First Rate and the flagship of the fleet. The large stock of worn out and captured brass guns held by the Board of Ordnance (PRO Supp 5-1), unsuitable for a warship of such high status, made the casting of a new brass set the right and necessary choice on prestige and economical grounds.

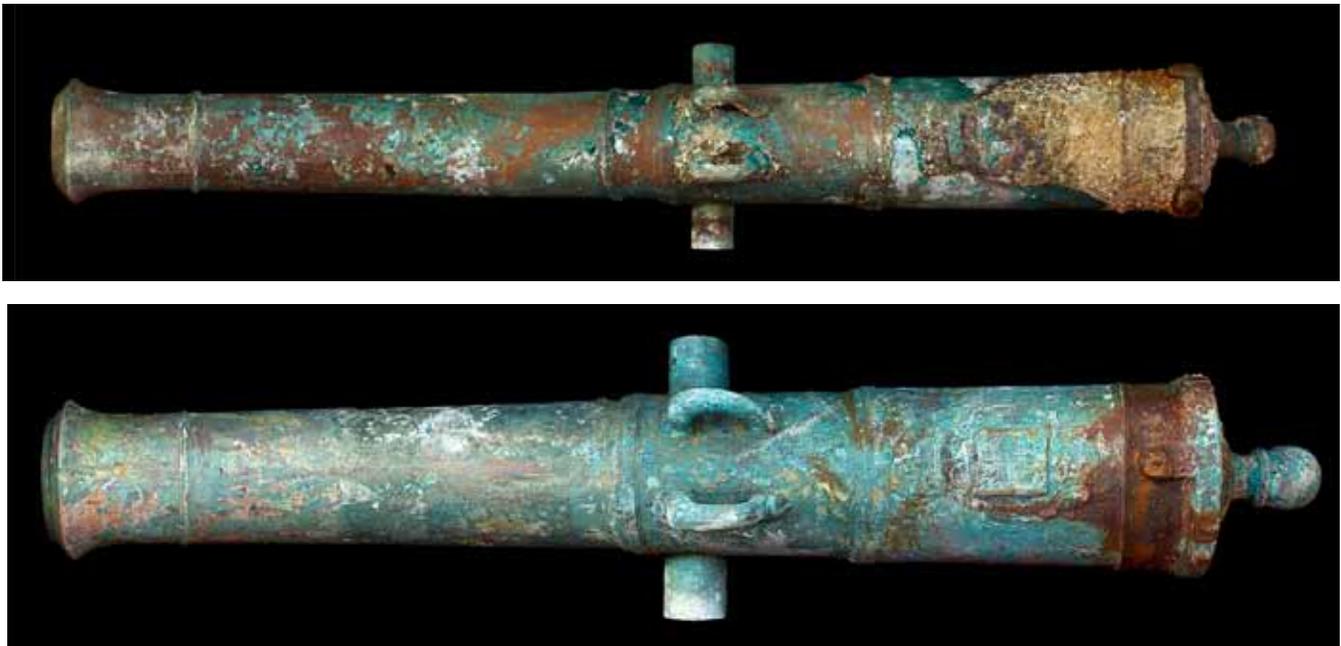
Old and unusable brass guns were viewed as scrap and not as historic pieces. To buy the raw copper and tin needed for a single gun cost £60, as compared to an iron gun cast from iron ore, whose production and delivery cost £20. From 1660 into the first half of the 18th century the price of cast iron guns ranged from £14 to £20 depending on urgency in peace and war. Brass guns varied from £30 to £40 when cast from old guns in hand, of which £4/10s to £8 was required for the quality hand finishing of the embellishments. Prize guns were bought in at £70 to £80 per ton from naval captains. Those taken in battle on land

obviously cost nothing (cf. PRO WO51). To cast a brass cannon from a captured and re-used enemy gun cost about the same as iron. Since the Board of Ordnance already possessed the necessary brass metal, the expense of casting was the only point needing factoring in to the new manufacture. Britannia ruled the waves, and with her 100 brass guns *Victory's* role was to remind the world of this feat.

2. Changing the Guard

By 1715 the Stuart Dynasty had been replaced by the Hanoverians and personnel in or close to the Board of Ordnance who understood the reasons for the gun design of 1670 were either dead or out of office. The Duke of Marlborough was back in the position of Master-General of the Ordnance. The senior engineer from his campaigns, Brigadier General Michael Richards, became Surveyor-General, and Colonel Albert Borgard (cf. Caruana, 1982), a Dane by birth, was employed to produce a complete system of artillery, guns, gun carriages, carts and ammunition.

Borgard belonged to the European school of artilleryists who thought that gunpowder exploded instantaneously and therefore the area of maximum chamber pressure was confined to the space occupied by the gunpowder charge only and thus did not extend any further down the bore. Therefore, in his view, the first reinforce only needed to be positioned at 2/7th of the gun's length. He chose to ignore the design of the 1670s that had extended the first reinforce lengths.



Figs. 1-2. A 42-pounder brass cannon C33 (bottom) and 12-pounder C28 (top) recovered from the wreck of Balchin's *Victory*.



Fig. 3. Royal arms of King George I on 42-pounder cannon C33.



Fig. 4. Royal arms of King George II on 12-pounder cannon C28.

Borgard's designs in both brass and iron extended from the half-pounder swivel gun up to and including the 42-pounder. While brass guns produced to his designs proved safe due to the tensile strength of brass, no iron guns were ever taken into service above the 24-pounder calibre because the first reinforce was too short to accommodate the area of maximum chamber pressure without the length of the guns being extended by an extra 1-2ft to a length that a ship could not reasonably accommodate. Extending the gun also extended the first reinforce but did not simultaneously increase the size of the gunpowder charge.

Brigadier General Michael Richards died in 1721 and was replaced by Colonel – later Major General – John Armstrong as Surveyor-General. Armstrong dispensed with the services of Colonel Borgard and took the design of ordnance into his own hands. Brass guns continued to be cast to the Borgard pattern for some years to come. Armstrong reduced the metal on the iron guns of Borgard's design to save weight, with predictable results – the new guns started to burst.

3. Borgard Pattern Brass Guns

The casting of brass guns to Borgard's pattern (cf. BM Kings 261) in 1716 did not get off to an auspicious start. The cannon included two 24-pounders and were to be cast by Mathew Bagley at his foundry in Moorfields, where a crowd of eminent persons gathered to view proceedings. Regrettably the molds used were still damp and a disastrous eruption occurred. Mathew Bagley and many others were killed and even more injured, including Borgard (cf. PRO WO51-98 for payments for Borgard's injuries). As *The Mercurius Politicus* of 18 May 1716 announced (Hogg, 1963: 246-7):

“Several gentlemen were invited to see the Metal run, which being a very great and curious Piece of Art, a great many Persons of Quality came to see it, and some General Officers of the Army among the rest... About 11 at night the Metal being ready, was let go... the burning Metal no sooner sunk down to the Bottom of the Mould, but with a Noise and Force equal to that of gunpowder, it came pouring up again, blowing like the Mouth of a *Volcano*, or little *Vesuvius*. There was in the place about 20 Men, as well as Workmen as Spectators, 17 of whom were so burnt that nothing more horrible can be thought of, neither can Words describe their Misery. About 9 of the 17 are already dead, the other 8 are yet living, but in such a condition that the Surgeons say they have very small hopes of above 2 of them.”



Fig. 5. Latin inscription 'SCHALCH FECIT' along the base ring of 12-pounder cannon C28.



Fig. 6. The date of '1726' on the base ring of 42-pounder cannon C33.



Fig. 7. The date of '1734' on the base ring of 12-pounder cannon C28.



Fig. 8. Dolphin handle on 42-pounder cannon C33.



Fig. 9. Gun deck position '28' incised onto the trunnion of cannon C28. Balchin's Victory had 28 x 12-pounder guns on the upper deck and this gun would have been the last in the circuit of the deck. Numbering usually started at the entry port and worked clockwise round the ship.

As a direct result of this disaster the Board of Ordnance took the decision to take the casting of brass guns into their own hands, and the Royal Brass Foundry was commenced in 1716. Accordingly, the Ordnance Journal Book of 19 June 1716 reports how (PRO WO 47/29):

"It having for many years been the Opinion of the most experienced Officers that the Government should have a Brass Foundry of their own, and whereas Mr. Bagley's Foundry is the only own for Casting Brass Ordnance and liable to dangerous Accidents, w^{ch} can't be prevented.

It is therefore order'd that a Proposal and Estimate be made for Building a Royal Brass Foundry at His Majesty's Tower Place at Woolwich; and the Charge thereof Defrayed out of the £5,000 given this Year by Parliament for recasting Brass Ordn^{ce} and y^t no time be lost herein, inasmuch as there are but 2 12 Pounds, and not 1 18 or 24 Pounder for Land Service."

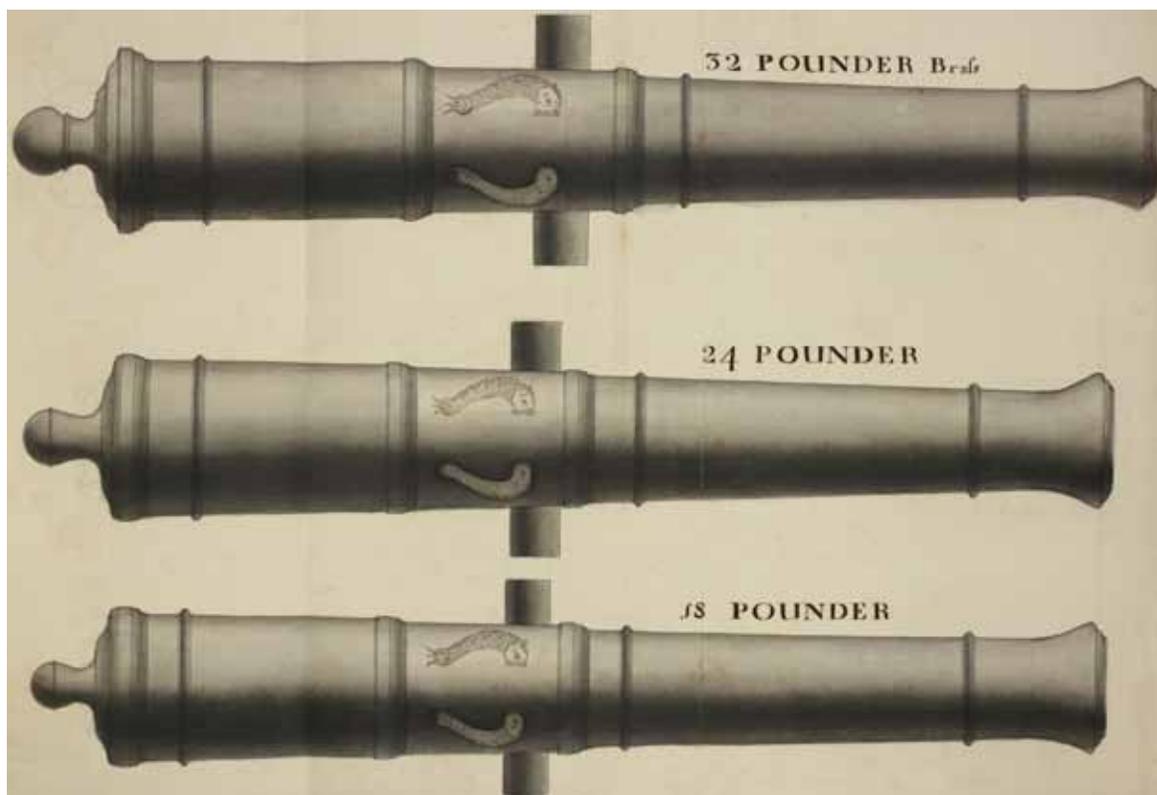


Fig. 10. Templates for 32-, 24- and 18-pounder cannon to be used in gun manufacture by the Royal Brass Foundry, Woolwich. Photo: © The British Library, London (BM Kings 261).

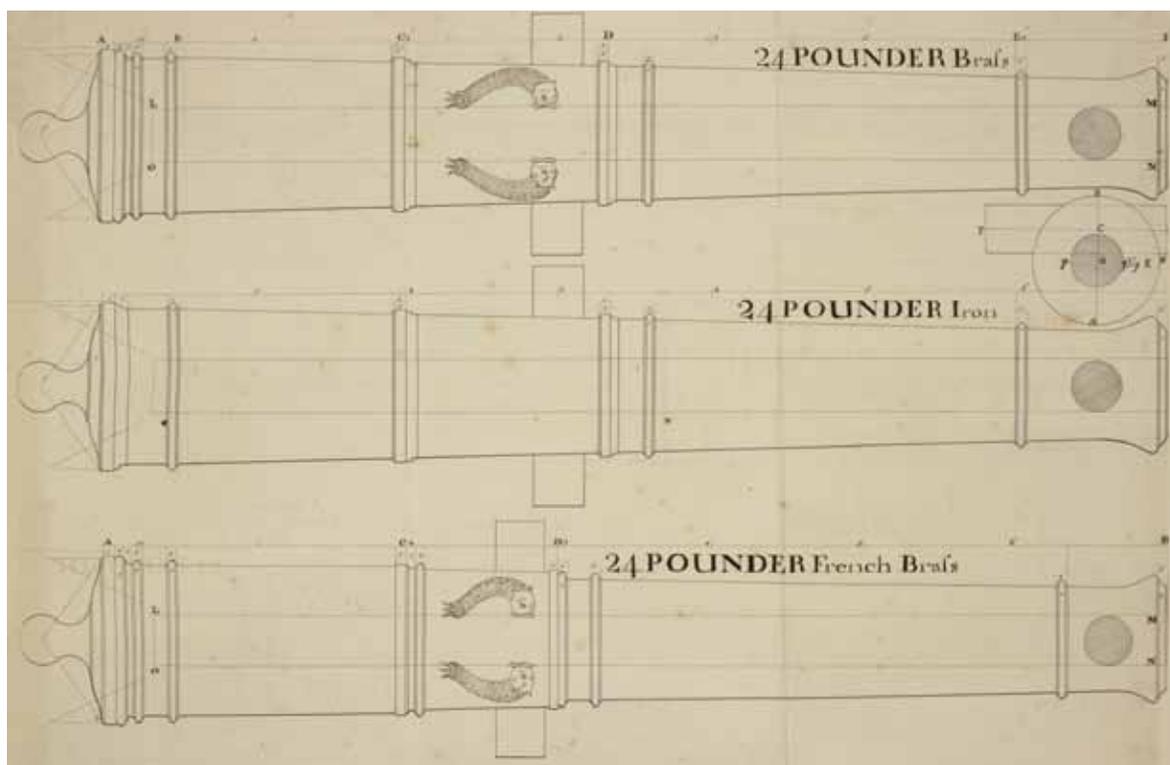


Fig. 11. Templates for 24-pounder cannon to be used in gun manufacture by the Royal Brass Foundry, Woolwich, based on a blueprint obtained by Colonel John Armstrong in Paris in 1727. Note the French gun lines at bottom. Photo: © The British Library, London (BM Kings 261).

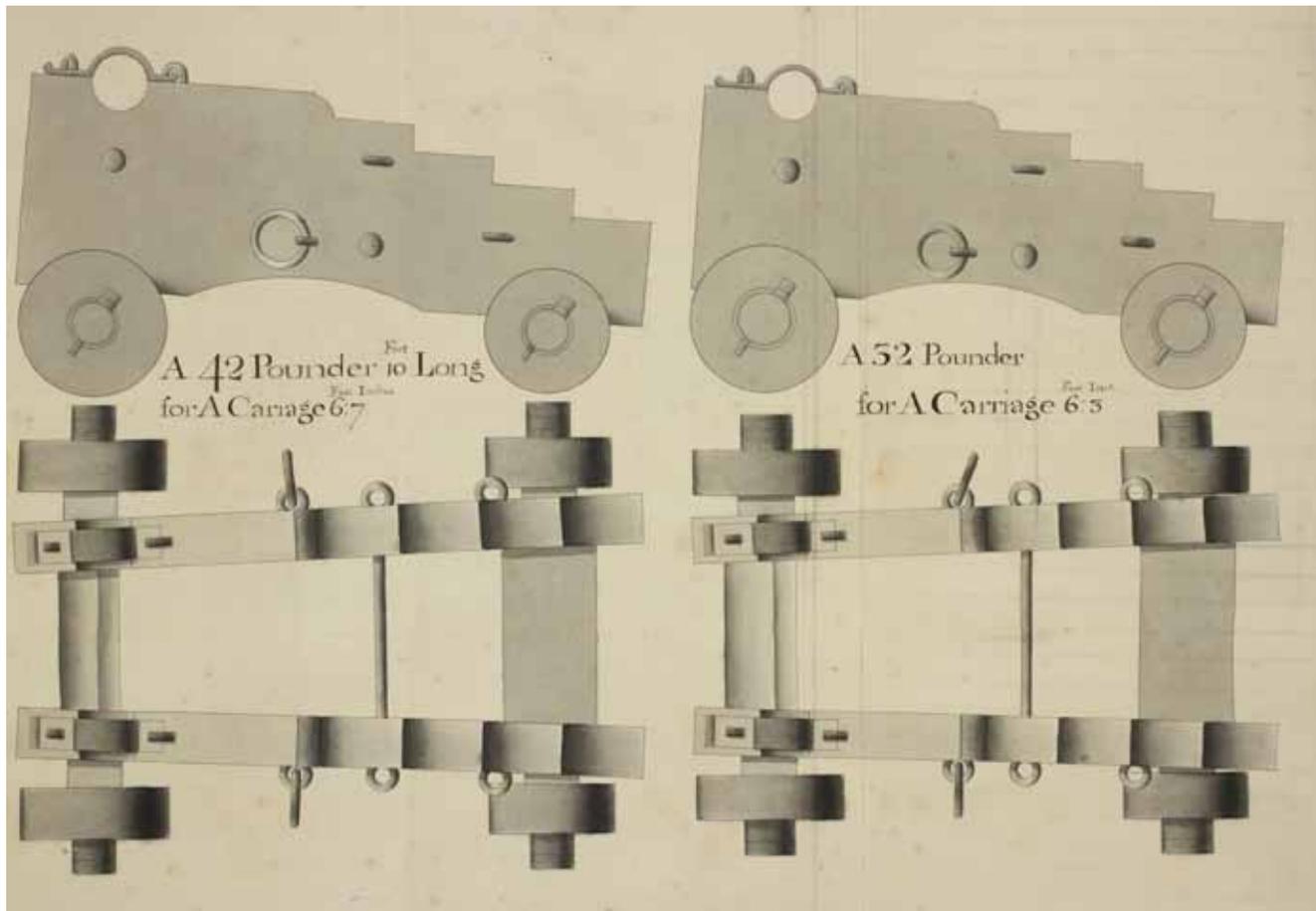


Fig. 12. Templates for 42- and 32-pounder gun carriages to be used on Royal Navy warships. Photo: © The British Library, London (BM Kings 261).

The Royal Brass Foundry opened in 1717, with Andrew Schalch recruited as Master Founder and receiving a salary of 5s. a day, which was upgraded to £219 per annum after 1 April 1718, once the Board of Ordnance was satisfied by his skill and competence (Hogg, 1963: 251, 259; Kennard, 1986). Casting started with a variety of small items and small mortars on 16 October 1717, and large guns began to be cast a year later.

It was in 1722 that Schalch started to cast a complete set of 100 brass guns for a First Rate warship, a task that would take him a total of some 12 years (when combined with the requirement to cast an additional 400 guns, mortars and howitzers). Those cast up to and including 1727 were manufactured to the Borgard pattern. The batch of guns post-dating 1727 were manufactured to the new design introduced by Armstrong. Some 15 of the 42-pounders, all the 24-pounders, all of the 12-pounders (although one on Balchin's *Victory* is a later addition: Cunningham Dobson and Kingsley, 2010: 248, 261), and all 6-pounders mounted on Balchin's *Victory* should have been produced to the Borgard design.

4. Colonel John Armstrong's Gun Design

Colonel Armstrong's career had been largely spent as an engineer specializing in the building, attacking and knocking down of fortresses. The closest that he had ever got to studying guns first-hand was to site and build batteries and then direct the battery's fire. Such guns would have been designed to the earlier 1670 series.

On assuming the position of Surveyor General, Armstrong had clearly recognized that the Borgard gun design had a greater weight than the 1670 series and, quite reasonably, attempted to reduce their weight. The English practice since 1670 had been to make the first reinforce of a cannon to cover a length that covered the area of maximum chamber pressure, which was more than 2/7th of the gun's total length (see Section 2 above). However, by reducing the weight produced to the Borgard system, Armstrong introduced a major structural flaw into the cannon design, which was his undoing. As noted above, because of his design iron guns started to burst onboard ship. Armstrong had a serious problem.

As a consequence, all casting of iron guns was stopped and none were accepted for proof between 31 December 1724 and 25 April 1729. The brass guns then being cast for the *Victory* to the Borgard pattern were all 6-12in longer than had been accepted during the previous 50 years and so were safe.

Armstrong's problem was solved when he received instructions from George I to go on a diplomatic trip to Paris on the king's behalf. He set out for Paris on 3 April 1727 and returned after 49 days on the 21 May (for the record of Armstrong's journey to Paris, see PRO WO 51/122). In his baggage on his return he had drawings of the latest French gun designs (for a drawing of his 24-pounders imitating those of Paris, see BM Kings 261, Fig. 11).

Armstrong anglicized these drawings, changed the gun button design and had a set of scale models cast, which he

received on 30 June 1729 (WO 51/121). The Colonel set the gun casters and the Brass Foundry to work to produce the brass and iron guns needed, and the first delivery of iron guns passed proof on 25 April 1729. Armstrong's designs, with minor modifications, continued in production into the 1790s, when they were replaced in turn by General Blomefield's designs.

5. The Guns on Balchin's *Victory*

The decision to build the First Rate *Victory* was clearly taken before 1722 because on 29 June 1722 Armstrong wrote to the Admiralty (PRO ADM 1/4006) to confirm that this warship's brass guns were to conform to the current regulations laid down in 1715 (as extracted from a notebook by Lieutenant James c. 1722: RAI G3n 1a and ADM 1/4005) and that both the 42-pounders and the 24-pounders were to be 10ft long. By this date the first of *Victory's* three 42-pounders had already been cast to the Borgard design at Woolwich. The comment added by the Admiralty, on Armstrong's letter after receipt, confirms the above.

Armstrong's next letter to the Admiralty, dated to 9 July 1722 (PRO ADM 1/4006), pointed out that of the brass guns on the three other operative First Rates of the era, the *Royal George*, *Royal Sovereign* and *Britannia*, only 53 conformed to the current establishment. He thus proposed casting additional guns to correct this anomaly. The fourth First Rate, the *London*, was rebuilt in 1706 and again in 1721, but never received her brass guns. These cannon remained stockpiled ashore.

The state of the armament of the three First Rates cited above accounts for the additional guns cast at the same time as those for *Victory* and explains why the 12-pounder recovered by Odyssey Marine Exploration in 2008 dates to 1734 (Cunningham Dobson and Kingsley, 2010: 248, 261). Those guns cast from 1727 onwards are of the John Armstrong design, but of necessity had to conform to the lengths of the guns already cast. Otherwise, the differences between Borgard and Armstrong's designs were mostly minor and lie in the style of decoration, the royal cipher and muzzle swell.

Balchin's *Victory* may have been carrying additional 3-pounders of 4ft 6in length above the quarterdeck, as was the practice on previous and subsequent First Rates. The 6-pounder of 9ft length is not an ideal signal gun. A set of 3-pounders was cast in 1729 alongside some of the *Victory's* guns and may potentially have been exploited instead of (or as well as) the 6-pounders. Only time and future fieldwork on the wreck site will tell.

The supply of guns of greater length and weight, as compared with 17th-century standards, added an



Fig. 13. Cannon C22 perched on top of a second bronze gun on the wreck of Balchin's *Victory*.



Fig. 14. Bronze cannon C15 and C19 on the wreck of Balchin's *Victory*. The conger eel inhabiting the gun's bore is common to all of the other site cannon.

additional 18+ tons weight to a warship above the waterline. While this may not seem to be a great addition, when combined with the reduction below the waterline of provisions eaten and water and beer drunk, plus broadsides fired (each broadside requiring approximately 1 ton's weight of powder and shot), this disproportionate, unbalanced upper weight may have been a contributing factor to *Victory's* loss after just five months at sea. This mathematical conundrum remains a matter for a naval architect to calculate.

It is interesting to note, and may be nothing more than a coincidence, that immediately after the launch of Balchin's *Victory*, in the year before he died Armstrong conducted experiments to determine the correct length and weight of guns necessary to achieve optimum performance (records of Armstrong's expenses in these exercises are listed in PRO WO 51/139). As a direct result of these experiments his successor reduced the length of Royal Navy cannon once again. As a consequence, the 42-pounders and 24-pounders cast in the 1760s for the *Royal George* measured 9ft 6in in length and her total ordnance was lighter in weight: her 12-pounder and 6-pounders on the upper deck now weighed 19 tons less than *Victory*. Lessons had been learned and applied for the naval protection of the realm.

6. Conclusion

In the era that covers the history of naval ordnance applicable to use on the First Rate warship Balchin's *Victory*, four cannon series may be considered relevant in general:

- Borgard, 1715-22
- Borgard modified by Armstrong, 1722-27
- Armstrong, 1728-33
- Armstrong modified by himself, 1733-44

Due to changes in personnel, naval tactics and the pivotal transition in the medium of gun casting from brass to iron, Balchin's *Victory* was built and equipped at a seminal moment in the history of gun founding. The ship was the last fitted with a full complement of purpose-made brass cannon. The guns onboard the First Rate *Royal George* and *Britannia* were a cosmopolitan collection of English cannon and prizes seized from enemy ships over the course of decades. Thus, their armament technically was comprised of brass antiques of which hardly any two were alike, and included English 12-pounders and 6-pounders of Henry Pitt (1591), Dutch 12-pounders of Johannes Burgherhuys and Arent Vander Put (1616), and Spanish 6-pounders of Ferdinando de Valdesteero (1623).

As a result of the normal practice of melting brass guns down for re-use, very few cannon from this pivotal era survive for study today. The *Britannia's* guns were all melted down. Although the *Royal George* of 1756 possessed a full set of newly cast brass guns when launched, her ordnance had been reorganized and was mixed by the time she sank. The 49 brass cannon salvaged from the *Royal George's* iron and brass guns off Spithead between 1782 and 1843 (27 x 24-pounders and 22 x 12-pounders) were similarly almost all melted down, with one brass 24-pounder and six brass 12-pounders left unsalvaged on the seabed (Codrington, 1840: 167). The few retained or sold by its salvors, rather than returned to the Admiralty for melting, comprise the limited examples preserved in museums and storerooms today.

Balchin's *Victory* is thus a highly unique site in the history of naval ordnance (Figs. 1-9, 13-18):



Fig. 15. Bronze cannon C13 on the wreck of Balchin's *Victory*, contextualized with wooden remains.



Fig. 16. Bronze cannon C7, C8 and C12 on the site of Balchin's *Victory*.



Fig. 17. A wooden carriage truck in situ on the wreck of Balchin's Victory.



Fig. 18. Bronze cannon C37 on the wreck of Balchin's Victory, contextualized with wood remains.

1. The last Royal Navy First Rate warship in British history to be armed with a single batch of brass cannon when lost (rather than a geographically and chronologically diverse collection of English and foreign antiques).
2. By far the most complete collection of English cannon cast by any founder at Moorgate, Woolwich or anywhere else in existence.
3. The largest surviving collection of cannon produced by the Master Founder Andrew Schalch at the Royal Brass Foundry, Woolwich.
4. The only wreck site of a First Rate Royal Navy warship with an intact collection of cannon known in the world.

The rarity of the Balchin's *Victory* cannon is compounded by the survival of very few comparable examples on museum display or in storerooms worldwide. All of this warship's 28 lower-deck 42-pounders were cast between 1722 and 1728 specifically for the *Victory* and thus no other comparative examples exist in museums. Of the thousands cast in England in the 17th and 18th centuries, the only one in existence on land today is the single example recovered so far from the wreck of Balchin's *Victory*. No brass 42-pounders were installed on the First Rate warship *Royal George* when she foundered off Spithead in 1782, having been replaced in spring 1782 or the year before with iron 32-pounders (Codrington, 1840: 23-24).

All of the 28 middle-deck 24-pounder sea service guns commissioned for the *Victory* were cast between 1719 and 1724. No comparable cannon for this period survive in museums, although several 24-pounders are known from the *Royal George*. The earliest is dated to 1743 and differs in detail from those cast for the *Victory*: it bears in relief the arms of John, Duke of Montagu, Master General of the Ordnance (from 1740-2 and 1742-49), with its base ring inscribed with name of the founder and the date ('A. SCHALCH FECIT 1743'); the cascabel is incised with the weight of '51-1-0'. The royal arms of King George II are present on the first reinforce and a brass plate near the muzzle states that this gun was recovered from the *Royal George* by Anthony Dean in 1834. The cannon is now at Southsea Castle (Blackmore, 1976: 72).

Some 34 12-pounders were cast between 1719 and 1729, plus a few more in the 1730s. Only one survives in the Rotunda collection at Woolwich, dated to 1739. No 6-pounder or 3-pounder sea service guns exist from this period.

Apart from the two guns raised by Odyssey Marine Exploration from the *Victory*, only three other English-manufactured naval cannon dating to the reign of King George I survive on land. One 32-pounder of 1719, bored to 7in, exists in Tangier; an English 13in mortar cast in 1726 by Andrew Schalch, bearing the arms of George I on the reinforce is still extant (Blackmore, 1976: pl. 65); and an 8-inch howitzer captured at Yorktown in October 1781 and, dating to 1727, with the royal arms of George I on the chase and the coat of arms of John, Duke of Argyll, Master General of Ordnance from 3 June 1725 to 10 May 1740, on the breech, is preserved in the Colonial National Historical Park, Virginia (Borresen, 1938: 237, 239).

Other than that, a remarkable collection of 31 small brass 3-pounders survives at Fort Belvedere, of which 27 were cast by Andrew Schalch between 1729 and 1747. A further few 3-pounders are preserved in Lisbon. Notably, however, all of these 3-pounders were designed for and used

in land service. In this regard, they had a wholly different function to *Victory's* naval guns.

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