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Octopodology and Dark *Amphorae*: alien archaeologies, reflexivity, and the non-human afterlives of objects in the sea

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Introduction

When Christopher Columbus presented his argument for the existence of lands across the Atlantic Ocean, the "eminent men of Genoa" apocryphally replied that to the west were only "the mist of darkness" (Abulafia, 2019, p. 610). This self-limiting conception of the world resulted in Genoa missing the European "discovery" of the western continents to the benefit of Spain. Anthropology and archaeology have their own 'mists of darkness', self-imposed limits or blindness due to culture, gender, or social status. There are aspects that observers cannot perceived due to their proximity to the subject. Anthropology sought to address this through the "reflexive turn", where researchers seek to identify and understand their own inherent biases (Hymes, 1999).

It is hardly surprising that in archaeology, as a field that interprets material culture to gain an understanding about the past, there are some interpretations say more about the archaeologist – their identity and values – than about past cultures. Perhaps the bluntest example is a bronze artifact that was interpreted as a crown by 19th century archaeologists who wished to see a royal burial, when in fact it is simply the remains of a bucket (Landsberg, 2018, p. 1). Feminist Theory exposed the male gaze dominating interpretations of the archaeological record. Palaeolithic female figurines were interpreted by men to be fertility votives, but feminist theorists dispensed with this supposition based on the fact the figurines depict elder women past child-bearing age, do not depict the vulva or pregnancy, and perspective that suggests the figurines are self-portraits (McCoid and McDermott, 1996; McDermott, 1996). Archaeology is currently undergoing a decolonial turn, one stripping back the dominant white colonial narratives to reveal indigenous perspectives (Bruchac, 2014) and academics from the Global South providing non-Western systems of knowledge (Sinamai, 2020). The Euro-centric ideas that proliferate archaeology have created imagined mists that obscure truths that are evident to those of non-European backgrounds. The mists of darkness affect one's perception of the world; can one practice reflexivity through non-human perspectives?[1]

Vilém Flusser and Louis Bec examine the *Dasein* of the cephalopod *Vampyroteuthis infernalis*, or vampire squid, putting forward that "Perhaps a game can be built out of distorting mirrors that would enable us to recognize the basic structure, distorted and from afar, of our own Dasein. By playing a "reflective" game of this sort, we should hope to gain a new, reflexive perspective of ourselves. This view, though distanced, is not 'transcendent', meaning a perspective of the vampire squid, in the case of Flusser and Bec or the ocoptus in the present chapter, reflects our co-being (*Mit-Sein*) on this planet (Flusser and Bec, 2012, pp. 9–10), which Donna Haraway calls "making kin" with the squid or octopus (Haraway, 2016).[2] A non-human perspective may allow us to take aim at our collective blind spot – our humanness – and determine things about ourselves and cultures that we cannot normally see due our proximity to our *Dasein*. Archaeology is not an objective field; it is firmly anthropocentric by design. However, just as Feminist and Decolonial approaches break down

[1] However, non-human reflexivity is far less urgent than the critical and overdue decolonialism required in archaeology.

[2] Dasein and Mit-Sein are terms coined by the philosopher Martin Heidegger.

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the assumptions that underlie traditional approaches, a non-human view of humans and material culture may reveal new perspectives about our cultures. Human-animal relations has been a growing section of the Humanities and non-human archaeology is a developing discourse (Kirksey and Helmreich, 2010; Pilaar Birch, 2018). This chapter probes the edges of archaeology from the perspective of the non-human and the lessons that can be learned from raising the mists of darkness that we self-impose by being human. To this end, the chapter seeks a non-human perspective: cephalopods. Why? "Because", as Peter Godfrey-Smith writes, "evolution built minds twice over. [The cephalopod] is probably the closest we will come to meeting an intelligent alien" (2016, p. 9). If we wish to understand a non-human perspective of ourselves, or if we wish to explore alien archaeology, then the best we can do on Earth is the octopus.

Octopuses are commonplace on submerged archaeological sites in the oceans. This proliferation of octopuses provides two opportunities: to investigate a non-human archaeology and to hold a mirror up to human archaeology. In exploring Octopodology, the goal is a "jolting of the archaeological imagination" (Pétursdóttir, 2017, p. 192) and radically re-think our notions of archaeological deposits as static and the domain of humans. It is also worth exploring octopus consciousness because maritime archaeologists impose our thought upon oceanic environments that are much older than our own. Sea consciousness predates consciousness on land by millions of years and the fact that consciousness evolved on two occasions begs for comparison. The persistence of objects or entities across time is an important aspect for archaeology and the sea provides ample examples, whether it is an octopus altering its behavior to make use of a two-thousand-year-old amphora or humans altering their behavior to shutdown beaches due to persistent Cambrian (541-485.4 million years ago) and Ordovician (450-420 million years ago) entities like the box jellyfish and sharks. The persistence of entities in the sea challenges the anthropocentrism of archaeology.

Mind the Gap

Michael Shanks argues that archaeology "focuses upon the gap between the lived past and its ruin now" (1995, p. 17). Mark Hudson takes this argument and uses contemporary philosophy and discourse on the Anthropocene to demonstrate that contemporary archaeology precludes a gap, since we are integrated into it (2014, p. 85). These "dark artifacts" are time transgressive and experience adjunct lives to those they had in the past (Hudson, 2014, p. 84). Hudson adopts the term dark objects from Object-Oriented Ontology (OOO) theorists (Bryant, 2014; Harman, 2016; Morton, 2016); Graham Harman argues that objects have a dark side which is hidden and not fully comprehensible (Harman, 2016, p. 7). Hudson uses Styrofoam as an example of dark artifacts, which was created for cheap and disposable containers, yet take thousands of years to disintegrate, forming significant deposits of persistent material culture on land and in the sea. "In the ocean, the plastic can break down into small particles that damage marine life yet can also create new ecological habitats for microorganisms" (Hudson, 2014, p. 85). These dark artifacts have unintended non-human afterlives, leading archaeology to a new conceptual exploration of artifacts and "how they endure and outlive us, and how they interact outside our control and domain (Pétursdóttir, 2017, p. 194).

Recent scholarship on non-human agency and multispecies archaeology has challenged this gap, arguing that it is an anthropocentric perception of the material record (Witmore, 2007; Olsen *et al.*, 2012; Pétursdóttir, 2017). The "afterlives" of human-made objects are actually the longest part of their lives (Liboiron, 2016, p. 103; Pétursdóttir, 2017, p. 192), which

causes Pétursdóttir to avoid the term 'afterlives' entirely since it is anthropocentric (Pétursdóttir, 2017). Nevertheless, I am using 'afterlives' within the narrow focus of *amphorae* because they are commonly described in terms of their 'use-life' in archaeological parlance and I wish to examine the *non-human* afterlife. *Amphorae* are found on the seafloor in the millions through shipwreck and discard, as these ceramic containers were used to transport wine, olive oil, and fish sauce – similar to barrels – from the Bronze Age through Late Antiquity. While their human use-life ended at 'deposition', they persist as structures on the seafloor which forms the longest part of their object-life. In maritime archaeology shipwrecks are often viewed from the anthropocentric 'time capsule', but the structure of the wreckage, or piles of *amphorae*, provides a habitation for marine life including fish, coral, sponges, cephalopods, and more.

It is evident that shipwrecks, and *amphorae*, possess agency, serving as structures for ecosystem development, protective spaces for species to dwell, and elements for accessing resources in currents and the water column. Non-human agency is a controversial topic within traditional archaeology, but contemporary philosophy has recently advocated for it through Speculative Realism (SR) and OOO. Agency is the capacity to effect change (Dolwick, 2008, p. 18) and should not be conflated with intentionality. For example, Andreas Malm argues against object agency by incorrectly conflating it with intentionally, stating, "The sun does not act when it rises in the morning (although it certainly makes a difference to a state of affairs), for on the lay view, an element is needed which is absent in the daybreak: an agent seeking to accomplish some goal. The parent who wakes up his child when the sun rises has agency, while the morning light does not" (Malm, 2018, p. 84). The sun does not have intent, but its agency is evident in the fact that it powers life on Earth through photosynthesis, causes skin cancer, and prompted the creation and use of sunscreen. The sun has consequence in the world, which is agency but not intent. The philosophies emphasizing the agency of non-humans – the 'flat ontologies' – de-anthropocentrize existence and have led to new perspectives on the role of objects beyond human perception. The term 'object', which has specific meaning in archaeology, in philosophy has broader meaning and archaeologists might feel more comfortable with the term 'entity'.

Within OOO, objects are always more than what we perceive. To describe this, objects are philosophically described as 'withdrawn' and we perceive their 'sensual' characteristics (Morton, 2013, p. 89). When the ocean casts a wave up onto a beach and small grains of sand are eroded away in one place and deposited in another, neither the totality of the ocean or the beach are interacting or perceivable. Instead, there is always more to an object that is withdrawn; neither the ocean or beach are 'exhausted' by their interaction. In this way, objects possess agency and interact with other objects, independent of human thought. When a potter creates an amphora, they anthropomorphized the clay for human purposes, shaping it with twin handles for a human's two hands and firing it to harden the clay so that it is robust enough to hold liquids and facilitate transport. A key component of OOO is recognition of the sensual interactions differing between objects (Morton, 2013, p. 89), so while humans anthropomorphize the amphora, the octopus octopomorphizes it as a den, the coral coralmorphizes it as a solid surface for colonization, and the amphora amphoramorphizes humans, octopuses, and coral because the engagement of amphora with those entities differs for each. Further, each object has finitude, meaning that though one might be quite durable, all objects exist for a certain amount of time (Morton, 2013). Humans have difficulty with finitudes longer than their own lifetimes, such as conceptually distinguishing between 10,000 versus 50,000 years.

In this way, OOO is a *realist* philosophy, because it advocates that objects are real and not constructs of the human mind. The latter is the approach of *idealist* philosophies, which argue for Cartesian dualism that separate mind and nature. Idealist approaches are evident in archaeology, for example, in cognitive landscapes theories such as the maritime cultural landscapes paradigm. Maritime cultural landscapes argues for cognitive landscapes which are created in the human mind (Westerdahl, 1992); however, the interaction between the ocean and beach continues whether humans form a maritime cultural landscape in their mind or not, demonstrating that these are real objects. In advocating for realist over idealist approaches, I recently argued that OOO in archaeology provides a more contextual view of human culture, offering an outside view or distance to give more perspective (Campbell, 2020, pp. 210–211). This article continues advocating for realist philosophy in archaeology, as the persistence of objects in the sea is best understood through flat ontologies.

Figure 10.1. An amphora from the Levanzo I shipwreck colonized by a coral, which was found during the Egadi Islands Survey Project (Author; Soprintendenza del Mare/RPM Nautical Foundation).

A Sea-Change Rich and Strange: Persistence and Afterlives Beneath the Sea

"Full fathom five thy father lies;
Of his bones are coral made;
Those are pearls that were his eyes:
Nothing of him that doth fade,
But doth suffer a sea-change
Into something rich and strange."

It is persistence and metamorphosis that William Shakespeare captures in *The Tempest* (1611).[3] Édouard Glissant expresses persistence when writing of the enslaved thrown from slave ships, "These underwater signposts mark the course between the Gold Coast and the Leeward Islands… [in] these deeps, with their punctuation of scarcely corroded balls and chains" (Glissant, 1997, p. 6). The sponge diver who discovered the ancient statues of a Roman shipwreck at Antikythera returned to the surface in hysteria, shouting that the seafloor was covered with bodies corrupted by disease (Throckmorton, 1964, p. 34). When the captain, a person of sturdier constitution, dove below he found marble faces half eaten by endolithic organisms and bronze limbs covered in calcareous growths. The corrupting sea colonizes objects from the land and transforms them into its own weird and uncanny, almost mocking, versions of the original, as seen in colonized *amphorae* (Fig. 10.1) and statues (Fig. 10.2). Francis Bacon claims, "Antiquities are history defaced" (2011[1605]: 333)[4], but beneath the sea they are further transformed into grotesques.

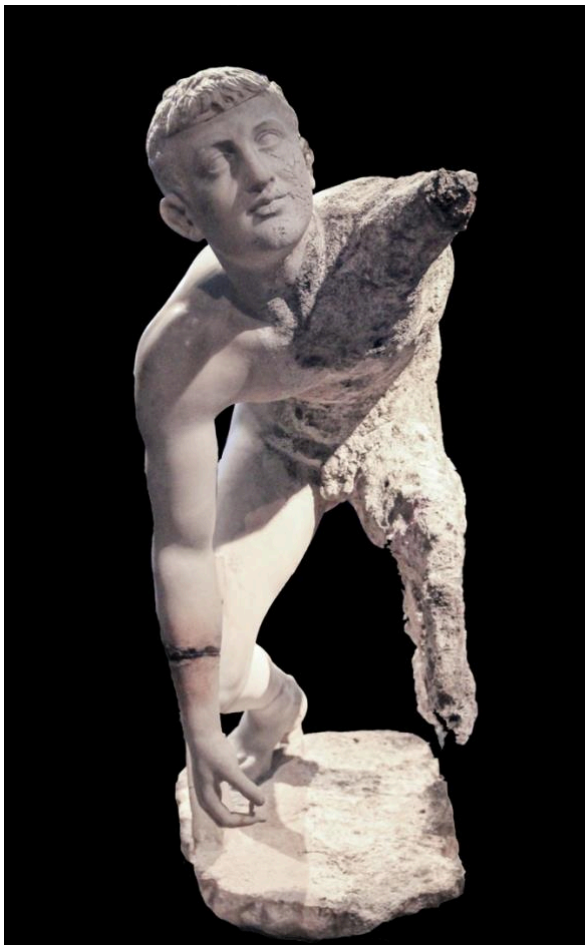

Figure 10.2. A statue of a youth from the Antikythera shipwreck showing the effects of endoliths which consumed the exposed half (right) while the portion that was buried was unaffected (left), which led the diver who discovered the wreck in 1901 to exclaim that there were diseased bodies on the seafloor (Author; National Archaeological Museum Athens).

It is an alien archaeology beneath the sea, requiring one to think differently. In the television series *Stranger Things,* the characters descend into a subterranean underworld that is a mirror

[3] The play recounts the wreck of the *Sea Venture*, later discovered by archaeologists after it became part of a Bermuda reef (Wingood 1982).

[4] The full quote is "Antiquities are history defaced, or some remnants of history which have casually escaped the shipwrack [sic] of time".

of the surface called Upside Down. Everything appears uncannily similar, except buildings are abandoned and inhabited by perverse and corrupted creatures. Archaeology studies a form of the Upside Down, where we descend below ground or underwater to study buildings, ships, and sites that were once complete on the surface, but have been corrupted by site formation processes – biological, chemical, and physical forces – to make them at once familiar and strange (Ward, Larcombe and Veth, 1999). The ocean is indeed an Upside Down where cities and ships plunged below and become weird versions of their former selves. It should be noted that, as Graham Harman writes in his chapter, "Weirdness is actually a technical term in OOO… It is defined as what happens not only when the deep reality of an object is hidden beneath its phenomenal surface, but more generally whenever an object has a loose relationship with its own qualities" (Harman, this volume). Donna Haraway adopts the Greek *chthonios* means "of, in, or under the earth and the sea", from which H.P. Lovecraft derived the octopus-like Cthulhu who inhabits a sunken city, for her term for climate change or the Anthropocene: the Chthulucene. She defines it as an epoch defined by "ongoing multispecies stories and practises of becoming-with" (Haraway, 2016, pp. 53, 55).[5] It is multispecies practices that form underwater sites, creating the metamorphosis that is the archaeological Upside Down. To think as an archaeologist, one has to think differently to understand the shape of the past which is at once worrisomely familiar and unexpectedly different. One method of thinking differently is to explore alien archaeologies.

There are, on Earth, persistent non-human entities in deep-time if we are willing to look beyond the individual and toward the species. Each summer, Australian beaches are shut down by the clash of persistent Cambrian box jellyfish and Ordovician sharks with Pliocene and Holocene (5.6 million years ago to present) beings: us.[6] These Cambrian and Ordovician entities strike fear in humans, who deploy material culture in the form of nets, helicopters and drones, and issue warnings through radio and television broadcasts. A material record prompted by the persistent Cambrian is not unique; in fact, wars have been fought over oil and gas which are the remains of decomposed Palaeozoic marine organisms (541-251 million years ago)[7] and seabird guano from the Late Pleistocene and Holocene (129,000 years ago to present). It is hardly an exaggeration to say the Modern Period is powered by consuming the Palaeozoic. Archaeology has long relied on an observer situated in a present to provide comparison with the past; however, it would be more accurate to view the present as transient and intersecting with persistent entities from the deep past (e.g. Cambrian box jellyfish) and extending into a deep future (e.g. radioactivity created 70 years ago will not dissipate for 200 million years). From this perspective, archaeology is less about the gap between the lived (human) past and ruined present, and more about objects of varying finitudes bumping into each other in a frame of reference that we call the present.

Maritime archaeology often generalizes depositional, wrecking, or subsidence events and subsequent site formation processes through the perspective that artifacts lie in stasis until

[5] Haraway derived the name of the epoch from a spider, *Pimoa chthulhu*, and not Lovecraft.
[6] Box jellyfish and sharks are naturally Holocene species as well, since they are alive today. However, the species evolved into their present forms and behaviors for Cambrian and Ordovician Earths and they have changed little in the intervening periods – though they have changed. It is in this respect that I refer to them as Cambrian and Ordovician, as they were largely shaped by nature for an Earth that is past, yet they remain successful species today. Similarly, humans developed for a Pliocene Earth, thrived in the more stable climate of the Holocene, and face an uncertain future with the Anthropocene.
[7] Coal is formed primarily from terrestrial trees and plant material, while oil and gas are formed primarily from marine organisms such as plankton.

rediscovered by humans.[8] Rather than entering stasis, artifacts continue to possess agency. They are, in this regard, quite evidently objects in the manner of OOO. Work by coastal ecologists such as Derek Smith have demonstrated that shipwrecks are similar to "whale falls", forming entirely new ecosystems that feed and develop on the skeletons of both whale and ship alike (Smith 2014). These mid-ocean ecosystems can lead to unique and important groups of colonization, though the ecosystems change over time with phases of colonization by different species. The appearance of an object on the seafloor is important, as it is vertical structures that lead to complex ecosystems since they change or provide access to the flow of water (and hence waterborne organisms for both colonization and as a food source) and provide protection from predators. The *amphorae* which this study focuses on are therefore objects with agency, which do not lie in wait for humans to rediscover them but have lengthy non-human afterlives (Fig. 10.3). These are dark *amphorae* that endure and possess capacities beyond human intention.

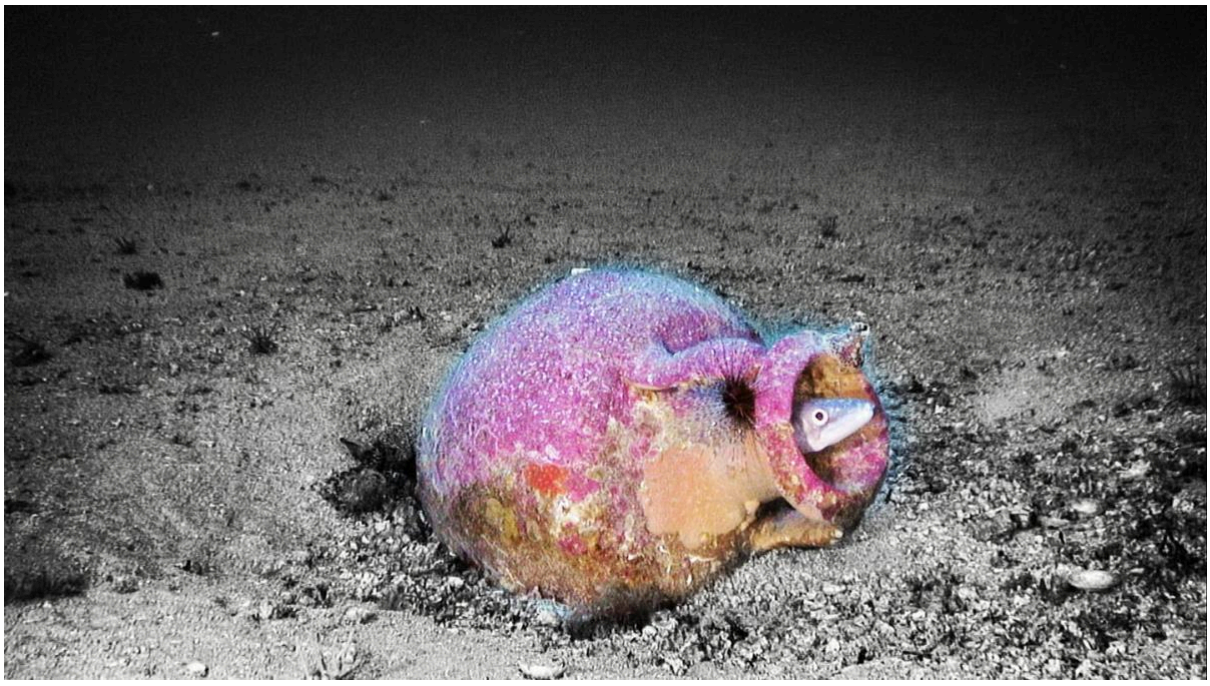

Figure 10.3. An eel hides in an amphora colonized by red and brown invertebrates on the Battle of the Egadi Islands site, a shell midden outside the mount indicates octopodes have used it as a den in the past. Given the time of year, the eel may have consumed an octopus resident (RPMNF/Soprintendenza del Mare).

The Octopus and the Archaeologist

The octopus has been part of archaeologists' awareness since the foundation of the field of maritime archaeology. They are curious organisms with a penchant for stealing fieldwork tools, bringing them into their dens. As a result, they have been approached from the perspective of site formation processes that break down intact human features on archaeological sites. One of the foundational theories of maritime archaeology, site formation processes were first proposed by Keith Muckelroy in his book *Maritime Archaeology* (1978). Octopuses were classified as "scramblers" by Parker, who describes them as "[collecting] small objects to furnish their homes" (1981, p. 312). However, the octopus is not a process; it is an intelligent being that offers more perspective than it has previously been given credit for.

[8] The inherent fallacies in this paradigm are examined in this volume by Rich (pp. x-x) and *Shipwreck Hauntography* (Rich, 2021).

Regarded as the founder of nautical archaeology, George Bass' research is a good place to start an inspection of octopus behavior. Bass describes the shipwreck site at Sheytan Deresi and notes a confused mix of material inside one of the ceramic containers called a pithos. "[The pithos] lay about 100 ft (30 m) away from the other complete pithos (SD 10), in shallower water (90ft or 27m deep) in a sandy area above the rocky slope (Fig. 3). Inside this pithos (SD 13) were a number of large rocks, an amphora neck (SD 18), an amphora base (SD 17) and a lead fishing weight (SD 22); we assumed they were carried into the open mouth by an octopus. One sherd in the pithos joined perfectly a sherd uncovered below the distant grid, forming part of SD 8" (Bass, 1976, p. 295), indicating that an octopus can move an object significant distances and not simply to the nearest interior space. Muckelroy uses this description in his categorization of site formation processes to state, "the house-building instincts of the octopus can result in accumulations of potsherds in suitable crannies, including amphorae; this may have been the principal cause of enigmatic distributions recorded on the Sheytan Deresi site in southern Turkey" (Muckelroy, 1978, p. 181).

This fits with my observations over hundreds of dives in Albania, Croatia, Greece, Italy, and Montenegro, where my mentors taught me to check octopus dens for artifacts as an indicator for a nearby shipwreck. The octopus is, in a certain manner, the first archaeologist to find a site, moving artifacts and collecting them in and around its den, which human archaeologists can then use to make an informed survey to locate the main site. Octopuses also live on shipwrecks, making dens inside *amphorae* or among the timbers of more modern vessels. While recording a 19th century shipwreck in Bermuda, I felt a tug and looked down to see an octopus grasping my fluorescent green ruler with one tentacle in an attempt to pull it into its den. Texture and the behaviour of light interacting with an object appear to be important to the octopus. Muckelroy therefore underestimated the octopus by declaring only "house-building instincts", as they also collect objects that interest them. Over the course of the season, octopuses made off with pencils and scale bars, and nearly a camera. At the sunken Bronze Age city at Pavlopetri, Greece, an octopus ambitiously grabbed hold of our 2m shiny steel stadia rod while we were taking measurements. From Sheytan Deresi to current surveys, archaeologists have learned the behaviours of octopuses: their intense curiosity, bordering on mischievousness, and their desire for material objects. What drives these organisms to gather objects? Is it instinctive den-building, as Muckelroy suggests, or does it relate to their intelligence?

Octopus Consciousness

Octopus consciousness has long been the subject of study, as "Cephalopods are evolution's only experiment in big brains outside of the vertebrates" (Godfrey-Smith, 2016, p. 160). Their consciousness is distinct from vertebrates, developed under entirely different circumstances. The octopus does not have the majority of neurons in its brain, but instead two-thirds are found in its arms (Godfrey-Smith, 2016, p. 51). They developed 252-66 million years ago during the Mesozoic Marine Revolution, when they discarded their ancestor's shells in exchange for mobility and intelligence. However, the loss of their shells required them to find or create a protective dwelling. Octopuses are predators and aggressively hunt for prey and fight with other octopuses. They communicate with each other through bright colour changes and displays. However, octopus consciousness is brief as the common octopus (*Octopus vulgaris*) only lives for two years. They live until they reproduce, after which they die, perhaps to prevent competition for the same resources (Godfrey-Smith, 2016, p. 14).

Octopus intelligence, despite its distributed neurons, bears some resemblance to humans. For example, curiosity and touch are common in cephalopods (Godfrey-Smith, 2016, p. 22). Like humans, octopuses possess bilateralism, giving them orientation on the seafloor surface similar to humans on land. Sense of time and space developed early in life on Earth, and there is a shared single-celled ancestor of both humans and cephalopods which could conceive of time and space (Godfrey-Smith, 2016, p. 16). Octopuses have a developed since of self and 'other', and in fact can distinguish between different humans and treat individuals differently (Godfrey-Smith, 2016, p. 19). They display creativity, problem-solving, and even play. In one experiment an octopus used a pill bottle like a bouncing ball to entertain itself (Godfrey-Smith, 2016, p. 31). Play, along with other behaviours, demonstrate the non-subsistence activities that octopuses are known to engage in.

However, octopus intelligence also differs considerably. They can think through their arms in distributed intelligence. Their arms are not simply brains, but versatile and sensitive sensory organs, even perceiving light (Katz, Shomrat and Nesher, 2021). Each arm possesses 2000 suckers, each of which is independent. These also have chemical receptors that perceive touch (chemotactile) and distance (olfaction) (Jozet-Alves, Darmaillacq and Boal, 2014, p. 152). The arms are both tools and weapons, serving as primary means of predatory behaviour, self-defence, and engaging with the world (curiosity, play, etc.). The arms are used for communication and deception, as octopuses use shape changes to blend into the environment or intimidate other octopuses or species. Octopuses are capable of changing colour for communication and camouflage through colour receptors in the skin. While humans are a social species, octopuses are not, making them an example of non-social intelligence. There is no social teaching or knowledge exchange between generations, as parents die before the young are able to interact with them.

Figure 10.4. An octopus carries a coconut across the seafloor, climbing inside it as a den when predators are near (Agarianna76/Shutterstock).

Octopuses undertake what is known as "ecosystem engineering" (Scheel *et al.*, 2018). This consists of modifying the environment to suits their needs, primarily through re-use of materials in den creation. They have excellent spatial awareness, using sites for different purposes, constructing a den where they lives, maintaining a territory in which they hunt and collect resources, and identifying egg-laying sites. Figure 10.4 shows an example of an octopus using a coconut for mobile protection (notably not a marine material), transporting it

across the open and sandy seafloor where predators might easily catch an unprotected and vulnerable octopus. This demonstrates several key characteristics. First, tool use in the manipulation of an object for its own purposes. Second, forethought to carry the object through areas where it is exposed. It demonstrates planning to meet future needs, as the octopus has to "imagine the future and connect the dots between past events, current actions, and future events" (*Real Science*, 2020). This is, importantly, an understanding of causality. Third, it displays environmental and spatial understanding, including areas where it might be vulnerable. Fourth, it shows individual thought, as there is no social training among octopuses and the transportable shelter is a novel concept that this octopus had to conceive of rather than being taught.

Perhaps the most impressive example of ecosystem engineering is a site in Australia nicknamed Octopolis (Godfrey-Smith and Lawrence, 2012; Godfrey-Smith, 2016; Scheel *et al.*, 2017, 2018). A group of Gloomy octopus (*octopus tetricus*) created a series of dens among debris and co-habitat, unusually since octopuses are a non-social species. The site was formed by the deposit of a metal object from a boat and perhaps scallop shells in the 1980s or 1990s (Godfrey-Smith and Lawrence, 2012). There are therefore 30-40 years, or 15-20 generations, of behavioural change and environmental engineering visible on the site. Over the years, the number of scallop shells has increased as the octopuses feed, growing the site and the amount of den-building material. While currently the only known octopus co-habitation site, there may be others since material has been deposited on the seafloor by humans for thousands of years which create oases in the ocean's deserts where octopuses can live.

Figure 10.5. Octopus den, né amphora, on the Battle of the Egadi Islands site (RPMNF/Soprintendenza del Mare).

Octopodology: Non-Human Material Culture

Can a study of octopus material culture be undertaken? This is a human approach to archaeology of octopus 'culture'. Culture here is without a doubt a problematic term since octopuses are a non-social species; however, it refers to the use of objects in the octopus' environmental engineering, play, and curiosity-driven collection. An examination of the Battle of the Egadi Islands reveals octopus behaviour in the debris field of a battle (Fig. 10.5).

The engagement occurred on March 10, 241 B.C. and was the decisive battle of the First Punic War between Rome and Carthage. The survey has run from 2005-2021 and mapped over 270 km^2 of seafloor between the islands of Marrettimo, Levanzo, and Favignana off western Sicily. The battle is spread over a vast debris field and the main concentration of artifacts measures approximately 4x2km (Fig. 10.6). The project has mapped 1,376 artifacts, including 1,092 *amphorae* and ceramics and nearly all display evidence of octopus (*Octopus vulgaris*) use at present or in the past (Tusa *et al.*, 2021, p. 169). The piles of material (e.g. stones, shells, etc.) that develop outside the octopus dens serve as new structures that modify the seafloor and change the flow of the current, leading other species to subsequently inhabit them. These structures remain in use and affect the environment, even years later after the amphora which initially formed the den is removed by fishing nets or archaeologists. Octopolis in Australia provides an estimated 30-40 years of octopus site development, but the Battle of the Egadi Islands provides over 2,250 years of octopus archaeology. While the timespan that the Egadi battle site has been submerged represents approximately 90 generations of humans, it is over a thousand generations of octopuses. Coupled with the fact that the ships were floating for a few years but have been octopus habitation sites for 2,250 years, the site stands as an excellent comparison of human versus non-human archaeology.

The site plan of the battlefield is shown in Figure 10.6, composed of a basemap of multibeam data, which color-codes depths. The lighter colours indicate shallower regions, while darker are deeper. In the centre of the site plan one can see the main concentration of artifacts clustered to the east of a rocky reef system, shown in green. To the east is a flat plain of sandy seafloor, which looks like a lunar landscape when viewed through the remotely-operated vehicle's (ROV) cameras. This is a landscape that is not conducive to octopus habitation or hunting, nor is it suitable for other species which typically live among reefs such as eels, fish, and others. However, following the deposition of the battle artifacts, this region became filled with small oases suitable for reef species. As a result, the large sandy plain east of the rocky reef is now inhabited by a wide range of species that could not have lived outside the reefs prior to 241 BC, creating an ecosystem through deposition of the shipwrecks. Most artifacts are no closer than 20m in proximity to each other, many are further part, since the ships broke apart at the surface and percolated through the water column to the seafloor. The battle therefore served a prompt for the current ecosystem, creating inhabitable spaces for the species living on the reef to venture further out into the sandy territory to the east.

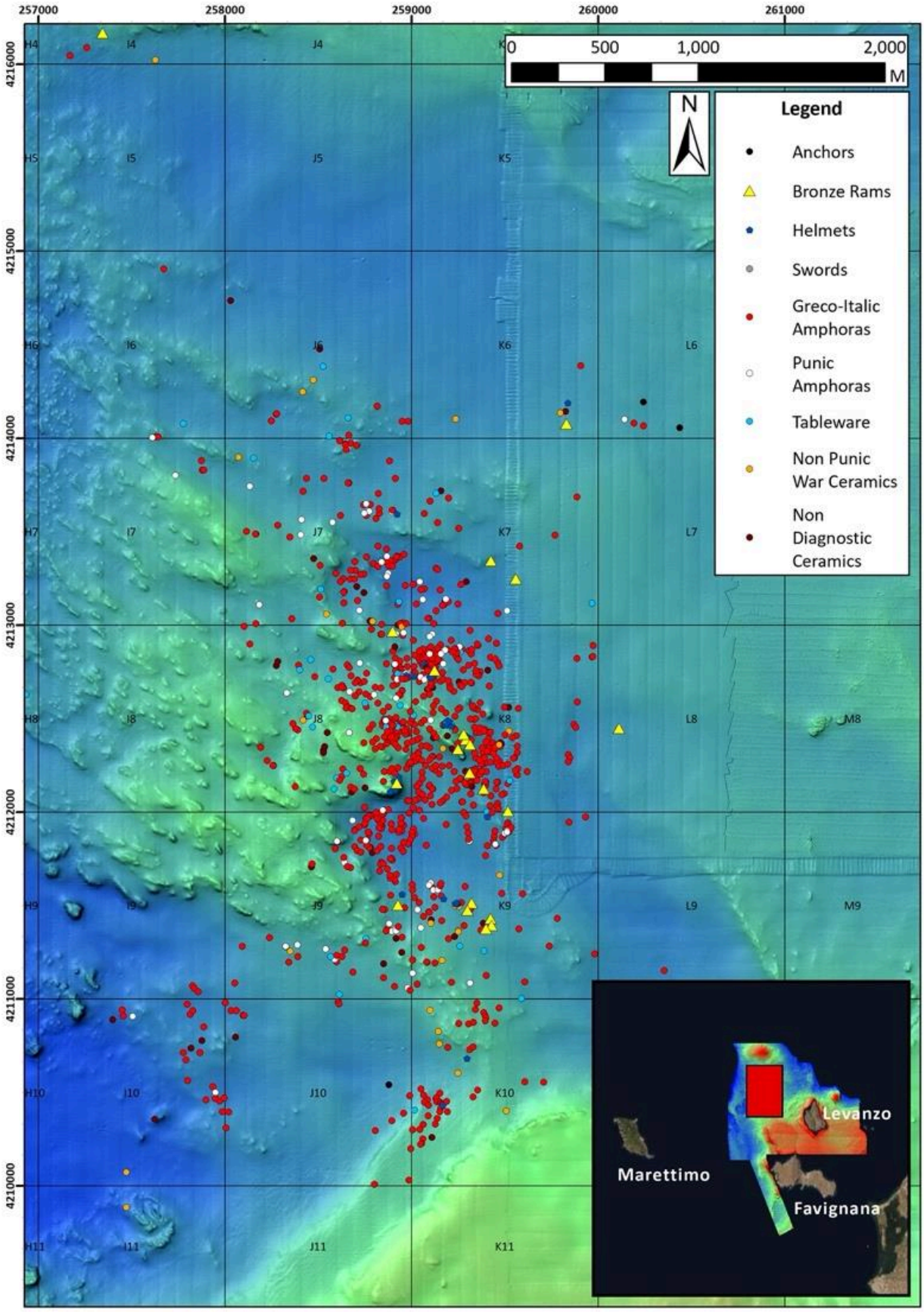

Figure 10.6. The site plan of the Battle of the Egadi Islands, showing the distribution of artifacts in an area of approximately 6x4km; each grid square measures 1x1km (RPMNF/Soprintendenza del Mare).

Pétursdóttir argues that "Traditionally, *meaning* in archaeology is constructed through the inherent, hierarchical ordering of archaeological assemblages confined to certain localities, and relations between these" (2017, p. 196). These criteria are found with the octopus' dens and territories. The octopuses demonstrate spatial awareness and a cognitive map of the territory that they collect resources within. At the Sheytan Deresi shipwreck, the octopus could distinguish its den in a specific pithos from the other *pithoi* on site. At Egadi, it is the same. Octopuses have large territories for hunting and bring prey, as well as objects that they collect, back to their dens from this catchment area. The seafloor is largely non-descript, with stones and other objects few and far between. Upon arrival at an amphora, however, one immediately sees a cluster of objects surrounding it. These represent generations of octopus foraging, collecting shellfish, stones, and artifacts around their den. If looking for a human parallel, this would be termed a shell midden, which are key features of human habitation sites, especially in prehistoric societies (Gamble, 2008, p. 142). There is also an awareness of temporality, so far as the octopus life cycle, as each octopus site is occupied for 2 years and then re-organized by the next inhabitant.

Within the dens, there are three categories of objects that octopuses have made use of. The dens on the Egadi site are composed of ceramics, typically *amphorae*, bronze helmets and warship rams, or piles of artifacts, stones, and shells. These dens serve as dwellings, as well as locations for attaching eggs. Inside the dens are occasionally found the beaks of octopuses, the only hard object in their bodies that preserves, indicating their death due to age or consumption by predators. The first category of object associated with the den is, naturally, food items and much of the material around the entrance to dens are indigestible material from food sources, such as scallop shells (Fig. 10.7, left side). These discard piles create shell middens. In natural areas without *amphorae* these discard piles can be re-formed as building material to make new dens.

Second, octopuses maintain doors for their dens, which are flat or wide objects which can be held over the entrance when they are inside the den to block predators (Fig. 10.7c). The rocks are brought to the den from the surrounding region; in the area of the Egadi battle they must have been brought from quite a distance, as rocks are uncommon on the sandy seafloor. These 'doors' are always at hand, or tentacle, ready for deployment. While not constructed or modified, the doors represent conscious tool use and are, in fact, composite tool use of the den and door. Figure 10.7 demonstrates door use in an amphora den. If one views the video stills in sequence, one can see the octopus focused on the 1.5 ton ROV robot outside its den. It subtly and skilfully pulled the rock resting on top of the scallop shell with one tenacle. Note the twin scallop shells outside the amphora. Both are placed upside down and are equidistant from the entrance, and both contain large stones that can block up the entrance. Whether this placement of "doors" on scallop shells is coincidence or purposeful is unknown, but certainly the mapping of octopus dens as sites warrants further study.

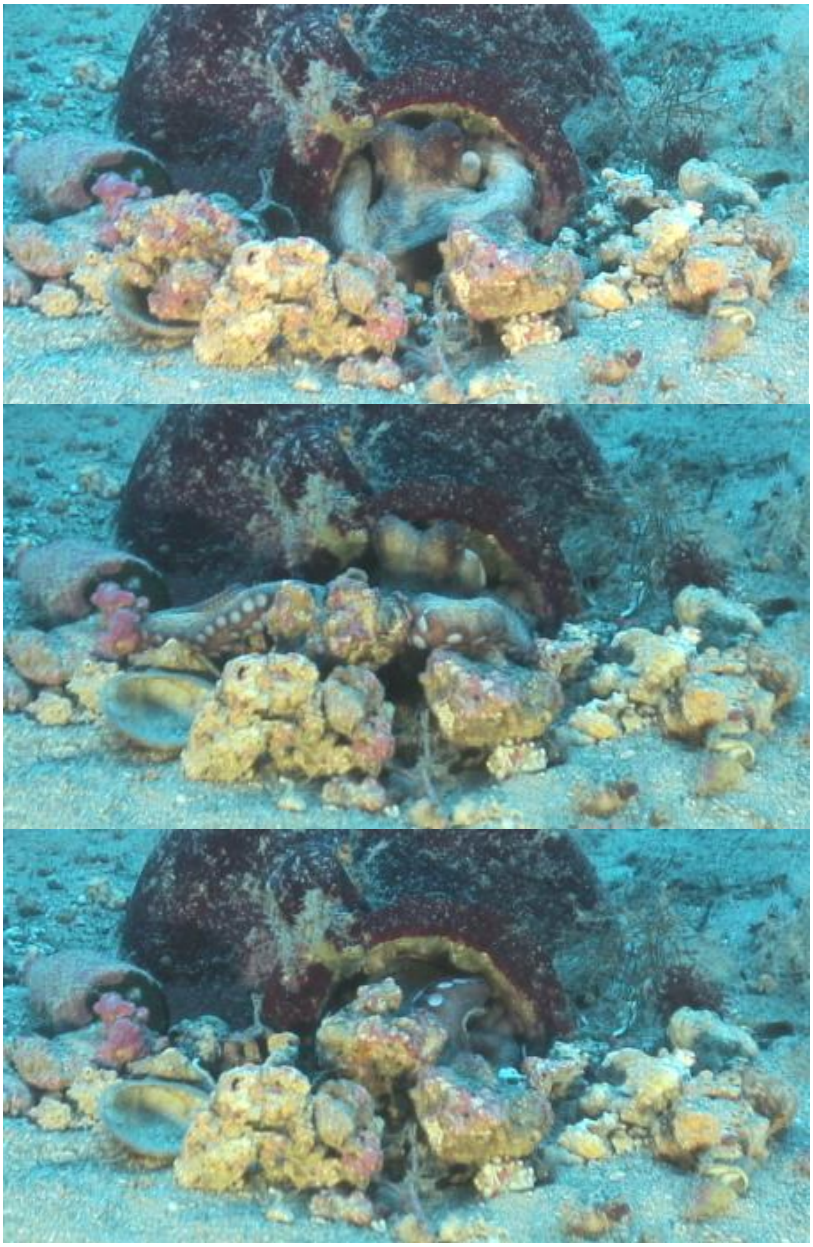

Figure 10.7. A series of video frames showing an octopus demonstrating the door or shield method of protection, as it reaches out of the amphora to grasp stones and pull them into the mouth of the amphora (RPMNF/Soprintendenza del Mare).

Third, octopuses collect objects of interest, which are neither food items nor objects that serve a functional purpose. Significantly, while items of categories 1 and 2 are typically kept at the entrance to the den, category 3 are often kept inside the den. It was noted earlier that octopuses will steal objects from archaeologist that have weight, colour, textures or affect light behaviour differently from those in the surrounding environment. Touch and curiosity are key features of cephalopods, and non-marine and unusual objects appear to be curiosities for octopuses. Inside amphoras that have been converted into dens, archaeologists have found ceramics, nails, bronze pieces, and ballast stones (Fig. 10.8). The objects found inside the amphoras differ from those outside, which is evidently part of a housekeeping element within the den. There is, then, a separate relationship between the objects outside the den (food remains and protective tools) versus the inside (curiosities). If one examines the objects in the den through the lens of a gathering of the assemblage's relationships, there are strong relations between the amphora and categories one and two, as their deposition had

interconnected roles related protection and subsistence. However, category three has weak relationships with the other objects in regards to octopodology. These objects have no relations within the deposition of the assemblage other than with the octopus' emotional response to its sensual characteristics.[9]

Octopus tool use, either with the portable coconut 'shell' or the prepared rock 'doors', raises the question of whether octopuses theorize. As discussed earlier, they are able to conceptualize space and problematize, as readily evident in the use of the coconut shell as a portable tool to cross open areas where they are at risk. In Figure 10.7, does the octopus consider the stone within its relations to the shell it rests upon, the entrance to the amphora, and its own vulnerable fleshy body? Would an eight-limbed Heidegger distinguish between ready-to-hand and present-at-hand if its brain is in its hand (Heidegger, 2010); is use and theorizing separate for the octopus? The octopus' distributed neurons may result in the den assemblage being ready-at-tenacle for unconscious use in the manner of humans, but equally it could mean there is no distinction for the cephalopod.

In *Tool-Being,* Harman argues that Heidegger misunderstood that present-at-hand in fact reflects that objects are withdraw from humans, but also other objects (Harman, 2002, pp. 2–6). The octopus, living in the sea inside a post-human amphora colonized by a dozen invertebrate species and surrounded by things that are neither cultural nor natural, likely has a level of understanding of the potential of objects is never exhausted. Unlike Heidegger's hammer versus broken hammer, the octopus' tools already exist as many things. Olsen argues that Norwegian fishermen are aware of the OOO nature of objects, even if they do not read contemporary philosophy. He writes, "these very northern fishers knew well the OOO wisdom that the boat (as well as the sea) is more than what it is doing at any moment and, and their use did not at any time fully exhaust its reserve of potentials" (Olsen, this volume). The same may be true for the octopus, who interacts with objects in a myriad of ways while immersed in the hyperobject ocean.

When examining an amphora re-used as a den, it is evident that it is not simply an artifact colonized by a species, such as the sponges or corals that grow on *amphorae*. Instead, octopuses repurposing an interior space, modifying it and the environment, and collecting tools and materials important to the inhabitant. Therefore, using an archaeological approach, it is possible to construct meaning from an octopus assemblage. There is a dwelling and shell midden, three categories of material objects forming the den and its use, as well as beak remains, territories. This is, however, a human approach to non-human archaeology and, as the following discussion examines, the octopus might conceive of things quite differently.

[9] This is exempting the non-octopus lives of the objects, but the focus here is on the deposition of the assemblage by the octopus.

Figure 10.8. A conservator catalogues the items found inside an amphora found on a shipwreck site in Fournoi, Greece, which included ballast stones, tableware, amphora fragments, lead sheathing, shells, and natural stones, much of which was likely brought inside by octopuses (Author; Fournoi Underwater Survey).

Discussion

140 million years ago the octopus discarded its shell, giving it mobility and intelligence, but requiring it to find or create a dwelling. 4.2 million years ago Australopithecus stood on the plains, leaving the safety of the trees. Both octopus and human are beholden to our origins and creating material existences, the octopus a den and humans a social connection. Octopuses pile detritus to create their homes. Walking the vast underground voids of pozzolana mines outside Rome, one cannot help but think that humans, too, pile up materials to create our homes.[10] Ecosystem engineering is evident with both, with the primary difference being the extent of the metamorphosis of the material.

So far, we have, quite purposefully, considered octopus dens in human terms - settlements, shell middles, conceptual space and territory, etc. The purpose was to demonstrate a consciousness in the material record of octopuses. Now we must consider the human material culture from the octopus' perspective, an altogether different exercise. This is something unknowable and recalls Thomas Nagel's *What Is It Like to be a Bat?* (1974), where human conception of what it is to be a bat is outside our conception since we have not been a bat from birth. In *Speculative Annihilationism*, Matt Rosen considers the material culture from the Lomekwi 3 site, which was created approximately 3.3 million years ago by Australopithecus (2019, p. 4). How can human archaeologists interpret the material record of a non-human species, although hominin, that has been extinct for over a million years? We know practically nothing about Australopithecus and imagining one becomes a correlationist trap. The archaeologist is interpreting "what it would be like for a human (and a human in our time and in our culture and with our scientific method, etc.) to imagine being the

[10] While exploring the mines with the author, Duncan Keenan-Jones observed that for all the building upwards in Rome, there was an equal quarrying downwards in pozzolana, stone, and other materials.

Australopithecus who made or used these artifacts" which is quite different to an objective examination of the Australopithecus (Rosen, 2019, p. 9). While Australopithecus was a hominin species with a related physiology, the octopus takes us even further afield. This is, then, a thought experiment with a human in the guise of an octopus. We must, as Flusser and Bec argue for the vampire squid, adjust the mirrors to view ourselves from the octopus' perspective. The minds of cephalopods are inaccessible but imaginable (Flusser and Bec, 2012, p. 30).

The octopus inhabits a world that is not simply objects in immediate view, but one in which the octopus conceives of space and objects, arranging them to suits its needs. The Egadi battle is an exceptional example, as where humans see the carnage of a battle, the octopus sees a relative utopia of ideal homes. The battle deposit increased the octopus' range from the western rocky reef into the eastern sandy plains, allowing them shelter in new regions. It must have expanded the population and, though octopuses do not share information socially or from parent to child, led to generations of octopuses modifying their environments based around amphora dens. As these generations of octopuses created and maintained spatial territories for hunting and exploration, they brought artifacts, stones, shells, and other materials to these nodes in the landscape. It is evident from the categories of objects discussed above that octopus 'materials' are focused on arranging and re-use, modifying the environment to suits its territory. However, the third category suggest that individual octopuses collected curiosities with no functional or subsistence purpose. Within this category lies something we might recognize as culture. Based colour, weight, feel, chemical taste or smell, or behaviour in light, the octopus seemingly finds meaning in these objects and brings them into its protected space within its environment. While biologists have observed octopus 'play' with artificial objects in a lab, there is little understanding of these types of behaviours in nature. Archaeological sites may offer insight into thousands of generations of the octopus mind.

The octopus experiences our material culture as alien. Whereas humans often create through reductive (e.g. woodworking, stonework, butchering) or additive (e.g. ceramics, textiles, metallurgy) processes (Gamble, 2007, p. 141), conception of these processes is foreign to the octopus who relies on foraging and adaptive re-use. As a social species, humans are interested in evidence for – and developing theories of - cultural and societal change. However, as a non-social species an octopus archaeologist would not share that approach. The octopus might wonder what the amphora meant to an individual and, as a result, we might better consider a den assemblage and its meaning to the individual octopus that collected the objects – a difficult challenge using the social methods that humans have developed. The octopus would be focused on individual motivations: hunger, protection, procreation, play or curiosity, and how these manifest materially. If human archaeologists perhaps err too much toward social-ritual interpretations, then the octopus might focus on individual-material interpretations. The individualism of the octopus offers an alternative to the social nature of humans when considering non-human archaeologies.

The octopus would also focus on material aspects of artifacts rather than their appearance. As our species first stood upright to look out for predators and resources, sight became the dominant sense for experience and language. Sight is the means of conceiving knowledge and communicating that conception. The male gaze, as identified by Feminist Theory, highlights the primacy of sight among humans. Therefore, human study relies primarily on visual data collection and presentation, rather than our other senses. There is, then, a difference with the octopus, who primarily experiences its world through the touch of their

tentacles. It is, however, a fundamentally different touch from that of humans, as each tentacle possesses chemical receptors and neurons. It is as if the octopus probes an object with touch, chemical "smelling" or "tasting", and its mind, so conception and knowledge may be understood through grasping or holding. When examining new materials brought to its environment in the fieldwork examples discussed earlier, the octopus grasped the objects in order to interrogate them. When Flusser and Bec ask "Is it the same world, only seen from a different perspective?" (Flusser and Bec, 2012, p. 30), the octopus might pose the question about humans by asking, "Is it the same world, only held-thought from a different perspective?"

The octopus conceives of humans, in an octopocentric manner, as a fellow surface dweller, but in Earth's second ocean. The atmosphere is less dense than the water, but it is an ocean of air that separates us from the vacuum of space. Because we exist within the atmosphere we rarely conceive of it in this way, but it would be evident from the octopus' perspective. The question, "do fish perceive water?" could be asked of humans and air, as it is easy to overlook the atmosphere-ocean as an entity we exist within. If the cephalopod archaeologist were able to study our being, it would see us as surface dweller in the atmosphere ocean, creating dwellings that we heap up in a similar manner to themselves. We also take mobile ships across open, vulnerable spaces much as the octopus does with coconuts on open seafloor. The octopus might find kin with us as both predators and prey that possess vulnerable fleshy bodies that require dens on the bottom of oceans – albeit different densities – through ecosystem engineering.

Reflexivity and Alien Archaeologies

While archaeology is often a mirror for our own values, in the octopus we find consciousness and evidence that material culture may not solely the domain of humans. After considering octopodology, it is worth examining the prerequisites for archaeology extracted from the anthropocentrism. What is required for the study of material remains to understand consciousness in a species' actions?

- Does the organism have a sense of time and space?
- Does it show an understanding of the connection between past events, current actions, and future events?
- How does the organism orient their world? Is it surface dwelling or pelagic?
- Does the organism have a sense of self and other?
- Is the organism social or non-social?
- Does the organism undertake ecosystem engineering? Does this include materials that are preserved as a physical record?
- What behaviors are observable? Are these subsistence or non-subsistence behaviors?
- Does the organism attribute meaning to certain objects or environmental features?

These questions aim to broadly address material records of 'other minds' and aid the interpretation of material records created by non-humans. Much of archaeology has focused on understanding large-scale social behaviour through material remains, but the octopus demonstrates that social behaviour is not a prerequisite for consciousness or material remains that reveal information about the past. Instead, it is evident that a conception of self and other may be more important than social systems, as this is fundamental to consciousness. The questions serve as a guide, while attempting to minimize our anthropocentric biases.

Conclusion: Oceanic Thought and Pelagic Being

The persistence of human objects in the sea meets with a consciousness older than our own, resulting in the octopus re-using archaeological materials as part of their ecosystem engineering. Despite our physical differences, the octopus and human are surface dwellers, one on the seafloor and the other on atmosphere-floor. Our bodies evolved as bilateral and our conception of the world is inherently surface-based. There is another, more alien, form of being that is worth considering: the surface-free and unencumbered pelagic being where the majority of Earth's biomass experiences life. Free-floating species exist devoid of surfaces, boundary-less in an ever-changing environment of water and currents. Whereas elements of existence are recognisable in the surface dwelling of the octopus, pelagic-being is quite alien. For this we return to Flusser and Bec's vampire squid living in the ocean abyss. If humans wish to consider alien archaeologies then we need to venture outside our self-limiting views and unbound our thought from surfaces. If one day humans conduct archaeology in space, it will not be on a surface but hurdling at 27,500 km per hour in space around the planet – a pelagic proxy.

Pelagic is a term that refers to the intermediate zone within the ocean's stratigraphy. Imagine a water column from the deep ocean to the surface. At the bottom are the benthic and demersal layers, where creatures inhabit the seafloor surface. Between the surface that interacts with the atmosphere and the seafloor are the pelagic layers, from near surface epipelagic to the deep mesopelagic inhabited by the vampire squid. Pelagic being consists of multitude of creatures, from the most plentiful species on Earth – the microscopic plankton – to the largest on the planet – the blue whale. Pelagic species are diverse in nature, but share one commonality: they live free of surfaces, free floating or swimming in an enormous environment.

Rarely do humans consider pelagic being and, initially, one might think that there is little material culture in the pelagic zone. However, archaeology is present. There is the exceptional, such as a whale that carried a stone harpoon in its side for 133 years (George *et al.*, 2011), to the commonplace, such as microplastics which float endlessly throughout the oceans and form a global layer (Cole *et al.*, 2011). Then there are the much larger and troubling trends, such as shark migrations that shifted , not temporarily, but permanently through deepwater areas due to the European slave trade as the enslaved were murdered by drowning in the thousands (Rediker, 2008; Samuelson, 2018). Pelagic being is culturally shaped, such as the shark migration patterns, and culturally shaping as seen with political entities, such as the Hanseatic League, and settlements, such as Copenhagen, would not exist without the pelagic herring.

However, more than archaeology, pelagic thought is useful as metaphor and device for thinking differently, rejecting the conception of surfaces and moving toward a truly oceanic perspective. This is because the ocean is an exceptional example of objects in OOO, where the real object is pelagic, but we perceive only interactions at surfaces. We most often interact with the surface of the ocean and relatively shallow depths (e.g. sailing, swimming, etc.) and the seafloor surface (e.g. diving, dredging, mining, etc.). As evident in maritime archaeology, marine legislation, and literature, humans conceive of the ocean from the perspective of these surfaces. However, the ocean, the *real* ocean, is primarily pelagic with all of its great scale, mass, and pressure. Absent a surface to stand on, humans only see water and consider it – without form or landmarks – to be nothing. Lacking interaction between surfaces to display change (e.g. storms and erosion) humans have difficulty conceiving of

time and space. I raise this not only to be reflexive about how human perception and thought are surface-oriented, but because the ocean is a wonderful example of objects in OOO. Objects are withdrawn and it is only their sensual characteristics that interact with other objects (and us). Objects can be conceived as pelagic and we typically only interact with surfaces. Humans only interact with the edges of the ocean, its surfaces where it touches the atmosphere and land. However, the ocean interacts with the moon, creating currents, and the atmosphere interacts with the sun, creating winds. The greatest storms rage at the interface of the ocean and atmosphere, the ocean absorbs the forces such that a calm exists throughout the ocean's depths except for the small layer where the sensual characteristics interact.[11] Human perception of the sea is shaped by a small proportion of the vast waters. Accounts of the ocean leap from the surface to the seafloor, where the waters are contact with the atmosphere or Earth and interactions animate the objects, but away from the surfaces –withdrawn and imperceptible – is the vast, real object.

What does this mean? Our understanding of the ocean is that of surfaces, where the ocean object interacts with objects such as the atmosphere and land. Within the excluded area is the heart of the ocean, the pelagic space that drives global climate and weather, and the water cycle that sustains life on Earth. It is as if the ocean is a book and humans focus on the front and back cover, while the bulk remains largely unread as humans skim between surfaces. As the Blue Humanities and Oceanic Thought have been a means of gaining new perspective by thinking through the sea (Mentz, 2009; Steinberg and Peters, 2015), Pelagic Thought can build on these and attempt to break humans of our dependence on surfaces. Surfaces are deeply ingrained in our conception of being and the world. There is no better evidence of humans as surface-thinkers than when, in 2010, Russia planted its flag on the seafloor at the North Pole. Located under 4,261 m of water and meters of ice, it is unviewable to any human and meaningless to sea creatures, existing as a dark artifact. Meanwhile, in the surrounding water, pelagic thermonuclear reactors at the heart of war machines pass by each other to transport warheads that can destroy entire cities on the surface, manned by hundreds of humans who can neither look outside nor perceive the environment they float through. Instead, they pass dumbly, deprived of organic senses or tactility, seeing through sound waves that bounce off the surfaces of marine environment to ensure their pelagic bubble is preserved intact.

[11] There is opportunity for life in these interaction zones, however. Where objects interact, such as land and sea, or sea and atmosphere, life experiences an efflorescence. In an object-oriented ecology, tide pools, for example, and are among the world's most diverse ecosystems.

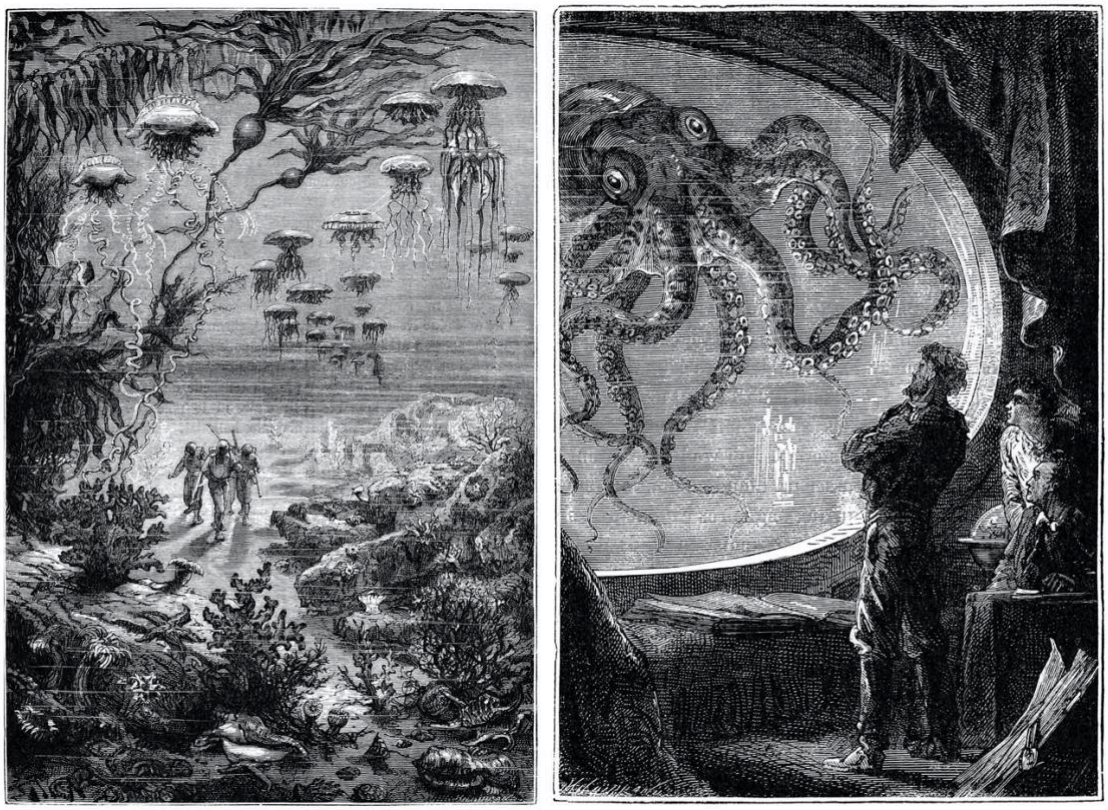

Figure 10.9. Jules Verne conceived of humans inhabiting the seafloor surface as they do on land, despite the movement of the submarine *Nautilus*, and the mesopelagic species such as jellyfish and giant squid are portrayed as alien and terrifying (Alphonse de Neuville).

In *Twenty Thousand Leagues Under the Sea*, Jules Verne conceived of Captain Nemo's crew living and collecting resources from the seafloor as if the surface of the land (Fig. 10.9). The pelagic beings in Verne's conception of the ocean, such as the giant squid and jellyfish, are portrayed as strange and displaying otherness. Pelagic life is even more alien than the octopus. The vampire squid is said to dwell in 'nothingness' because there is no surface that we recognize as a place to dwell. But the squid might see it as dwelling in 'everything' because its pelagic home is near limitless mobility. The squid exists fully in its environment in every direction, not simply on a surface. When turning to look back at ourselves from the squid's perspective we can see how much of our thought is framed by our existence on surfaces. Pelagic thinking might offer a greater perspective moving forward. The transformative challenge of the Anthropocene is experienced throughout existence from the molecular to planetary scale. The "aggregate monstrosity" permeates every aspect of Earth from soil to water to air (Witmore, 2019, p. 143). The Anthropocene is, then, pelagic in that it inhabits both very small (e.g. DNA) and immense (e.g. global climate) spaces at once, absorbing and enmeshing life on Earth. Addressing the persistence Anthropocene objects will require humans to look beyond surface-thinking, adopting new perspectives about the afterlives of objects and moving away from the human mindset that led us to the present circumstances.

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