

Science AMA Series: I'm Peter Campbell, co-director of the Fourni Underwater Survey that recently located 22 ancient shipwrecks in Greece. We're looking for shipwrecks and sunken cities to understand o

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Abstract

Hello folks, I'm with a team from the Greek Ephorate of Underwater Antiquities and RPM Nautical Foundation. Last month we conducted an underwater survey around the Fourni archipelago in the eastern Aegean Sea and located 22 ancient shipwrecks. These islands are situated along ancient trade routes dating as early as the Neolithic (Stone Age) and used through the Bronze Age, Classical Period, and into modern times. The massive volume of trade means there are lots of wrecks. It also made Fourni an infamous pirate den for centuries. Besides searching for evidence of ancient trade and piracy, we were looking for indicators of sea level change to reconstruct the region's ancient environment and understand future changes. We'll be back at 1 pm ET (10 am PT, 5 pm UTC) to answer your questions about underwater research! Edit: Thanks everyone! It is midnight here in the UK, so it is stopping time. I'll answer the questions that are left tomorrow, but if you have any underwater archaeology questions in the future you can always find me at /u/maritimearchaeology or on Twitter @peterbcampbell. Everyone in the US: Enjoy Halloween and make smart costume decisions- it is cold out there.

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PETER-CAMPBELL [R/SCIENCE](#)

ABSTRACT

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Last month we conducted an underwater survey around the Fourni archipelago in the eastern Aegean Sea and [located 22 ancient shipwrecks](#). These islands are situated along ancient trade routes dating as early as the Neolithic (Stone Age) and used through the Bronze Age, Classical Period, and into modern times. The massive volume of trade means there are lots of wrecks. It also made Fourni an infamous pirate den for centuries. Besides searching for evidence of ancient trade and piracy, we were looking for indicators of sea level change to reconstruct the region's ancient environment and understand future changes.

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What item -in your opinion- is the best item you have ever found in a shipwreck and why? And what's the most unusual/weirdest item that you have found in an ancient shipwreck?

p.s I think this is an amazing find and I am completely fascinated by all things ancient world. I'm currently studying the ancient world at university and finds like yours/people like you just interest me so very much. So thank you for being so interesting and bringing information to the world!

[excellent_916](#)

I always find the personal effects of the crew the most fascinating. A lot of ships we find in the Mediterranean are bulk carriers (like shipping today), so the cargos can be a bit repetitive. However, the crew's personal effects, such as cooking pots or lamps, give the ships a human element and you remember that it was real people thousands of years ago that sailed on these ships, even perhaps lost their lives.

I was on a deep survey in Albania and one diver found a stone tool. It fits perfectly in your hand and is squared off into a rough rectangle. However, the bottom edge has hole which extends through the length of the stone but stops before it gets to the other side. The stone is a type that doesn't match the area it was found. Was it some sort of drilling implement? Absolutely no one has any idea what it is and it just goes in the "unknown" category. It was documented and its in the national museum, but its a

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mystery what it is and how it got there. These things pop up from time to time and its a mystery until we find more like them.

Thank you for your interest in our research! Hopefully more people like you will go out and explore the world.

What can you tell us about the technical details of how you found the wrecks?

What is the depth of the shipwrecks, and how were they found - random / systematic diving (by Scuba? piloted ROV? AUV sweeps?), or some method of seafloor mapping (what was the method)?

[khaddy](#)

The success of this project was a mixed methodology. The wrecks range in depth from 5 to 55m. Maritime archaeology is super tech oriented and RPM Nautical Foundation (my organization) specializes in deep water survey using multibeam, remotely operated vehicles (ROVs), and autonomous underwater vehicles (AUVs).

However, we went old school for this project (not least because our AUV got caught up in customs). We used the method that George Bass and the founders of underwater archaeology used- we asked the locals. There are a lot of fishermen who pull things up in their nets, so they took us to areas where they remembered their nets snagging. One of my good friends is a former sponge diver and he remembered seeing wrecks back in the 70s, so he took us to several locations. We combined local information with diver and ROV surveys to locate the wrecks.

Of course it makes sense to speak with the locals, but you'd be surprised how often researchers fail to do so. If we had only used multibeam and the ROV we probably would have only located 3-5 wrecks.

There is *a lot* of money for projects that throw technology at a problem, but the interesting thing about archaeology is that a lot of things are hiding right under our noses. In the future we will use high tech methods (since we have them), but the heart of this project will still be working with the local community.

Have you found any evidence of structures under the water, that would prove existence of a civilization that lost their lands due to rising water levels?

[CorruptDuck](#)

We found less evidence of sealevel change at Fourni than we had hoped. We were looking for submerged settlements and notches (formed from waves crashing against a rock face for centuries) to tell us how much the sea had changed. However, other sites all around Greece give good indications of sea level change.

[Pavlopetri](#) is the oldest known submerged city and it is located in the Peloponnese. Earlier this year a team made an exciting discovery of a [massive Bronze Age city](#) in Greece, literally right under our noses- it was next to a tourist beach resort.

Sea level change offers some of the most interesting discoveries. There is current a big [project in the Black Sea](#), mapping the deep water coastal change as well as looking for shipwrecks. If you look at sea level in the past, the earth has changed significantly. You used to be able to walk from Copenhagen to London on dry land. Perhaps the most significant finds about our collective past may come from beneath the sea.

You look at where cities are located today and it is based on (geologically) quite recent sea levels in a

dynamic world. We're all clinging to mountain tops and lying to ourselves that it is dry land.

What are the biggest "known unknowns" that you think shipwreck excavations will help uncover? Have any "unknown unknowns" have been discovered recently? Do you think you can find any ships from the "Sea Peoples?"

[iorgfeflkd](#)

There are so many known unknowns in archaeology! The biggest in maritime history is the trireme. In fact, up until a few years ago we didn't even have an example of a naval battle. RPM Nautical Foundation (my organization) and the Soprintendenza del Mare located the [Battle of the Egadi Islands](#) from 241 BC off Sicily just a few years ago, which was the battle that put Rome on the road toward empire. It is the first naval battle ever found, which is surprising given all the battles we read about. And we have never found a Classical trireme like those used by the Athenian navy. Many people have sent out fruitless expeditions.

As far as unknown unknowns, that area is dominated by people research drown landscapes. The historical record is pretty good at giving us hints on what to expect from later periods, but an incredible history of the human race lies beneath the sea. From when we became anatomically modern humans around 140,000 years ago up until around 10,000 years ago, global sea levels were as much as 80m lower. Humans were living in all those spaces that are now covered by the sea. So pre-writing underwater settlements are complete unknowns, but they have incredible stories to tell. Just this spring a team announced that they had identified wheat DNA from a submerged settlement off the southern coast of the UK that dated to the Mesolithic- far earlier than was expected for wheat in the UK.

I'd love to find some Sea People vessels. If the [Medinet Habu relief](#) is accurate then they might be quite distinctive. However, we haven't found anything that old at Fourni. Bronze Age ships are very rare, but as we search wider then we might stumble upon them!

The article mentions "unique cargoes, some of which have been found for the first time....". Can you give examples, and do these items change any current concept of maritime trade in their respective periods?

[show me the math](#)

Yes, good question. We had three vessels carrying amphora types that were known from terrestrial excavations, but have not been found (or at least published) as shipwreck cargos previously. These were cargos of amphoras- the terracotta predecessor to barrels- that carried wine, olive oil, fish sauce, and similar products. Its a bit of a simplification, but each city had its own distinct style of amphora and the form varied depending on what it carried. This way we know roughly the time period and origin of amphoras.

City excavations tell us what types of amphoras were used and traded in different periods based on the stratigraphy (layers of sediment deposited over time), but these amphoras are often broken and fragmentary. On shipwrecks you often have the whole amphoras. So we knew about these types of amphoras from fragments found on land, but it is the first time that we have a whole cargo of each of them.

What are the cargos? The first is Archaic Period amphoras from Samos, an island very close to Fourni. The Archaic Period spanned from roughly 700-480 BC, right before the Classical Period (think the defeat of the Persians in 300 and the rise of the Athenian Empire). It was an important period of Greek colonization, where Greeks took to long distance sailing across the Mediterranean. These amphoras are only known from Cyprus and Egypt, plus a single example from Samos. This wreck is therefore

quite significant.

The second is a cargo of 2nd century AD amphoras from the Black Sea. These are among the largest amphoras ever made and have only been in fragments on land excavations. It has been a mystery what they carried, but due to this wreck we now know. But you'll have to read the forthcoming publication to find out :)

The third is a cargo also from the Black Sea, of wine amphoras nicknamed "Sinopean carrots." These date to circa 300-700 AD, a period of change in the Mediterranean world. They were manufactured in Sinope on the southern Black Sea coast and were likely on their way to the Levant.

What happens to the artifacts you discover?

[CorruptDuck](#)

Very good question! All artifacts remain in situ on the seafloor, except for a representative artifact from each wreck that is collected for conservation, scientific analysis, and archiving. Underwater cultural heritage is non-renewable and a limited dataset. Each wreck is unique in several ways. In the last 20 years we have seen great advances in analysis techniques, but many of these are not possible on conserved artifacts. For example, we can recover ancient DNA from ceramics that haven't been conserved, but we cannot recover DNA from the ambitious whole wreck excavations that were conserved during the 60s, 70s, and 80s. In order to leave samples for future researchers we thoroughly map the sites and take the archive sample, but otherwise leave everything else in situ. This is also the only way for other researchers to replicate our findings if they want to test our interpretation of the site.

This also allows divers to visit the sites and experience the thrill of ancient wrecks.

Fourni is a beautiful island that tourists would love, so I hope that one day they open an archaeological museum that will function as the archive for the project's finds. Right now the artifacts we brought up are undergoing analysis and conservation in the Ministry's laboratory, but perhaps one day they can go on display in Fourni.

Do you find any evidence for bronze-age transport of seeds? I'm interested in the spread of brassica crop ancestors from the eastern med to atlantic coasts.

[jay_moo](#)

We haven't found any Bronze Age wrecks; however, Fourni is located along the primary crossing route from Asia Minor to mainland Greece. It certainly is possible that there are Bronze Age wrecks in the vicinity of the islands.

So will you investigate the items on the ship at all or is this solely focused on environmental aspects?

[flipponater](#)

Yes! Sea level change is just one aspect. We have shipwreck and ceramic specialists. Expeditions to the eastern Aegean are costly and permission is limited, so we try to get as many specialists as we can to participate. We'd like to become more multidisciplinary in the future, so calling all proposals by researchers!

Good morning,

Typical SSS/Mag/MBE for your initial exploration, or are you using some other kind of equipment to hunt for the wrecks?

(I am a hydrographer by trade)

[47South](#)

Great question! We usually use multibeam for seafloor mapping to search for ancient wrecks, though we use sidescan or sectorscan sonar and magnetometers for historic (16th century to modern) wrecks. Ancient wrecks are usually just piles of cargo on the seafloor, while later wrecks have some structure still standing that shows up real nice on sonar. Historic wrecks also usually have a lot of iron that shows up on mag.

For this project we used the best remote sensing equipment there is: generations of oral history and countless hours on the water. Sponge divers, free divers, and fishermen came out in droves to help us. Fourni is an amazing island with a rich maritime culture and the local response to the project was incredible. They took us to locations where they remembered seeing or catching things in their nets, which allowed us to greatly narrow down the search area. We had an ROV and tried to get our AUV (shout out to [OceanServer!](#)) over, but had some customs issues. In the end, the most effective means was local knowledge and diver surveys.

What is your favorite shipwreck? As in, which shipwreck has the most fascinating story for your team? The coolest history?

[idontknowwhattosay-](#)

There was one day on the project that I think was a world record: we found 6 in a single day. We dive separately in team, so we all gathered on the research vessel to share our team's findings. We went one by one and finally got to George, the Greek director. He put up photos of these small amphoras that had a culturally Greek form. The room went completely silent and I think we all realized we were seeing something very old. He scrolled through the images and when he was done we all jumped to, looking through comparative collections and publications to identify precisely what it was. Finally we found a match in an obscure publication from the 60s, which led us to finds from Cyprus and Egypt. It was the Archaic (c.700-480 BC) wreck from Samos. Samos produced distinctive amphoras from the Classical period onwards, but these were very odd and clearly older. It is the certainly the most fascinating wreck, though there are many others that are great stories.

What is the oldest dated wreck you have found so far and have you found anything else resembling the Antikythera mechanism or similar technological devices?

[hamish001](#)

The oldest wreck we found on this project was an Archaic Period (700-480 BC) wreck, though we are still narrowing down when it dates to precisely (we'd like to get within a 25-50 year range).

We haven't found anything like the Antikythera device (shout out to [Antikythera team!](#)), but I'm actually ok with that. It is important to understand the top 1% of society that owned statues, the mechanism, and wrote the history books, but for scientific research the every day cargo ship is invaluable. At Fourni we have 22 merchant ships from all different periods. This incredible dataset allows us to infer certain things about changing trade networks, ship technologies, and politics. Understanding the average sailor and merchant in these periods takes us beyond written history and allows us to make novel contributions to understanding life in the past.

Don't get me wrong- I'd love to find a mechanism!

Have you ever come across any food items still in tact?

[Sirnando138](#)

Hahah I love this question because of the answers I can give. At Fourni we have not, because of all the sea creatures in the warm salt water that eat anything organic. So we don't have wooden ship structure or things like food items surviving. We would like to do residue analysis of the ceramic pots to see if we can identify what was in them.

However in places that have cold fresh water you do have food items that survive intact. Very well in fact. During the excavation of the Vasa in the Sweden (the Baltic has very good preservation due to cold fresh water), the archaeologists and Navy divers found a box with cheese that looked like it was made yesterday. The head archaeologist and the head of the Navy tried it... and got quite ill.

In the rarest cases an archaeologist has found an amphora with the stopper intact and wine still inside. Of course they try it, but it is always very salty because the seawater permeates through the terracotta after a few years.

In good or rare conditions you do find foodstuffs preserved and it is amazing no archaeologists have died from trying ancient food.

How do you date items and ships that were underwater? Are the ships' names visible enough to check against rolls, or do items on the ship help to identify when it went down? Also, this probably isn't applicable to these particular ships, but is it possible to do any sort of carbon or radioactive dating for items that were underwater? It doesn't seem like you could, but if not, is the accuracy of carbon dating compromised if something was under water for a long stint before it began to fossilize?

[CharMeckSchools](#)

Great question! There are several methods. The primary means is through ceramic chronologies. Years of archaeological research have combined stratigraphic data (ie this ceramic was found in a layer of dirt that dates between 300-200 BC), production kiln sites (ie this kiln surrounded with this type of ceramic carbon dates to 250 BC +/- 75 years), and direct dating (ie this pot is filled with organic material that dates to 215 BC +/- 50 years). This information is compiled into chronologies that say so-and-so pot is known to date between 325-175 BC. Now if you have 10 different types of pots you chart these chronologies and you can figure out a tight time period that fits them all, hopefully placing the time of the wreck in a 25 year range. Chronologies are constantly being updated for new information. Ceramics also tell you the city that produced them and sometimes the clay source that was used to make it.

As you say, there are direct dating methods. The most well known is radio-carbon dating, which is the dating of organics containing carbon. However, there is not much organic remaining on our wrecks, which is common in the Mediterranean due to the ecology of the sea. There are other methods such as thermoluminescence which dates the period of time since a crystalline structure (like sand) was last exposed to the sun. We can use both carbon and TL on shipwrecks. However, these generally have an error greater than what is known for ceramic chronologies. Therefore, these methods are most common on really old sites that predate established ceramic chronologies.

Maritime archaeology generally uses a variety of dating methods to tighten the date range on a wreck.

How long will it take to survey, record and catalogue these wrecks. Will your team have the opportunity and time to do this?

Also what difficulties do your experience in getting the funding and resources to search for these amazing finds.

[Reality-Dysfunction](#)

Each of the 22 wrecks we identified this season were 3D mapped and recorded this year. We also brought back representative artifacts for analysis and archiving in the Ministry's facilities. However, since we only had 13 days we would of course like more time on each site. We would also like to extended the survey area since we explored less than 5% of the islands' coastline. There is many years work to be done, so we hope to continue next year.

Funding this sort of expedition is incredibly difficult. Our funding came from the [Honor Frost Foundation](#), a UK charity that funds research in the eastern Mediterranean. The Foundation is quite progressive and funds seed projects. However, most other grant agencies declined because they only fund successful projects- not preliminary research. This is makes it very difficult for research into any new area. Hopefully our initial success this year will convince grant agencies to take part.

Good afternoon! Thanks for doing this AMA, I recently went Scuba diving for the first time in Santorini and it was a stunning experience. My question to you is in your opinion what is underwater tourism doing for these ancient sites? I know there are a lot of ancient artifacts quite literally just sitting around on the ocean floor and one of the options we had was to go and visit a local shipwreck - would you say more harm or good comes from tourists discoveries of these objects and locations? Also, what is your favourite underwater site in Greece?

Thank you for your time!

[aethernyx](#)

My personal opinion is that underwater tourism is critical for two reasons. First, everyone should be able to experience the past. Second, the best protection of archaeological sites comes from local communities. Tourists need to know that these sites have to be preserved for future generations. Laws need to be strict in order to punish the bad apples, but I don't think people should be banned from sites. It is impossible to patrol the sea, so the local community needs to engage with its past and see the economic benefit of preserving its cultural heritage. A shipwreck can be sustainable tourism, but it needs self-policing by community members and dive charters.

And as [/u/funsizedfury](#) says, all shipwreck become complex ecosystems that also need be preserved. A shipwreck is like a whale fall, it leads to colonies of different species that can be quite important.

There seems to be a lot of ancient texts referring to the lost city of Atlantis, due to the fact that it was never found, people seem to dismiss its existence as a myth.

As a professional in the field and as a general community, is the possible existence of said city accepted or is the large majority dismissing it as non-sense?

Is there some kind of active debate regarding it within the community as well?

[kinpsychosis](#)

They Atlantis story comes from two books by Plato. Both of them are very clear that it is a fictional story. All the elements of Atlantis are highly stylized based on Athenian mythology and the moral of the

stories fit well with 5th century BC Athenian writing. All ancient writers regarded the stories as fictional. It wasn't until the romanticism of the 19th century writing that authors tried to pass it off a real.

Were there cities in the sea that inspire Plato to describe Atlantis? Palvopetri would have been ruins sticking out of the sea at that time and Helike was sunk by a tsunami. Were either of these (or another city elsewhere) the city of Atlantis? No.

Sorry, but there is no reason to think Atlantis was a real place- no one thought that it was until 19th century novel and penny dreadfuls. Real sunken cities are far more interesting than the myth if you ask me!

How many sunken cities have been discovered to date?

[My3rdTesticle](#)

Great question! I spoke about this in [my previous AMA](#) as well- [here is an image](#) of the known sunken cities around the Mediterranean. They aren't uncommon!

What happens if you find a cache of valuable items (treasure)? Is it a big problem legally or does it simply go to greece or is it split up somehow?

[Halsfield](#)

We have never found anything with any market value; however, if we did then it would belong to the same people as everything else- the people of Greece. As an archaeologist I'm more interested in the life of every day sailors than the elites (gold was super rare in the past and controlled by a few). We learn the most about the past from the average person, rather than the elite. Finding a cache of treasure would be exciting and it would be a great exhibit for a local museum, but it would (and should) remain in Greece.

Will Atlantis be ever found? Could it exist?

[Only-Says-Indeed](#)

I love the Atlantis story. However, it'd be the same if people in 2,000 years went searching for Hogwarts. Everyone in Antiquity regarded it as a fiction story, there is no reason for people today to think it was real. Sorry :(

Do you find any texts that survive?

[jeffwingersballs](#)

On the shipwrecks? No... not yet. Maybe one day! It will have to be in very good conditions for organic artifacts, so somewhere like the Black Sea or buried in river sediments like the Nile.

Have you found any cities that appear to have gone under water catastrophically - 'over a period of hours'? Or is it possible to tell how quickly a city was subsumed?

[justbhere](#)

There are a few (not many) cities that sank catastrophically. The most famous are Port Royal in 1692 that sank from an earthquake and Helike in 373 BC that sank from liquifaction and a tsunami resulting from an earthquake.

There are a range of methods for checking for how a city submerged. You usually check for surrounding areas: does it have paleo-beach formations in lines from slow subsidence over thousands of years? Are there notches in underwater rock faces showing where the sea level used to be? Does the geological record show evidence of large-scale earthquakes? How frequent are they?

You also look at the spatial patterning of the city and its artifacts. Are the building blasted apart? Or do they look like they slowly collapsed in place? Are people's belongings left in place (ie a quick exit) or does it look like they had time to just leave old, broken things behind?

The article about this I read on news.discovery.com described Fourni as a site that would be expected to possibly contain many shipwrecks. Why wasn't it looked at until now, is it just the limited amount of money available for underwater archaeology?

[cliff99](#)

Good question. The answer is a combination of things. Fourni never hosted any major cities, so a lot of archaeology has (rightly) focused on major polis like Samos, Piraeus, Corinth, Rhodes, etc. The context of shipwrecks in these locations tells you important things about who was trading with whom.

It is also expensive organizing expeditions to the eastern Aegean. Any time you involve boats and diving it gets expensive quickly.

However, there was some evidence that Fourni may hold shipwrecks. It lies between the major east-west and north-south sailing routes. It appeared to be an important navigational feature for people sailing without a compass or maps. And there were rumors of people seeing wrecks there. However, this sort of evidence sounds relatively weak considering that you could also go to major cities throughout the Aegean that are attested in historical records (Fourni is rarely mentioned in historical sources).

You're right about the limited money for underwater archaeology. Our budget was tiny and it was only possible through people volunteering and support from local business (all our breakfasts and lunches were provided for free by Ikaria's Carrefour grocery store). Hopefully with the success of this short season we can get more grant funding and sponsorship to go back.

It took a great hunch from George, the Greek director, who is from nearby Ikaria and some information from Tony, a former sponge diver. However, we easily could have pick larger, more well known islands and archaeologists would not have visited Fourni for the next 50 years.

How many people were on your team?

What were they (team) studied in?

Did you consider the "local sponge divers, fishermen, and free divers" part of your team?

What is the process of obtaining funding for archaeology like this?

What happens to the artifacts you collect?

Do the shipwrecks

- all get exhumed?

- become local sight seeing destinations?
- get protection (Imagining a security guard arms behind him standing on the Mediterranean sea floor eyeing passers by with suspicion.)

[bobs_vulger](#)

We had 13 people on the team, ranging from archaeologists to conservators to professional divers and ship captains. The sponge divers and fishermen were definitely part of the team- you can see them in [our team photo](#) (missing from that photo is our captain, who is traditional shipbuilder and had to go cut down the right tree when the moon was full due to the sap level in the tree- he knows his stuff). We traveled together, worked together, and would eat every meal together. Once we started working on the island many more fishermen appeared in order to help, we were thankful for all the support from the local community.

The project is funded through grants. Many maritime archaeology grants come through the EU, National Science Foundation, Global Heritage Fund, and other such institutions- our came through a maritime archaeology specific foundation called the Honor Frost Foundation.

Almost all the artifacts are left on the seafloor. We take a representative sample for archiving, in case anything happens to the site in the future. The artifacts we recovered are currently in the Ministry's conservation laboratory, where they are undergoing analysis and conservation. In the future they may go on display in museums, or will be available on request to research in the national museum archive.

Full recovery of a shipwreck is rare for several reason. First, it is very expensive and usually take many decades to fully conserve. Second, it is best practice to leave the majority for future researchers. We don't know what methods they may have in the future. Today, we are unable to take DNA samples from ships excavated in the 60s and 70s because of their conservation methods and they did not leave anything in situ. So we want to leave as much as we can for future generations.

Leaving the shipwrecks in the sea also means they can be visited by divers. Everyone should be able to experience the past and hopefully there are no bad apples that abuse the privilege and take artifacts. The Fourni wrecks had been looted for years by outsiders, but now that we have identified where they are it is possible to implement a monitoring program and the local coastguard can watch boat traffic.

Sunken cities. Of the ones you're aware of, around what period were they built? And how do you hope to prevent us from losing more of our cities to the sea?

[unlisted_user](#)

There are sunken cities from many different periods, it all depends on the local factors leading to subsidence. Sunken cities are very important because in place like Rome and Athens subsequent civilizations built over (and dug foundations through) the previous layers. But a submerged city is stuck in the time of its subsidence, so we have an "uncontaminated" view of Neolithic or Bronze Age or Classical life. For example, [see Pavlopetri](#).

While a few cities sink due to dramatic events (such as Helike in Greece) like liquifaction and tsunamis, the vast majority slowly subside by a millimeter or less per year. The other side of the coin is cities rising away from the sea: eastern Crete is slowly subsiding, while western Crete is slowly rising. We have great examples of cities on Crete from the same time period where one is in the sea and the other is high and dry.

How do we prevent the loss of cities in the sea? Good question. We need to understand the many the factors involved: isostatic change, ice caps regulating global sea level, and- most important right now- climate change.

Climate change is nothing new and every long term culture in the past has had to deal with it to some

extent. However, today we have climate change as a result of human actions and change is occurring on a rapid scale.

As I mentioned in a previous comment, our cities are all clinging to mountain tops and we're lying to ourselves that it is dry land. We live on a dynamic planet and change is a natural part of it. I can tell you from an archaeological perspective that the defining characteristic of a culture is how they adapt to change (or fail to).

What do underwater explorers think of *The Life Aquatic*?

[SonOfKrampus](#)

I love the movie, but as you may know it is based on the Cousteau family. Most underwater explorers have at least a passing connection with the Cousteaus and, while we may enjoy the movie, it is incredibly sad to watch the final scene and know what happened Philippe Cousteau.

Fabien Cousteau is doing some amazing underwater programs and his team was kind enough to Skype with our students from 63 feet below the surface during their 31 days in the Aquarius habitat. [check out their work here!](#) Apparently M&Ms taste super weird at one atmosphere below the surface.

It seems like a relatively accessible area with a ton of archaeological promise, but given the cost of excavating and conserving shipwrecks I can't see the Greek government doing much beyond survey.

Given the high density of archaeological finds and the low likelihood of excavation, is there a greater than average worry of looting occurring on these wrecks? Are there any plans to protect the area?

[MarsupialBob](#)

It is all about your research question. If someone has a research question requiring excavation, then the Greek Ministry will allow it. Our research is about ancient trade and navigation, so excavation would not add much more information toward answering our question.

Looting of underwater sites is always a concern. We are losing entire chapters of history from people either taking souvenirs or destroying sites searching for non-existent gold. Nothing we found has market value; everything we found is priceless in terms of scientific value.

There is no way to protect what you don't know is there, so the first step is identifying sites. We started that this year and now we can start monitoring the area. The local coast guard knows where the sensitive areas are and the local community is mobilized to protect the sites. This is the best protection you can have for any underwater site. Croatia puts cages over their wrecks, requiring a license for divers to access them. While this works well in Croatia, I hope it doesn't come to that in Greece.

Have you (or have you heard about someone else) made any plans to expand the study in the Black Sea basin?

[hameleona](#)

There is a [huge multi-year project](#) going on right now with several of the top maritime archaeologists in the world that examines the Bulgarian Black Sea coast. They were in the field in Bulgaria at the same time we were in Fourni.

Expect big things from their project. The Black Sea has amazing preservation of artifacts. It might be the most exciting archaeological project in the world right now (besides ours, of course).

How is the food and people in Ikaria? Do the locals know what you are doing there?

[Acherontas](#)

Ikaria is unlike anywhere else- the community and culture is incredible. Ikarians are different and I think everyone should experience a festival there. There have been quite a few newspaper articles on our project in Ikaria and we were sponsored by the Ikaria Carrefour- in fact the Carrefour was critical to our being able to run the project.

George, the Greek director, is from Ikaria. My former professor/mentor is Antony Papalas who recorded the history of the island. The team has a special connection to the island!

Is underwater geophysics (e.g. magnetometry) commonly used, or is it a bit niche?

[hurston](#)

Absolutely! Sonar and mag are standard practice. Sub-bottom profilers were designed with archaeology partially in mind. In fact, test beds for new equipment are archaeological sites. Doc Edgerton tried some of the first sonar systems in Greece to try to locate archaeological sites.

Most maritime archaeology projects begin with a foundation of seafloor mapping.

Did you need to use calculus and take double derivatives to find the shipwrecks?

My professors said that everyone will need those skills to work in the real world.

[jerryeight](#)

This is yet another case of Big Calculus using all their lobbying money.

Are sunken cities due to previous climate change and rising of the oceans?

[SinCalFire](#)

There are several factors. Right now the earth is undergoing a rebound from the last ice age. There was a whole lot of weight at the poles during the ice age, which caused the earth to change shape under the pressure. The earth is slowly bending back in certain areas and this is called isostatic change. It occurs locally so the amount of rise or subsidence differs from place to place.

You also have some cities that were built on silt or sand. Due to large earthquakes, the sediment has moved and caused the city to sink lower.

Global sea levels appear ready to rise due to human caused climate change, which will further submerge some sites.

TL;DR there are a range of factors and the reason behind a city being in the sea is usually an interplay between several of these factors.