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The Use of Benchmarks in the Popular Reporting of Commercial Shipping: Is the Titanic an appropriate measure to convey the size of a modern ship?

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In conclusion, one of the earliest descriptions of parbuckling, from 1627, was used in the context of loading and unloading cargo but is still relevant to the procedures used with the *Costa Concordia*:

A Parbunkel is two ropes that haue at each

end a noose or lumpe [loope?] that being crossed, you may set any vessell that hath but one head vpon them, bringing but the loopes ouer the vpper end of the caske, fix but the tackle to them, and then the vessell will stand strait . . . to heaue out, or take in without spilling.⁴

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4 Smith, J. *A Sea Grammar* (London, 1627), 21.

The Use of Benchmarks in the Popular Reporting of Commercial Shipping: Is the *Titanic* an appropriate measure to convey the size of a modern ship?

Popular science reports often make use of benchmarks to represent the size of objects in terms to which lay persons can relate. For length the reference may be to a number of London buses, height may be in multiples of the Eiffel Tower and area may be reported in numbers of football pitches or tennis courts. For a three-dimensional object such as a ship the appropriate benchmark should be volumetric and this leads to an additional element of complexity when compared to simple linear measurements. A device often used for benchmarking the size of a ship is comparing it to the *Titanic*. For example, in reporting the heroic efforts of salvors to extract the stricken cruise ship *Costa Concordia* from the rocks off the island of Giglio, the BBC reported that the ship 'weighs twice as much as the *Titanic*'.¹ A later news report noted that the *Costa Concordia* 'weighs 114,000 tonnes'.² While a quick reference to, for example, Wikipedia would seem to confirm that these statements are apparently valid, a simple error of understanding of word 'tonnage' means that neither statement is even approximately correct, let alone being anywhere near accurate.

This misunderstanding is common even in the technical press and possibly reflects a general air of mystery surrounding the technical nature of ships in the eyes of lay persons. A good metaphor for this mystery can be found in a mural titled 'We sit starving amidst our gold', painted by British artist Jeremy Deller and exhibited in the British Pavilion at the Venice Biennale in May 2013. An apparent critique of wealth, the painting shows a patently wealthy person with a strong resemblance to classical images of Poseidon, holding a modern luxury motor yacht over his head, trident-like, which he is about to cast it into the sea. The yacht is a perfect representation of a modern vessel from the waterline upwards, but with the underwater portion of the hull forming no part of the image at all. Underwater lines, propeller, thrusters and rudder remain unknown to the viewer. This in no way detracts from the power of the image in an artistic sense and in the context in which it is being used, but it is perhaps illustrative of the complexity of ships and a lack of general knowledge of that complexity.

More than this, however, the time has perhaps come to question the use of an unhelpful benchmark derived from an engineering object that was built over one hundred years ago. For comparison, the French Grand Prix of 1912, the year of the *Titanic*'s delivery, was won by a Fiat S74, a car that in the previous year had won the prestigious American Grand Prize at a speed of 74.4 mph over a distance of 412 miles.³ The engine of this car was rated at 190

1 The *Today* Programme, BBC Radio 4, 16 Sep. 2013.

2 *Newsround*, BBC1 Television, 16 Sep. 2013.

3 Ludvigsen, *Italian racing red*.

bhp and a modern Formula 1 car therefore has an engine power of around five Fiat S74s. This statistic may be interesting in gauging the progress of engine design but it is rather meaningless in trying to convey to a lay person the extent of the power of a modern racing car in terms to which they can directly relate. It carries connotations about how relatively weak Edwardian cars were, rather than how relatively powerful modern cars are. RMS *Titanic* was indeed a large ship in her day, but has long since been superseded by much larger vessels. The vessel remains in the popular consciousness specifically because of the tragedy that unfolded on her maiden voyage. Without the tragedy it is likely that the vessel would have long ago faded from general public memory, and using the ship as a comparator for the size of a modern vessel has no more validity than using the Fiat S74 as a benchmark for engine power. The size of the *Titanic* has no intuitive tangible meaning to assist in gauging the size of a ship in the modern context.

That *Titanic* is remembered specifically for the tragedy rather than for its size can be demonstrated by the fact that *Titanic* was the second of three ships of White Star Line's *Olympic Class* Liners, the first to be delivered being *Olympic* and the third *Britannic*. It would surely be logical to conclude that if these sisters were remembered as paragons of ship size the designation would go to the eponymous *Olympic* rather than the tragic *Titanic* which is actually remembered.

Tonnage

What is normally quoted as the tonnage of a merchant ship is a measure of volume, not weight, and the correct unit is tons, not tonnes. The confusion arises because tonnage was originally 'tunnage' and referred to the number of tuns or barrels that a ship could carry. One tun was originally 100 cubic feet, but is now decimalized at 2.83 m³ and refers to the volume enclosed by the ship's hull and superstructures. It is fundamentally, therefore, a measure of the physical size of a ship in terms of its enclosed volume.⁴

Using tonnage correctly the *Titanic* was

registered at 46,329 tons, compared to the *Costa Concordia's* 114,147 tons. The *Costa Concordia* in terms of its physical size was therefore about 2.5 times the size of the *Titanic* and the BBC's statement is therefore roughly correct on this basis. On the basis of weight, however, the two ships were remarkably similar.

The weight of a ship in service is made up of two elements: the 'lightship' weight, being the weight of the empty ship and the 'deadweight', being the weight of everything put aboard the ship such as fuel, stores, passengers and cargo. The sum of the two is the 'displacement' which is the weight of the ship and everything in it (by simple Archimedes principle, the weight of a floating body is equal to the weight of fluid displaced). Displacement is used routinely only to specify the size of warships: for example the US Nimitz class carriers, the largest warships ever built, have a displacement of about 100,000 tonnes – meaning that the ship actually weighs 100,000 tonnes when loaded. How much the ship itself weighs without deadweight is not a matter of public record and as a warship the gross tonnage is not normally calculated. For merchant ships the displacement and ship's weight are rarely used except for specific technical purposes, and the values are not routinely published.

The *Titanic's* displacement was 52,310 tonnes at full load, compared to around 55,000 tonnes (author's estimate) for the *Costa Concordia*, so when in service the ships weighed remarkably similar amounts – primarily because *Titanic* was built from much thicker steel which was joined by millions of heavy rivets, rather than the modern technique of welding, and because coal is a relatively heavy fuel. The actual weight of the ships themselves (the lightweight) was 38,760 tonnes for the *Titanic* and around 46,000 tonnes (author's estimate) for the *Costa Concordia*, so the *Costa* is about 20 per cent heavier than the *Titanic*.

So, it is true to say that the *Costa Concordia* was around twice the size of the *Titanic*, providing that it is referred correctly to volume and not to weight. Greater accuracy than this is difficult because the *Titanic* was measured under a different tonnage convention compared to modern ships. To obtain an accurate comparison the tonnage of one of the vessels would have to

⁴ Oxford English Dictionary 'tonnage'.

be recalculated under the matching convention, which would be no simple task. The question remains, however, whether this actually carries any significance in the modern era. The actual size of the *Titanic* is no more than an intangible notion in the mind of most, rather than being a fixed and relatable quantity such as the height of the Eiffel Tower, which many have actually seen and can therefore use as a direct reference. Does the fact that the *Costa Concordia* is around twice the size of the *Titanic* mean that the *Costa Concordia* is a large ship in the modern era?

Was the *Titanic* a large ship?

The size of the *Titanic* is legendary and in the era when the ship was built this legend was well founded. At the time this could have been judged by using the approach of the popular press and comparing *Titanic* to a previously legendary ships. *Cutty Sark* for example has a gross tonnage of 963 tons,⁵ making the *Titanic* at 46,329 gross tons around 48 times bigger. The *Cutty Sark* is primarily remembered for elegance and speed rather than size, however, so a more appropriate prior icon would be Brunel's nemesis the *Great Eastern*, launched from John Scott Russell's shipyard at Milwall on the banks of the Thames between 1857 and 1858.⁶ *Great Eastern* was 'nearly six times as large as any vessel yet built' and was temporarily named *Leviathan* at launch before assuming Brunel's preferred name when completed. As testament to the ship's size, Lavery writes:

She served mainly as a warning about the dangers of expanding too fast, and it would be 40 years before the *Kaiser Wilhem II* of 1901 exceeded her in tonnage, and nearly 50 years before the *Mauretania* of 1907 exceeded her in length.⁷

Great Eastern was a large ship for her time but at 18,915 tons the *Titanic* was more than double the size of Brunel's 'leviathan'.

Looking at it another way, at the time of the *Titanic*'s ill-fated maiden voyage the average

size of the 71 cargo liners owned by the Blue Funnel Line, one of the British Empire's most prestigious shipping companies, was 6,591 tons and this represents a typical average size of an ocean-going cargo ship of the day.⁸ By this measure the *Titanic* was seven times the size of an average cargo liner in its time. A typical transatlantic passenger liner of the time was between 15,000 and 20,000 tons, the *Oceanic* built by Harland and Wolff for White Star line in 1899 being typical at 17,274 tons.⁹ *Titanic* was 2.6 times the size of this typical liner. The two largest ships in the world prior to *Titanic* were the *Lusitania* at 31,540 tons and *Mauretania* at 31,938 tons, both delivered in 1907. *Titanic* was 50 per cent larger than these two previous record holders, built less than a decade after them.

By any measure of size, therefore, the *Titanic* earned the epithet 'leviathan' in her day. It was not only size that contributed to the legendary status of the vessel, however. The subsequent tragic end of the vessel coupled to the unprecedented level of opulence and facilities aboard, with a first-class ticket costing the equivalent of £64,000 in modern money, plus the doomed connotations of the label 'unsinkable' applied to the vessel, assured its place in society's collective consciousness.¹⁰ The legend remains, but the significance of the size diminished long ago. The *Queen Mary* built in 1936, for example, was 81,237 tons and the *Queen Elizabeth* built in 1940 was 83,673 tons,¹¹ both approaching double the size of the *Titanic*. The question has to be asked, therefore, does the *Titanic* have any relevance as a benchmark of size in the modern era?

The size of modern ships

When built in 2006 the *Costa Concordia*, along with her sisters *Costa Pacifica* and *Costa Serena*, was undoubtedly a large cruise ship at 114,000 tons,¹² but the largest at that time was

8 Falkus, *The Blue Funnel Legend*.

9 Blake, *Titanic: A passenger's guide*.

10 Ibid.

11 Dunn, *Passenger Liners*.

12 All tonnages in the modern era are taken from Sea-Web, a database of the registered particulars of all merchant ships: www.sea-web.com

5 MacGregor, *The Tea Clippers*.

6 Lack of experience of launching a ship of this size meant that it was difficult and the launching operation took three months.

7 Lavery, *Ship*.

the *Queen Mary 2*, delivered from Chantiers de L'Atlantique in St Nazaire in 2003, at 148,528 tons. *QM2* is just over three times the size of the *Titanic*, although interestingly has a lightship weight of 60,637 tonnes, only around 60 per cent larger. But even this has now been well surpassed, with the largest cruise ship in 2013 being Royal Caribbean's *Oasis of the Seas*, delivered from Finland in 2009, which is a colossal 225,282 tons, nearly double the size of the *Costa Concordia* and nearly five times the size of the *Titanic*. *Oasis of the Seas* was the first of Royal Caribbean's *Oasis Class* vessels and has now been joined by *Allure of the Seas* and with a third sister vessel due for delivery in 2016 and a fourth sister possibly to follow.

Even this is not the largest ship ever built, however. The accolade is awarded to a series of oil tankers referred to as 'Ultra Large Crude Carriers' or ULCCs built in the 1970s. The largest ever is normally regarded by those in the shipping industry to have been the appropriately named *Seawise Giant*,¹³ delivered from Sumitomo in Japan in 1979. That ship was 564,650 tonnes, referring to the deadweight tonnage and indicating that it was capable of transporting over half a million tonnes of crude oil. *Seawise Giant* is also the longest ship ever built, at nearly 460 m. The weight of the vessel can be estimated by subtracting the deadweight from the published displacement of the vessel of 647,945 tonnes, suggesting a lightship weight of 83,305 tonnes.

Seawise Giant is commonly regarded in the shipping industry as the largest ship ever built but technically a vessel called *Bellamy* delivered to Shell by Chantiers de l'Atlantique in St Nazaire in 1976, was larger by virtue of having a less efficient design. *Bellamy* carried 553,652 deadweight, about 2 per cent less than the *Seawise Giant*, but was 14,327 gross tons larger at 275,268 tons. Having said this, the ship's actual physical weight (calculated by subtracting deadweight from displacement) was relatively modest at around 77,300 tonnes, equivalent to only around two *Titanics*. This reinforces why a volumetric measure is

appropriate to specify a ship size, rather than weight. *Seawise Giant* is likely to have been the heaviest moving manmade object ever when fully laden, at 647,950 tonnes, but the ship itself is lighter than the *Oasis of the Seas*, estimated at over 100,000 tonnes, which is likely to be the holder of the record for the weight of the ship alone (surpassing the *Nimitz* class carriers which are likely to have previously held this record although it is not possible to verify this from published information).

At the time of the construction of ULCCs it was confidently predicted that crude oil carriers would reach the million deadweight point within a few years, prompting Dubai Drydocks to build a dry dock capable of docking such a vessel, which is still very much in use today although still awaits the ship for which it was designed. Such vessels were too inflexible and became 'white elephants'. Modern large oil tankers, referred to as 'Very Large Crude Carriers' or VLCCs typically have a deadweight of around 320,000 tonnes, capable of transporting two million barrels of crude oil. *Seawise Giant* managed a long life of 33 years by conversion into a floating storage unit, but most ULCCs were scrapped at a relatively young age, the youngest going to the breakers at the age of only seven years (the *Ulsan Master* built by Hyundai in 1977 and broken up in 1984).

The *Oasis of the Seas* is the largest ship afloat in 2013 but is not quite the largest moving object ever built by mankind, as the *Titanic* undoubtedly was in her day. *Bellamy* remains the largest ever built. The largest object currently afloat is a floating oil storage unit (an 'FSO'), the *FSO Asia*, built by Daewoo in South Korea in 2002, which is about 5 per cent larger than the *Oasis of the Seas* when measured by gross tons.

The *Bellamy* is shortly to lose its number one position as the largest vessel ever built to a gas processing vessel (currently carrying the builders' name *Samsung 2030*) due for delivery from Samsung in South Korea in 2016, which is expected to be around 300,000 gross tons, surpassing the *Bellamy* to become the largest moving object ever created by mankind. It is expected to be just less than half a kilometre in length which will be around double the length of the *Titanic* but the ship will be 6.5 times

¹³ This vessel had four name changes over its life, subsequently called *Happy Giant*, *Jahre Viking*, *Knock Nevis* and *Mont*.

the *Titanic*'s size when measured correctly by gross tons.

A further complication in assessing the largest ship in the world is met in the emerging fleet of ultra large container ships, carrying around 18,000 shipping containers. The *Mærsk Mc-Kinney Møller* is one such vessel, the first of the so called 'Triple E' class of ships delivered in 2013, which has a gross tonnage of 194,849 tons. On this measurement it is about 12 per cent smaller than the *Oasis of the Seas*. The tonnage measurement system, however, measures only the volume of the ship up to the main deck and superstructures but such a vessel carries a large number of containers above the main deck. Clearly the total size of the ship plus containers will vary according to how heavily laden the ship is. It is also difficult to calculate the equivalent tonnage of boxes on deck, not least because the design capacity on deck is not a published statistic. Based on plans and photographs of the vessel, and equating one standard 20 foot shipping container (1 TEU) to 13.6 GT (20 ft x 8 ft x 8.5 ft) it is estimated that the deck load could be equivalent to as much as 60,000 gross tons (1.3 *Titanics*) when the vessel is fully laden, making the laden 'Triple E' class vessels over a quarter of a million tons when full laden. This makes the 'Triple E' the largest vessel afloat, likely to exceed the *Oasis of the Seas* with only a moderate deck cargo. It is still somewhat smaller than the ULCCs, however, even if fully loaded.

Conclusions and suggested benchmarks

The use of RMS *Titanic* as a benchmark against which the size of modern ships can be stated is illogical. It remains in use in the popular media because of the emotive connotations that the vessel carries in the popular imagination, not because it gives a tangible and useful scale against which size can be gauged. It has no significant meaning such as exists, for example, in comparing the height of the Shard in London to the height of the Empire State Building. That it is also no longer appropriate as a measure of large ship size may be gauged by the fact that, for example, the P&O ferry *Pride of Hull*, aboard which readers may have crossed the North Sea, is 30 per cent larger than the *Titanic* when measured correctly by gross tons. That

this relatively ordinary ferry is a third larger than the *Titanic* surely renders the *Titanic* benchmark for gauging the size of large ships as meaningless?

Difficulty is encountered, however, in trying to find an accessible parameter that can generally convey the size of a ship to a lay reader. Weight is inappropriate not only because the weight of a vessel is not a generally published parameter and is difficult to obtain, but also because the wide variation of density of outfit and structure between vessels of different types mean that it would be misleading. Using weight would conclude, for example, that the *Oasis of the Seas* is approaching double the size of the *Bellamy* or *Seawise Giant*, which would convey an incorrect impression. Displacement can also be misleading because of the significant variation in cargo density. Using displacement would suggest that *Oasis of the Seas* is only about 20 per cent of the size of the *Bellamy*. Length is not appropriate because different types of vessel have different degrees of 'fullness' in the shape and this too can be misleading. Using length, for example, would conclude that the *Costa Concordia* is only 8 per cent larger than the *Titanic*, which also would be misleading. Fullness is represented in naval architecture by a parameter known as 'block coefficient', normally designated by the letters C_B , which is the ratio of the actual underwater volume compared to that of a rectangular block with dimensions length (at the waterline), breadth and draught. This parameter determines the relationship between the weight of a vessel and its dimensions. *Titanic*, for example, had an estimated C_B value of about 0.66, compared to *Costa Concordia* with an estimated value of about 0.76. Ships have in general become 'fuller' in terms of underwater shape over time as they have become larger so weight can be carried within relatively smaller principal dimensions when compared historically. C_B is also strongly related to speed, with faster ships requiring a 'finer' underwater shape (i.e. a lower C_B) to reduce resistance. For example, a modern VLCC designed to carry 320,000 tonnes of cargo at about 14 knots has a C_B of about 0.79, compared to an estimated value of about 0.59 for *Emma Maersk*, a large container ship designed to carry 15,550 containers at a speed of 24.5 knots.

For these reasons linear dimensions or

weight cannot adequately provide a reliable comparator for ship size. A volumetric comparator is needed that has meaning to those that are trying to assimilate the size of a ship, but such a parameter is difficult to find. The use of a North Sea ferry was suggested earlier, but the characteristics of ferries are too varied to provide a fixed benchmark that everyone will understand on the same basis.

A more meaningful reference point is needed and an ideal comparative object would be between about 30,000 and 100,000 gross tons, 85,000 to 283,000 cubic metres or 3 million to 10 million cubic feet. This size cuts out many commonly encountered volumes such as an Olympic-sized swimming pool, which is only around 900 gross tons. The most obvious place to look for such a comparator is in large buildings, although architects normally specify buildings in linear dimensions and floor areas and volume measurements for buildings are not normally published. Comparators are therefore difficult to identify.

Sports stadia present a potential option for gauging the size of a large object but tend to be too large for ships: Melbourne Cricket Ground, for example, is around 1.7 million m³ (equivalent to about 600,000 gross tons), and Wembley stadium around 1.14 million m³ (about 400,000 gross tons).¹⁴ These are too large for referencing ships. Stating that the world's largest ship is equivalent to around half a Wembley stadium seems to lose impact in expressing its size.

The Royal Albert Hall in London provides a possible metric. The internal volume of the auditorium of that building is measured by Beranek as about three million cubic feet, conveniently equivalent to about 30,000 gross tons.¹⁵ The *Costa Concordia* therefore is equivalent to nearly four Royal Albert Halls, the *Oasis of the Seas* around seven and the *Bellamy* over nine. The auditorium of the Great Hall of the People at Tiananmen Square at 90,333 m³ provides a very similar benchmark, being equivalent to around 32,000 gross tons. These comparisons perhaps truly give an impression of size that is more accessible than comparing ships

to the *Titanic*. Of course these benchmarks only work for an audience familiar with the size of the Royal Albert Hall or the Great Hall of the People and are therefore limited in application. Others without this knowledge will need some other benchmark to convey the size of large ships on a basis that they can assimilate. Unfortunately, comparison with concert venues does not provide a generally applicable parameter. By Beranek's measurements no other of the world's classic concert venues are large enough to provide a benchmark. La Scala of Milan, for example, rates at only 397,300 cubic feet or less than 4,000 gross tons. Only the mighty Carnegie Hall in New York comes close to a useful parameter at 857,000 cubic feet, around 8,600 gross tons. Modern stadium venues, like sports arenas, are potentially too large for comparison with ships. The O2 Arena in London, for example, formerly the Millennium Dome, reportedly contains a volume of about 2.4 million cubic metres although a reliable and exact figure has not been found. Notwithstanding, this reported value is equivalent to around 850,000 gross tons and is therefore too large as a comparator for ships.

Large religious buildings might present a possible alternative, but as with arenas the largest are simply too big. St Peter's Basilica in Vatican City, for example, reportedly has an internal volume of 1.2 million cubic metres or 424,000 gross tons, around double the size of the largest ship at the time of writing. Saint Paul's Cathedral in London might provide a better comparator with an unverified reported volume of 152,000 cubic metres or about 55,000 gross tons, slightly larger than the *Titanic* and with *Costa Concordia* equivalent to just over two St Paul's. The author has not been able to identify a reliable source for this parameter, however, so it is not proposed for use. Similar comparisons may be identified in religious buildings of other faiths and other countries if dimensions can be found.

General civil engineering structures may provide the best comparator, and one that can be 'localized' to suit the intended readership for the comparison. An estimate of the volume of the Swiss Re Headquarters building, affectionately known as the 'Gherkin', has been made using published drawings and

¹⁴ *The Measure of Things* website: www.bluebullprojects.com/measureofthings

¹⁵ Beranek, *Music, Acoustics and Architecture*.

Table 1 – Comparative sizes of selected significant ships

	Date	Gross tonnage (tons)	Equivalent volume compared to:				Titanic
			Albert Hall	Great Hall of the People	Carnegie Hall	Gherkin* 128,500	
<i>Architectural equivalent gross tons</i>			30,000	31,800	8,600	128,500	—
<i>Great Eastern</i>	1858	18,915	0.6	0.6	2.2	0.1	0.4
<i>Cutty Sark</i>	1869	963	0.03	0.03	0.1	0.01	0.02
<i>Oceanic</i>	1899	17,274	0.6	0.5	2.0	0.1	0.4
<i>Mauretania</i>	1907	31,938	1.1	1.0	3.7	0.2	0.7
<i>Demodocus</i> [†]	1912	6,689	0.2	0.2	0.8	0.1	0.2
<i>Titanic</i>	1911	46,320	1.5	1.5	5.4	0.4	1.0
<i>Queen Mary</i>	1936	81,237	2.7	2.6	9.4	0.6	1.8
<i>Bellamy</i>	1976	275,268	9.2	8.7	32.0	2.1	5.9
<i>Queen Mary 2</i>	2003	148,528	5.0	4.7	17.3	1.2	3.2
<i>Costa Concordia</i>	2004	114,147	3.8	3.6	13.3	0.9	2.5
<i>Oasis of the Seas</i>	2009	222,282	7.4	7.0	25.8	1.7	4.8
<i>Mærsk Mc-Kinney Møller</i> (unladen)	2013	194,849	6.5	6.1	22.7	1.5	4.2
<i>Mærsk Mc-Kinney Møller</i> (loaded) [‡]	2013	250,000	8.3	7.9	29.1	1.9	5.4
<i>Samsung 2030</i>	2016	300,000	10.0	9.4	34.9	2.3	6.5

*Estimate made from drawings; † Typical Edwardian cargo liner of the Blue Funnel Line; ‡ Estimate

dimensions,¹⁶ and indicates that the volume within the glass skin above ground level is around 367,750 m³, equivalent to about 128,500 gross tons, suggesting that the *Costa Concordia* is of a comparable size to the Gherkin and the *Oasis of the Seas* is equivalent to about two Gherkins. Stating that the *Costa Concordia* is roughly equivalent in size to the 'Gherkin' would give a much more direct impression of the size of the vessel and the nature of the work being undertaken by the salvors attempting to right the vessel than does comparing it to *Titanic*.

Table 1 lists the vessels mentioned in this short paper along with statistics based on comparison with the volume of the Royal Albert Hall auditorium in London, the Great Hall of the People in Beijing, Carnegie Hall, the 'Gherkin' and with the *Titanic*. It is proposed that the architectural scales provide a more immediate impression of scale to the reader than does the *Titanic* at least for those acquainted with the scale of those buildings. Others may

substitute their own benchmark, within the parameters of volume stated above.

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The Lay of Rope

A hawser-laid rope is composed of three single strands, laid up right-handed or with the sun. Darcy Lever (1819)¹

What did Lever mean by right-handed laid rope and why was this lay preferred by ropemakers? Figure 1 shows hemp fibres (A) being *spun* right-handed as yarns (B), and these in turn being *formed* left-handed into strands (C), which are *laid* right-handed into ropes (D). By *closing* three ropes, we get a cable (E). Ashley says that these technical verbs are preferred by ropemakers, but comments that they are ‘often used indiscriminately’.² As a preface to what follows, I imagine that many people would feel that the meanings of terms like ‘with the sun’, ‘clockwise’ or ‘right-handed’ are self-evident, and follow some sort of onomastic natural law. In fact, they only make sense if we are told from which side of the rotational plane the movement is observed. Put more simply: point of view matters. The sun rises in the East and sets in the West, but as seen in figure 2, seen from a point above the North Pole, the earth is rotating counterclockwise, while from a corresponding point above the South Pole, it is moving clockwise. At higher latitudes, as one faces the sun, it travels across the sky from left to right in the northern hemisphere, and from right to left in the southern hemisphere. ‘With the sun’ is an old-fashioned alternative to ‘clockwise’, but when used it is tacitly assumed we are north of the equator. The arrangement of the numbers on the face of one’s wristwatch is not arbitrary but reflects the system used on the clock’s predecessor, the horizontal sundial, as seen in figure 3A. In the northern hemisphere the shadow of the gnomon moves from left to right, as seen by an observer looking north, that is to say with his back to the sun. If the sundial

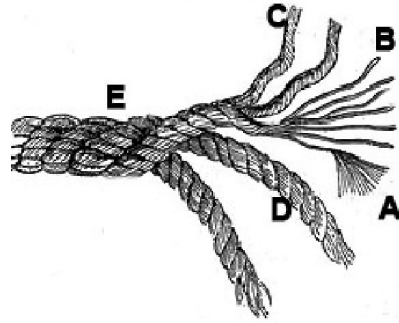


Figure 1 Cable dissected (Author's sketch)

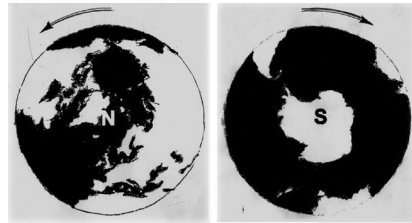


Figure 2 View from above the poles (Author's sketch)

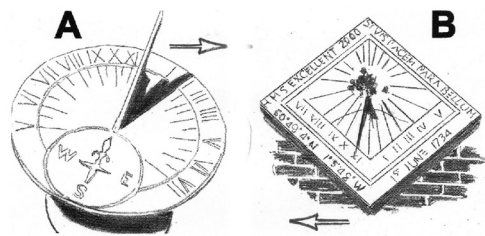


Figure 3 Sundials (Author's sketch)

is mounted vertically like that in figure 3B, the shadow moves the opposite way.³ Because the terms ‘right-hand’ and ‘left-hand lay’ occur so often in what follows, we will for convenience

¹ Lever, *Young Sea Officer's Sheet Anchor*, 2.

² Ashley, *Book of Knots*, 23.

³ Some medieval astronomical clocks like that at Münster cathedral do, in fact, read counterclockwise to match the movement of a wall-mounted sundial.