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## THE LIGHTHOUSE OF PHAROS: A NARRATIVE

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By Curt Baker

The word “Pharos” originally referred to either a small island off the coast of Alexandria or the ancient wonder of the world – the brilliant and magnificent lighthouse – that once sat upon it. This term has evolved, however, and now a derivation of “Pharos” is the word for lighthouse in multiple languages and the term “pharology” denotes the study of lighthouses. The transition of a word from holding such specific meaning to one that encompasses an entire field of study is reflective of the colossal significance of the Pharos, the original lighthouse. A member of an elite class of structures — the seven wonders of the world — Pharos served both to guide sailors into the grand ports of Alexandria, thus contributing to the economic success of her host city, and as a physical reminder of Alexander the Great’s expansionism and the dominating spread of Greek influence across the ancient world. Under the rule of Ptolemy I Soter, Alexandria reached the pinnacle of economic and cultural significance in the Mediterranean. Ptolemy I held great pride in his extraordinary city, evidenced in the developments he brought to Alexandria and culminating in his patronage of the marvelous lighthouse. The story begins with Alexander the Great in 331 BC after his victory in Tyre.<sup>1</sup>

After the battle, Alexander led his army southwest towards Egypt, then ruled by Mazaces, a viceroy of Darius the king of Persia.<sup>2</sup> Alexander accepted the surrender of Mazaces, established garrisons, and supplanted Persian rule in Egypt.<sup>3</sup> In his tour of the countryside Alexander “sailed around the Marian lake, and disembarked where is now situated the city of Alexandria...the position seemed to him a very fine one in which to found a city...”<sup>4</sup>

Alexander’s positive assessment of the location was understandable — the site was ideal. The area that Alexander chose was a high, flat strip of land running parallel with the coast of the Mediterranean near the western extremity of the Nile Delta.<sup>5</sup> A gradual decline to the south of this high ground led to Lake Mareotis or Marian/Mariut.<sup>6</sup> On the banks of this lake sat a collection of

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<sup>1</sup> Arrian, *The Anabasis of Alexander: Or, the History of the Wars and Conquests of Alexander the Great* (Forgotten Books, 2014), 140.

<sup>2</sup> Arrian, 140.

<sup>3</sup> Ibid., 141.

<sup>4</sup> Ibid., 141.

<sup>5</sup> P.M. Fraser, *Ptolemaic Alexandria* (Oxford, NY: Oxford University Press, 1972), 5.

<sup>6</sup> Fraser, 3.

agriculturally-based villages commonly referred to as Rhakotis, which took advantage of the excellent soil around the Nile to plant vineyards and produce oil.<sup>7</sup> To the east ran the Canopic branch of the Nile, accessible through three canals.<sup>8</sup> West of Alexander's location lay desert, eventually the location of the Necropolis.<sup>9</sup> North of the strip rested a large, deep bay, protected from the harsh Mediterranean Sea by the island of Pharos.<sup>10</sup> Even the weather seemed to favor Alexander's choice — a combination of the sea breeze from the Mediterranean and the consistent rising of the Nile kept temperatures cool during the summer when other cities suffered in the heat.<sup>11</sup> Alexander, thrilled about finding such an ideal spot for the city that would bear his name, immediately began planning the foundations, outlining buildings and walls in barley from his supply train.<sup>12</sup> In a disturbing omen for Alexander, birds flew down and ate the grain.<sup>13</sup> However, Alexander's advisors and soothsayers insisted that the omen indicated prosperity and abundance for the city.<sup>14</sup>

By the time construction of the lighthouse began between 280 and 270 BC under Ptolemy I, Alexandria had fulfilled the prophecy of economic wealth and metropolitan growth.<sup>15</sup> Ptolemy I, who served in Alexander's army during the Macedonian campaign against Persia, gained control of Egypt upon Alexander's death in 323 BC. A former companion and bodyguard to Alexander, Ptolemy I successfully established Alexandria as a thriving center of international trade and rapid urbanization.<sup>16</sup> Strabo describes the city as being 30 stadia (roughly 4700 meters) long and eight stadia (roughly 1200 meters) wide.<sup>17</sup> The physical growth of the city from Alexander's plans in grain to the flourishing center less than a century later point to this work by Ptolemy.

In the third century BC, Alexandria contained five distinct sectors, each populated nearly exclusively by a specific demographic.<sup>18</sup> These included

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<sup>7</sup> Kimberly Williams, *Alexandria and the Sea: Maritime Origins and Underwater Exploration* (Tampa, FL: Sharp Books International, 2004), 12.

<sup>8</sup> Thomas C. Clarie, *A lighthouse for Alexandria: Pharos, Ancient Wonder of the World* (Portsmouth, NH: Back Channel Press, 2008), 28.

<sup>9</sup> Clarie, 28.

<sup>10</sup> Fraser, 5.

<sup>11</sup> Strabo, *Geography*, trans. Horace Leonard Jones, Loeb Classical Library Online, 8, 1932, book 17, p.32.

<sup>12</sup> Arrian, 143.

<sup>13</sup> Clarie, 17.

<sup>14</sup> Arrian, 143.

<sup>15</sup> Fraser, 20.

<sup>16</sup> Clarie, 37.

<sup>17</sup> Strabo, 17.33.

<sup>18</sup> Fraser, 34.

communities from Macedon, Thrace, the Aegean Islands, Asia Minor, and Jews from the Levant.<sup>19</sup> In addition, the number of non-citizens increased during the time of Ptolemaic rule.<sup>20</sup> Two main streets bisected the city, each large enough for pedestrians and wheeled carriages.<sup>21</sup> One of these streets ran from the Canopic gate on the eastern edge of Alexandria to the Necropolis in the west, stretching five miles long and 200 feet wide.<sup>22</sup> Other streets formed a grid system, which crisscrossed the city and intersected at right angles.<sup>23</sup> Walls provided safety to the city, only penetrable through the eastern, western, and southern gates.<sup>24</sup> Ptolemy 1 commissioned the construction of palaces and other significant landmarks including the Library of Alexandria and the burial place of Alexander. Beautiful buildings such as these constituted at least one-fourth of the total buildings in Alexandria.<sup>25</sup> Ptolemy 1 successfully turned plans drawn in barley into an organized, bustling city with a diverse population and a powerful economic presence.

The commercial significance of Alexandria in the third century BC was rivaled by few other cities.<sup>26</sup> Egypt had long provided highly desired products to the Hellenistic world, especially grain and papyrus.<sup>27</sup> Egyptian drugs, spices, and perfumes also spread throughout the Hellenistic world, firmly establishing Alexandria as a legitimate center of trade.<sup>28</sup> Additionally, Alexandria excelled in the production of textiles. Grain, oil, and papyri were also significant local industries.<sup>29</sup> Alexandrian trade with other parts of the Mediterranean centered around many of these exports. Indeed, the island of Rhodes drew most of its revenue from trade with Egypt largely through Alexandria.<sup>30</sup> Often, groups of

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<sup>19</sup> Ibid., 42.

<sup>20</sup> Fraser, 51.

<sup>21</sup> Clarie, 28.

<sup>22</sup> Ibid., 29.

<sup>23</sup> Strabo, 17.34.

<sup>24</sup> Clarie, 29.

<sup>25</sup> Strabo, 17.35.

<sup>26</sup> Diodorus, *The Library of History*, trans. by C. Bradford Welles. Loeb Classical Library Online 8, 1975, book 17, 52.5. Although most primary sources highlighting the economic importance of Alexandria appear near the turn of the century, the assumption that the city was filling this role 200 years earlier is not unfounded, according to Fraser, (133). In accordance with this, Strabo, near the turn of the century, notes that Alexandrian ports noticeably busy, even to the common man (Strabo, 17.31).

<sup>27</sup> Fraser, 133.

<sup>28</sup> Ibid., 133.

<sup>29</sup> Fraser, 138, 148.

<sup>30</sup> Williams, 26.

Alexandrian citizens established a garrison on the oft-frequented islands as a means of solidifying the connection between trading partners.<sup>31</sup>

During the rule of Ptolemy I, Alexandria also traded with Carthage and portions of the Italian peninsula.<sup>32</sup> The significant number of ships in the Alexandrian fleet — 4000 in the navy and over 250 exclusively for commercial purposes by 246 BC — facilitated the booming maritime trade of the city.<sup>33</sup> Foreign merchant ships, ready to be unloaded and reloaded, waited for extended periods of time in the bustling ports of Alexandria, occasionally even multiple days at a time.<sup>34</sup> Alexandria's maritime economy was significant enough for a third-century depiction of the city to be represented by a woman wearing a ship hat.<sup>35</sup>

Although the international trade of Alexandria flourished, commercial pursuits within Egypt outperformed even the most lucrative endeavors across the Mediterranean<sup>36</sup> Lake Mareotis, directly south of the city, provided access to the Nile and the heart of Egypt through numerous canals.<sup>37</sup> Alexandrian trade within Egypt consisted primarily of the import of grain, wheat, and barley but included other products such as honey and linens.<sup>38</sup> Imports of vegetable oil and olive oil, both local and from Syria, also played significant roles in the internal trade of Alexandria.<sup>39</sup> Alexandrian trade with the Upper Nile region centered primarily around wine, cheese, and nuts, each distinctly profitable.<sup>40</sup> Ptolemy I, the architect of the flourishing Alexandrian economy, also capitalized on the influx of wealth into his city with a complex and comprehensive tax system.

By 258 BC, Ptolemy I had developed a customs system that included over 200 taxes for various products.<sup>41</sup> Alexander's successor organized his taxes into two categories: those on the *chora*, internal tariffs on Alexandrian products and those levied against imported and exported products, both within Egypt and across the Mediterranean.<sup>42</sup> As a result of the ancient concepts of property ownership in Egypt, the king was considered the ultimate owner of all

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<sup>31</sup> Fraser, 57.

<sup>32</sup> *Ibid.*, 152, 154.

<sup>33</sup> Williams, 56, 52.

<sup>34</sup> Clarie, 12.

<sup>35</sup> Williams, 41.

<sup>36</sup> Strabo, 17.31

<sup>37</sup> *Ibid.*, 17.31

<sup>38</sup> Fraser, 147, 148.

<sup>39</sup> *Ibid.*, 148.

<sup>40</sup> Williams, 45.

<sup>41</sup> Williams, 45.

<sup>42</sup> Fraser, 134, 150.

property under his rule. Thus, Ptolemy I refrained from imposing harsh tax rates on local industry.<sup>43</sup> Local products such as papyrus, salt, dyes, leather, glass, pottery, some oil, metal workings, and bone-carvings circulated within Alexandria with minimal charges.<sup>44</sup> Products exported from and imported into Alexandria drew much larger taxes.<sup>45</sup>

On imported and exported goods Ptolemy I demanded incredible payments from merchants at rates higher than anywhere else in the world.<sup>46</sup> An “internal” tax was levied against anything that traveled across the boundary of Upper and Middle Egypt also at extravagant rates.<sup>47</sup> “External” taxes were also extracted at various points on the Egyptian border, again drawing astonishing income as a result of the high tax rates.<sup>48</sup> Simple food items such as vegetable oil from Syria drew tax rates of fifty percent on their way into Egypt.<sup>49</sup> Additionally, these merchants were often taxed more than once in the process of declaring, selling, and reloading goods.<sup>50</sup>

The revenue generated from these huge taxes contributed to the significant coffers of the Ptolemies. Uniquely Alexandrian coins began to circulate throughout the ancient world as a result of the development of a coinage and banking system.<sup>51</sup> Ptolemy I also invested in the infrastructure of Alexandria by improving irrigation systems and promoting agricultural development around the city.<sup>52</sup> Additionally, Ptolemy commissioned work on the harbors of Alexandria.

By the third century BC Alexandrian ports bustled with activity which firmly established the city as a booming economic center and a trading hub for the entire Mediterranean. Ships from across the ancient world carried out nearly all of this commercial activity, visiting the Alexandrian harbors with regularity. Thanks to Alexander’s choice location the harbors were suited to accommodate such consistent and heavy traffic, especially in regard to the depth of the bay. Many harbors around Alexandria gradually became shallower as time passed. This process was a result of the proximity of these bays to the westernmost

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<sup>43</sup> *Ibid.*, 134.

<sup>44</sup> Williams, 50.

<sup>45</sup> Fraser, 143.

<sup>46</sup> Williams, 46.

<sup>47</sup> Fraser, 149.

<sup>48</sup> *Ibid.*, 149.

<sup>49</sup> Williams, 45.

<sup>50</sup> *Ibid.*, 45.

<sup>51</sup> *Ibid.*, 49.

<sup>52</sup> Williams, 49.

mouth of the Nile; the silt released from the Nile eventually filled up the natural bays along the coast.<sup>53</sup> The harbors at Alexandria, however, were protected from this gradual shallowing by the natural curvature of the bay and the island of Pharos.<sup>54</sup> A long, thin strip of land, the island of Pharos stretched parallel to the coast.<sup>55</sup> The concave coastline that formed the Alexandrian bay “thrusts two promontories into the open sea...”<sup>56</sup> The island of Pharos sat between these two thrusts of land, leaving enough room in-between for passage of ships but nevertheless effectively capping the Alexandrian bay. This protected the bay from the incoming weather of the Mediterranean and also prevented the silt produced by the Nile from washing into the bay.<sup>57</sup> Thus, the Alexandrian bay was deeper than most, rendering it more conducive to holding merchant ships with deep hulls designed for traversing the treacherous Mediterranean Sea.

In an effort to increase the efficiency of his maritime trade, Ptolemy 1 also commissioned the construction of the Heptastadion: an embankment that linked the mainland to the island of Pharos.<sup>58</sup> Stretching 4270 feet, the Heptastadion also contained an aqueduct and functioned as the only connection from the island to the mainland.<sup>59</sup> The embankment bisected the bay, splitting it into two harbors,<sup>60</sup> which served to combat the weather patterns of Alexandria — summer winds blew from West to North and winter winds blew from North to East.<sup>61</sup> The large embankment served as a buffer against these seasonal winds. As a result of these weather patterns the eastern port, protected during the summer months, became known as the “Great Harbour.”<sup>62</sup> Deep enough to moor any ship, the Great Harbour, around which were located the palaces and emporiums of Ptolemy 1, also displayed the magnificence of the city that Ptolemy had built. The western harbor, named Eunestos after one of Ptolemy’s relatives, saw less traffic but still functioned as a central element in the maritime trade of the city.<sup>63</sup> In order to allow access between harbors the extreme ends of the Heptastadion were bridged which provided an avenue for ships to transfer

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<sup>53</sup> Williams, 55.

<sup>54</sup> *Ibid.*, 55.

<sup>55</sup> Strabo, 17.25.

<sup>56</sup> *Ibid.*, 17.25.

<sup>57</sup> *Ibid.*, 17.25.

<sup>58</sup> Williams, 55.

<sup>59</sup> Clarie, 11.

<sup>60</sup> Strabo, 17.26.

<sup>61</sup> Williams, 56.

<sup>62</sup> P.M. Fraser, “The ΔΙΟΛΚΟΣ of Alexandria” *The Journal of Egyptian Archaeology* 47 (December, 1961), 137.

<sup>63</sup> Clarie, 12.

from one harbor to the other.<sup>64</sup> Ptolemy I commissioned the Heptastadion as a means of improving the availability and safety of his harbor. He also accomplished this by placing the famous lighthouse on the island of Pharos.

A functional external border for the bay, the island of Pharos stretched between the deep lagoon that formed Alexandria's harbors and the Mediterranean Sea. Ptolemy I worked to improve the safety of his harbors but he could only influence the natural geography to a limited degree. Rocks littered the entrance to the Great Harbor, both visible and those hidden below the surface of the choppy water.<sup>65</sup> The island of Pharos was surrounded by reefs and shallows which increased the difficulty for ships to enter and exit the harbors.<sup>66</sup> Ptolemy I remained set on improving the economic potential of the city and continuing Alexander's dream of making Alexandria a center of Hellenistic culture. He concluded that the most effective way to reach his goals would be the construction of an unprecedented structure: a lighthouse that would both guide ships safely to the harbors of Alexandria and indicate the cultural significance of the city.<sup>67</sup>

Ptolemy I fully grasped the incredible significance of this project, evidenced in the man that he selected to design and oversee the construction of the lighthouse: Sostratos of Knidos, the son of Dexiphanes.<sup>68</sup> Already well-established in the political world of the Mediterranean by his mission to Athens in 287 BC, Sostratos received numerous awards and was honored across the

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<sup>64</sup> Strabo, 17.26.

<sup>65</sup> Strabo, 17.25.

<sup>66</sup> Clarie, 8.

<sup>67</sup> *Ibid.*, 25.

<sup>68</sup> Alexander Meeus, "The Career of Sostratos of Knidos: Politics, Diplomacy, and the Alexandrian Building Programme in the Early Hellenistic Period" in *Greece, Macedonia and Persia: Studies in Social, Political and Military History in Honour of Waldemar Heckel* ed. by Timothy Howe, E. Edward Garvin, and Graham Wrightson, 143-171 (Oxford, UK: Oxbow Books, 2015), 143. Meeus engages in a robust debate with other authors in his defense of Sostratos as the architect, including P.M. Fraser and other experts. Meeus' argument centers around the necessity of using what the existing primary sources provide. Fraser's argument requires the disregard of Sostratos' motivation in his somewhat manipulative inscription on the side of the Pharos, a step that Meeus is unwilling to take without evidence from primary sources. Also, Fraser and other experts claim the lack of primary sources before Pliny (23 AD - 79 AD) as grounds for disregarding the primary accounts that submit Sostratos as the architect. Meeus rejects this theory because of the logical implications of disregarding primary sources that span centuries from their topic — the consistent application of such rejection would be devastating to historical study in any subject. Meeus concludes that the lack of concrete evidence does not discount the available evidence provided by the primary sources and that Sostratos should be considered the architect as a result.

Mediterranean for his role in diplomatic relations between states.<sup>69</sup> The frequency, quality, and widespread nature of these awards indicate that Sostratos was a well-respected and widely known diplomat in the service of the Ptolemies.

Sostratos' career, however, did not start in politics. Rather, his beginnings were in engineering. Sostratos' father Dexiphanes served as chief aide to Dinocrates, one of Alexander the Great's chief designers.<sup>70</sup>

Additionally, Dexiphanes assisted in the technical work and construction of the Heptastadion.<sup>71</sup> Thus, Sostratos was certainly exposed to construction and architecture from a young age. With this experience, he entered the service of the Ptolemies in the late fourth century BC.<sup>72</sup> His experience had immediate effect as he won the siege of Memphis for Ptolemy I by diverting the Nile.<sup>73</sup> Sostratos' fame as an engineer and architect was also influenced by his role in the construction of the Stoa of Sostratos on Knidos, a popular tourist destination in the ancient world.<sup>74</sup> Thus, Sostratos' political career was propelled by his well-respected work and consistent service as an engineer and architect under the Ptolemies.<sup>75</sup> As a result of his good standing and architectural experience, Sostratos was a natural choice to guide the construction of Alexandria's crowning jewel.

Ptolemy's goal in commissioning the construction of the lighthouse of Pharos was two-fold: to improve access to Alexandria for economic purposes and to symbolically indicate the leadership of the city in the ancient world.<sup>76</sup> Well-traveled as a result of his campaigns with Alexander, Ptolemy had seen other magnificent structures such as the Pyra of Haphaestion, the Colossus of Rhodes, and the Artemisium at Ephesus.<sup>77</sup> He also maintained a fondness for Babylonian architectural style — his palace in Alexandria centered around royal gardens, a Babylonian tradition.<sup>78</sup> Thus, the importance of this monument to Ptolemy cannot be understated.

Ptolemy intentionally selected his architect; next came the workers. Most of the manual labor was fulfilled by semi-unskilled laborers, many of them

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<sup>69</sup> Meeus, 158, 161. Meeus notes that the significance of Sostratos' mission to Athens in 287 indicates that he was a seasoned diplomat by this date.

<sup>70</sup> Clarie, 48.

<sup>71</sup> *Ibid.*, 47.

<sup>72</sup> Meeus, 165.

<sup>73</sup> Lucian, *Hippias*, trans. A.M. Harmon, Attalus, 2014, 2.

<sup>74</sup> Meeus, 147.

<sup>75</sup> *Ibid.*, 165.

<sup>76</sup> Charles Walker, *Wonders of the Ancient World* (Gallery Books, 1989), 16.

<sup>77</sup> Clarie, 40.

<sup>78</sup> Clarie, 40.

a part of the growing non-citizen population of Alexandria during the Ptolemaic period.<sup>79</sup> These laborers placed materials such as brick, sand, and mortar; cut stone and wood; and carried materials to the construction site.<sup>80</sup> Ptolemy 1 paid the wages for these laborers, in addition to paying for the collection and transportation of many of the materials needed for the construction of the lighthouse.<sup>81</sup>

Sostratos and Ptolemy 1 chose to use primarily a local limestone known as *kedan* for the construction of the lighthouse.<sup>82</sup> A stone of middling hardness, *kedan* was locally accessible and a high quality material.<sup>83</sup> Ptolemy also imported beautiful reddish-purple Aswan granite with which to construct statues around the Pharos.<sup>84</sup>

With ample workers and available resources, Sostratos turned to the actual construction of the building. One year after the turn of the third century BC Sostratos and Ptolemy broke ground on the easternmost part of the island of Pharos and the construction of one of the seven wonders of the ancient world began.<sup>85</sup> Sostratos selected the flattest part of the island and organized the construction of strong sea walls to stave off the invasive Mediterranean Sea.<sup>86</sup> On this flat area, Sostratos directed the construction of a square, masonry platform 110 meters square and seven meters high.<sup>87</sup> The process of laying this platform followed contemporary construction methods during the Ptolemaic period. This consisted of laying small limestone blocks — one meter by one-half a meter — in a grid and filling in a layer of mortar around and on top of the

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<sup>79</sup> Fraser, 51.

<sup>80</sup> William L. McDonald, *The Architecture of the Roman Empire*, vol. 1, *An Introductory Study* (Yale University Press, 1982), 142.

<sup>81</sup> McDonald, 142.

<sup>82</sup> Clarie, 59.

<sup>83</sup> Patrick Beaver, *A History of Lighthouses*, 11.

<sup>84</sup> Clarie, 60.

<sup>85</sup> *Ibid.*, 37. Identifying the exact beginning date of construction on the Pharos is difficult — no primary sources provide that information directly. However, a comparison of the timelines of other building projects of this magnitude point to the construction of the Pharos taking at least two decades to complete. That information matched with Posidippus' epigram (EP. 115.1) — written to celebrate the completion of the Pharos in a time contemporary with Pyrrhus (297-272 BC) — and other, later sources (Fakharani, 272) point to the earliest construction beginning around the turn of the century.

<sup>86</sup> Fraser, "The ΔΙΟΛΚΟΣ of Alexandria," 18.

<sup>87</sup> Kenneth Sutton-Jones, *Pharos: The Lighthouse Yesterday Today and Tomorrow*, Michael Russell Publishing Inc., 1985, 415. Sources vary on the exact size of this platform but most estimates hover around 110 meters squared by 7 meters high.

blocks.<sup>88</sup> Often, a thin layer of white plaster was applied as well, giving the appearance of marble.<sup>89</sup> This white-washed masonry platform would serve as the foundation for the Pharos and one that would hold the magnificent structure for centuries to come.

Upon this wide and strong platform, Sostratos directed the construction of the first level of the Pharos. Again using the limestone blocks, although much larger ones, Sostratos built a rectangular base thirty square meters on the bottom<sup>90</sup> and seventy-two meters high.<sup>91</sup> Such a massive and heavy structure necessitated the implementation of unconventional methods to hold the blocks together. Sostratos showed his ingenuity again by utilizing a model that stayed contemporary for centuries following. First, the workmen drilled holes into the blocks before pouring molten tallow into the cavities. Next, the workmen plunged a heat-anchoring iron into the tallow and poured molten lead into the holes immediately afterwards. This molten lead incinerated the tallow and filled its place, forming a dry and airtight bond. After repeating the process on another block the two would be fused together.<sup>92</sup> This method allowed the construction of such a colossal structure with the limited technology of that time period.

Sostratus, in his design of the second level of the Pharos, paid homage to a key principle in classical Hellenistic architecture. He designed the second layer as an octagon, seventeen meters across and 35 meters high.<sup>93</sup> Although there were numerous characteristics of Greek architecture during this time, the concept of axiality was a pillar of Hellenistic construction and one that Sostratos included in his design of the second layer. Axiality refers to an imaginary line that divides a structure into symmetrical parts, which was evident in the Pharos.<sup>94</sup> Although constructing a lighthouse on Egyptian soil, Sostratos never failed to honor and promote Hellenistic culture in his architectural masterpiece.

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<sup>88</sup> Fawzi El Fakharani, "The Lighthouse' of Abusir in Egypt" *Harvard Studies in Classical Philology* 78 (1974), 269.

<sup>89</sup> Fakharani, 269.

<sup>90</sup> Walker, 17.

<sup>91</sup> Fakharani, 415. Although the details of size differ slightly, nearly every account concludes that the first layer of the Pharos was in the form of a rectangle standing on one end.

<sup>92</sup> Beaver, 30.

<sup>93</sup> Sutton-Jones, 415.

<sup>94</sup> W.H. Davenport Adams, *Temples, Tombs, and Monuments of Ancient Greece and Rome: A description and a history of some of the most remarkable memorials of classical architecture* (London: T. Nelson and Sons, 1871), 214.

The third and final level of the Pharos also maintained the axiality of the structure; Sostratos designed it as a cylinder. This final level reached twenty-six meters high and spanned nine meters in diameter. The height of the cylinder roughly completed a 2.5:1.5:1 relationship between the respective heights of each level, a ratio that began to be represented in ancient Alexandrian coins.<sup>95</sup> Additionally, this final level of the Pharos contained the fire and mirrors, critical to make the Pharos a lighthouse and not simply a fantastic structure guarding the entrance to Alexandria's harbors. The constant fire that marked Alexandria's location for weary travelers blazed within a basin or lantern. This lantern, twenty feet in diameter and ten feet deep, hung from stone arches tiled with basalt, chosen for its flame-resistant qualities.<sup>96</sup> Although large, the fire atop the Pharos could never have been large enough on its own to be seen as far as twenty-nine miles out to sea.<sup>97</sup> The mirrors assisted in sending the light out into the Mediterranean. This was accomplished by the reflections of both sunlight and firelight off of a large, concave, bronze mirror positioned in the center of the cylindrical shaft. Light reflected off this horizontally-positioned mirror up to another bronze, eight-sided, pyramidal mirror, which reflected the light out from the lighthouse, guiding in the ships.<sup>98</sup>

Sostratos successfully built the lighthouse in 19 years, completing the project under Ptolemy 1 Soter's son Philadelphus in 279 BC.<sup>99</sup> It reached 138 meters into the sky, an astonishing height in the ancient world.<sup>100</sup> Although unprecedented in size and scale, Sostratos' architectural masterpiece was also beautiful and functional. A set of internal steps spiraled up the building, wide enough for two men to climb simultaneously.<sup>101</sup> An open shaft allowed for fuel to be lifted from the ground level to just under the top. Most of the second, octagonal layer was designed for storage. Indeed, Sostratos designed the Pharos with varying numbers of rooms at different access points inside the

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<sup>95</sup> Clarie, 58.

<sup>96</sup> Clarie, 67

<sup>97</sup> *Ibid.*, 51.

<sup>98</sup> Clarie, 71.

<sup>99</sup> Fakharani, 272. Again, exact dating is difficult for the completion of the Pharos. Nevertheless, most sources converge around 280 BC.

<sup>100</sup> Walker, 17. As with nearly every other exact measurement or date regarding the Pharos, historians contest each figure, some citing outrageous heights as great as 400 meters. Nevertheless, the general consensus of reliable sources centers around 138 meters high.

<sup>101</sup> Doris Behrens-Abouseif, "The Islamic History of the Lighthouse of Alexandria" *Muqarnas* 23 (2006), 3.

lighthouse.<sup>102</sup> The exterior of the Pharos also contained a shaft running all the way to the top of the structure and operated by a rope and windlass.<sup>103</sup> Additionally, something of note on the outside of the Pharos was the inscription by Sostratos. Located near the top of the first level on the east side of the Pharos, the fifteen-inch letters described Sostratos as the architect.<sup>104</sup> Sostratos also covered this engraved inscription with a layer of plaster, hiding the fact that he promoted his own name above that of either Ptolemy.

Sostratos also included less functional elements in the Pharos. Artists sculpted the red-purple granite into statues to decorate the area around the lighthouse. The main entrance door, situated nearly twenty-five feet above the water, had a high, arched doorframe and ramp leading into the lighthouse.<sup>105</sup> The Pharos also contained four bronze tritons. These were aesthetically pleasing but also served a purpose unrelated to economics: one would be blown to alert of enemy approach and one was blown every hour as a method of keeping time.<sup>106</sup> Additionally, the Pharos sat over a cistern of clean water, brought to the island through the aqueduct of the Heptastadion. Supporting this cistern sat four glass and bronze crabs, so large that a man could sit between the claws.<sup>107</sup>

A final artistic addition to the Pharos was the statue that rested at the very top of the structure. This statue represented Isis, the goddess who invented sails and was widely considered the protector of ships.<sup>108</sup> The naked and beardless figure held a small object in one hand and a rowing oar in the other.<sup>109</sup> Isis' posture was one of action and progression to declare from the highest point in Alexandria that the city was a thriving and growing metropolis. Such extravagance indicated Sostratos' pride in his work and was reflected in the bill

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<sup>102</sup> Behrens-Abouseif, 6. Scholars debate the exact number of rooms still today — the most reliable sources are Arabic writers from 1100 AD, most likely writing after the initial destruction and reconstruction of the lighthouse. Estimates for the original numbers vary between fifty and 300.

<sup>103</sup> Clarie, 61.

<sup>104</sup> *Ibid.*, 45.

<sup>105</sup> Clarie, 60.

<sup>106</sup> Clarie, 65.

<sup>107</sup> *Ibid.*, 63.

<sup>108</sup> Susan Handler, "Architecture on the Roman Coins of Alexandria," *American Journal of Archaeology* 75 no. 1 (January, 1971), 75. Again, historians cannot agree on the original subject of Sostratos' statue. Without conclusive evidence, historians are left to lean on ancient coins, the fact that a cult center or temple seemed to also be situated on the island of Pharos (Fraser, 20), and the recent discovery of a very large statue of Isis in the harbor of Alexandria.

<sup>109</sup> Handler, 75.

— the total construction cost of the Pharos reached over 800 talents of silver, equivalent to the weight of 800 men.<sup>110</sup>

In under two decades, Sostratos oversaw the building of a structure unprecedented in design, size, and function. The colossal height and unique layers of the Pharos set it apart from contemporary structures. Although earlier lighthouses may have existed, none reached the international fame and served as a model for countless others like the Pharos.<sup>111</sup> Sostratos' experience as both an architect and a diplomat uniquely prepared him to direct such a significant project. Indeed, Sostratos' employer, Ptolemy 1 Soter, recognized in him the characteristics of a man who would build a lighthouse that continued the vision established by Alexander the Great, a vision of a city both flourishing economically and leading the ancient world in scholarship and art.

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<sup>110</sup> Pliny, *Natural History*, 36.17.

<sup>111</sup> Sutton-Jones, 3.