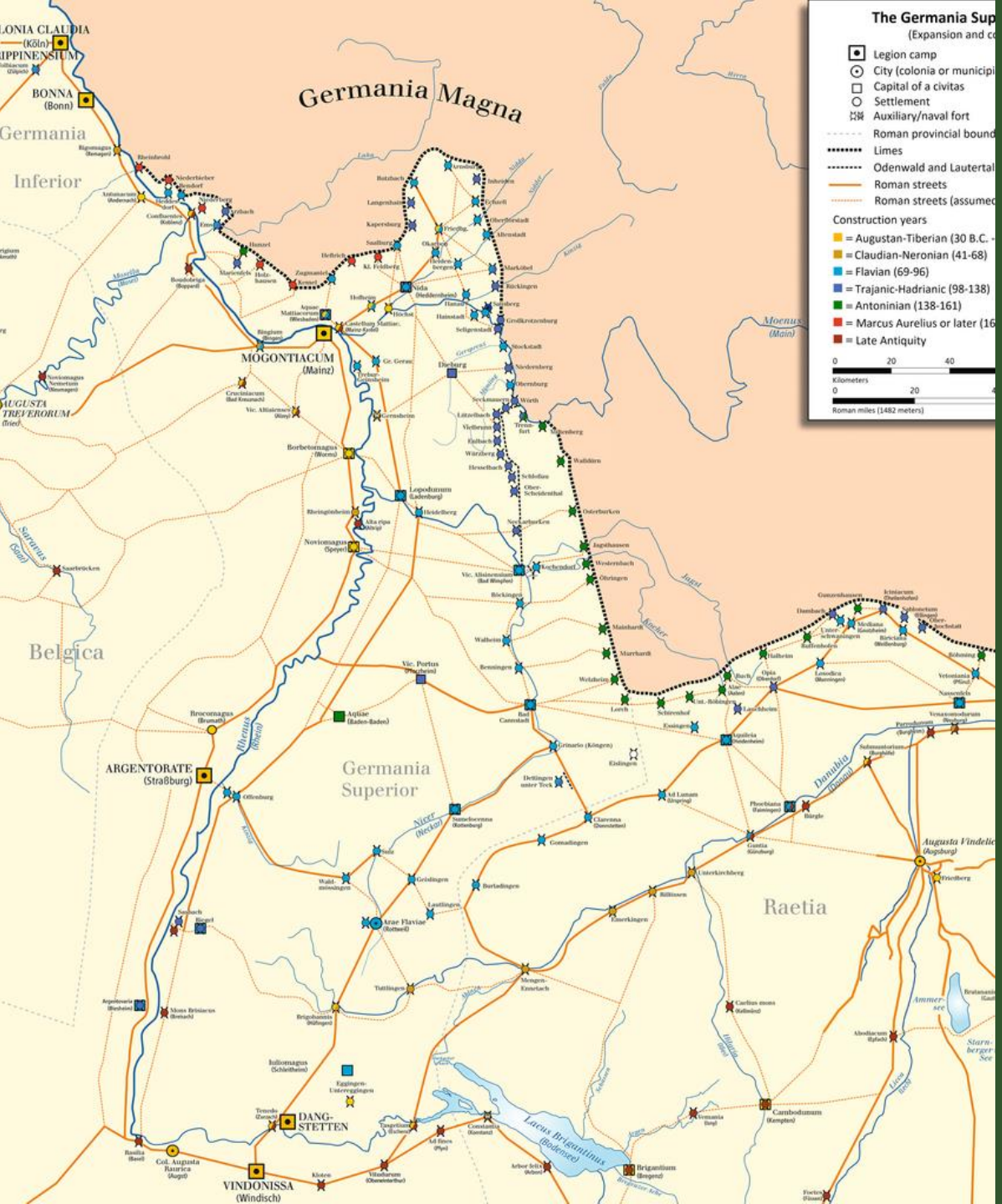
Roman Boats on the Frontier of the Empire

Dan Cicero

March 2024



Danubian Limes

The Roman Empire's frontier in the first century AD, ran along the Danube River, through what is now Germany, Austria, Slovakia, Hungary, Croatia, Serbia, Bulgaria and Romania.

They maintained defensive structures for long periods, reinforced with watchtowers, legion camps (*castra*) and forts (*castella*). Originally, there were no walls, but later during the reign of the Emperor Trajan (98 to 117 AD) the camps were enclosed by stone walls.

A Roman road, the *Via Istrum* linked the stations, camps and forts as far as the Danube Delta.

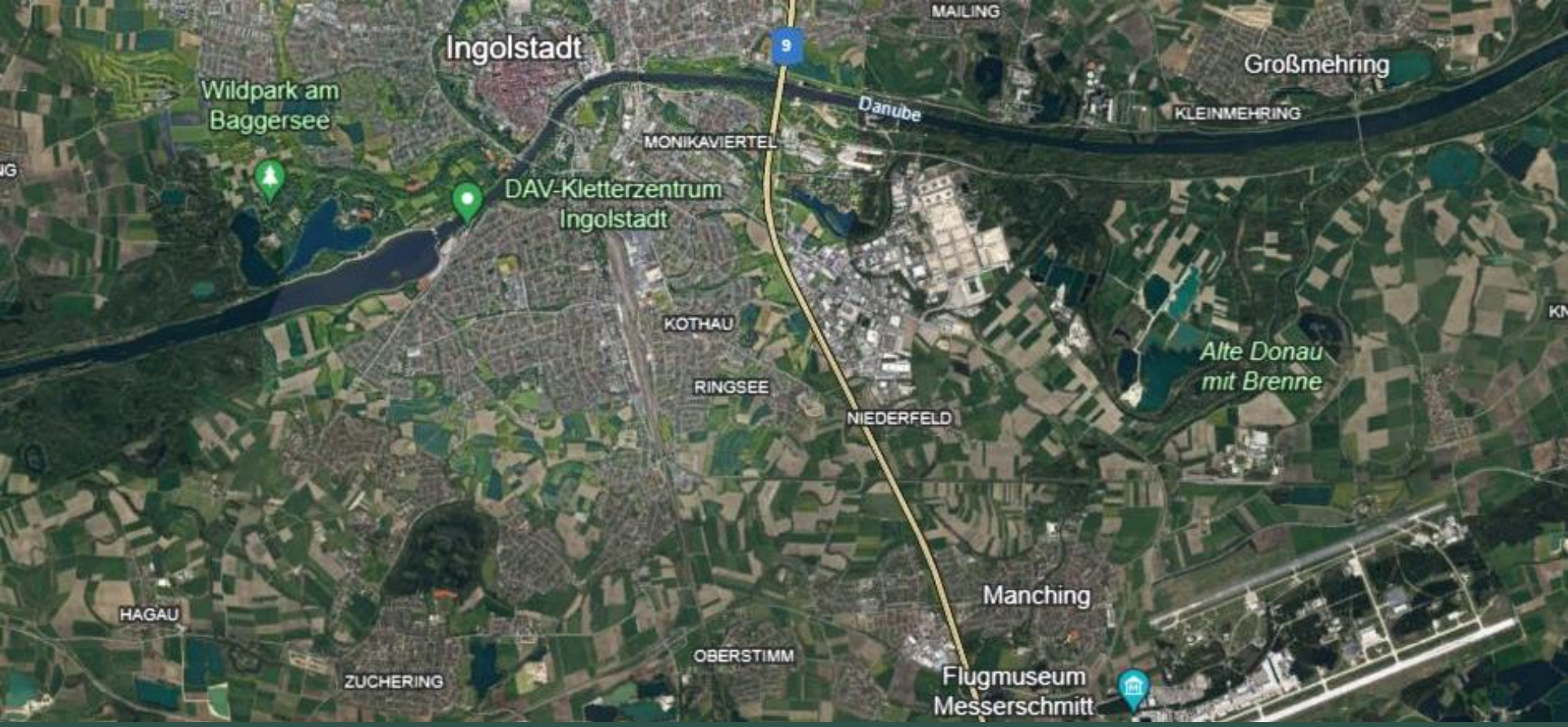
The Frontiers of the Roman Empire were designated a UNESCO World Heritage Site in 2021

Purpose

River transport was the easiest way to move goods and people through this region.

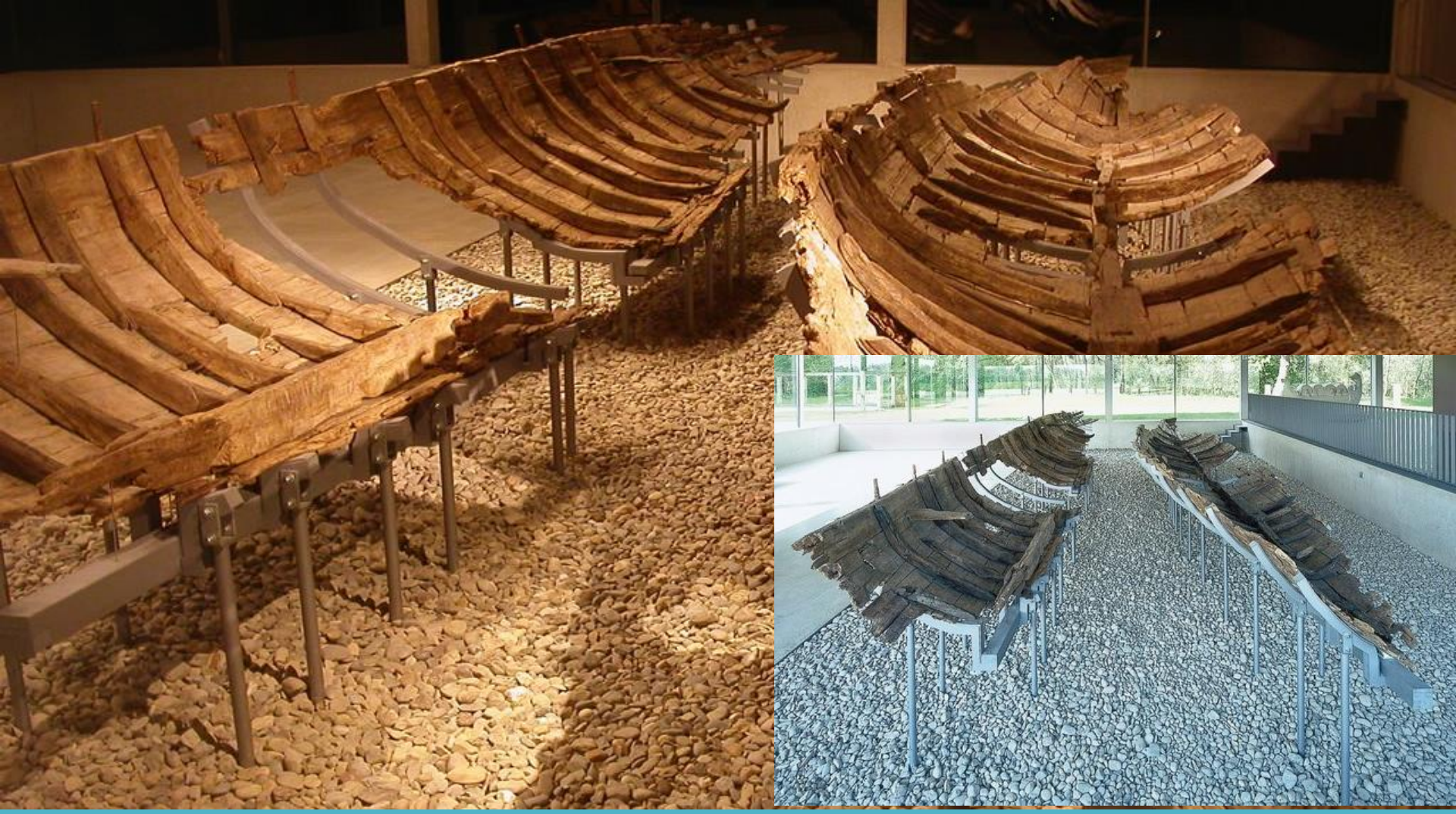
These installations were not necessarily for fending off external attacks. Roman soldiers guarded the frontier and enabled trade. They recruited auxiliaries, which contributed to the Romanization of the population

Forts and camps were spaced one half day's marching distance apart, often at bends in the river which would allow lookouts in the towers to see what was coming up or down the river.



Discovered near Oberstimm, Germany

Excavated in the 1980's and put on display at the Kelten-Römer-Museum in Manching, Germany

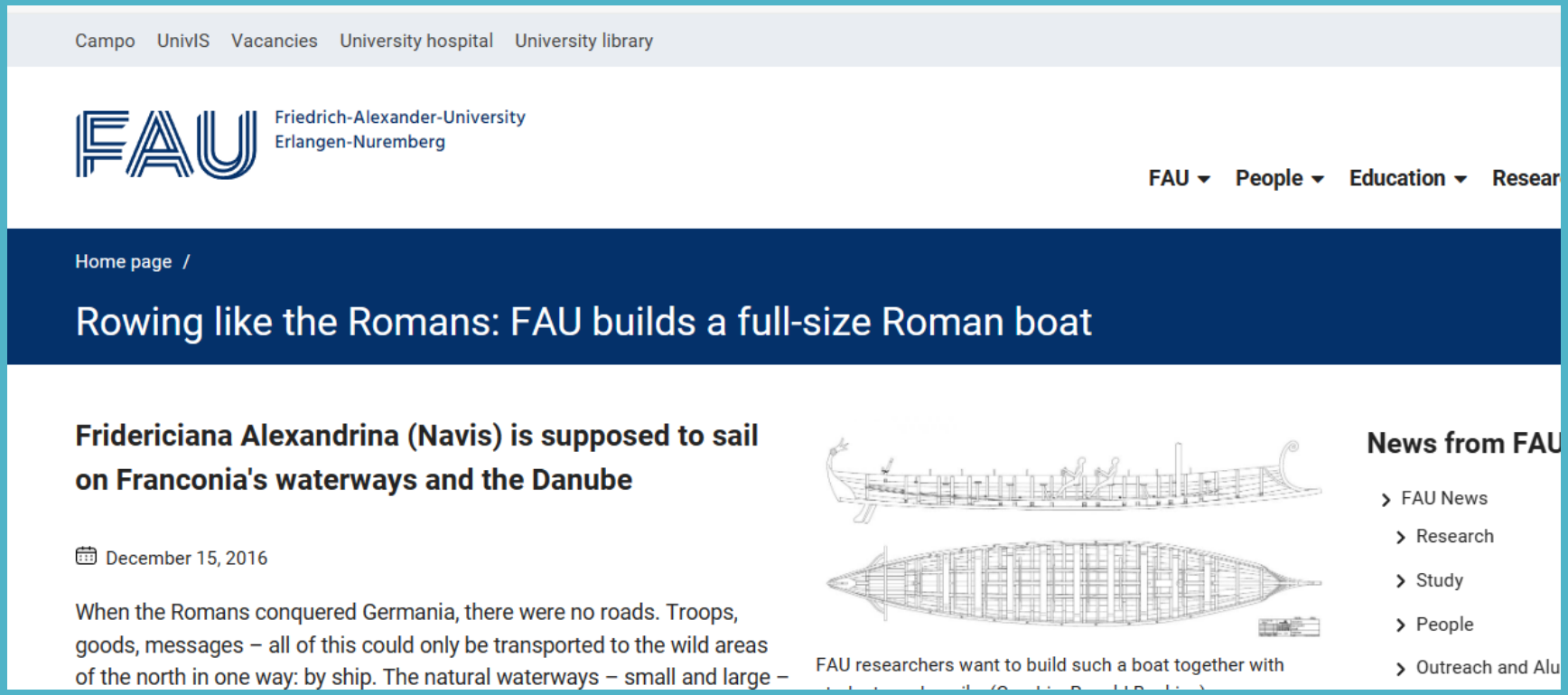


Two boats, known as *scafa*, or scout-ships, sunk on purpose to reinforce the banks of the ancient Danube.

Dated dendrochronologically to 89 AD and sunk some time around 100 AD. Constructed of oak and preserved almost completely up to the gunwales. No mast, but the mast step survived. No oars, but oars from other wrecks of similar boats from the region do exist.

Why reconstruct this boat?

We know the Romans patrolled the river extensively, but we don't know how the boats performed. The *Fridericiana Alexandrina Navis*, was launched in March 2018 and made her maiden voyage in May, before departing for the Black Sea in August.



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Rowing like the Romans: FAU builds a full-size Roman boat

Fridericiana Alexandrina (Navis) is supposed to sail on Franconia's waterways and the Danube

December 15, 2016

When the Romans conquered Germania, there were no roads. Troops, goods, messages – all of this could only be transported to the wild areas of the north in one way: by ship. The natural waterways – small and large –

FAU researchers want to build such a boat together with

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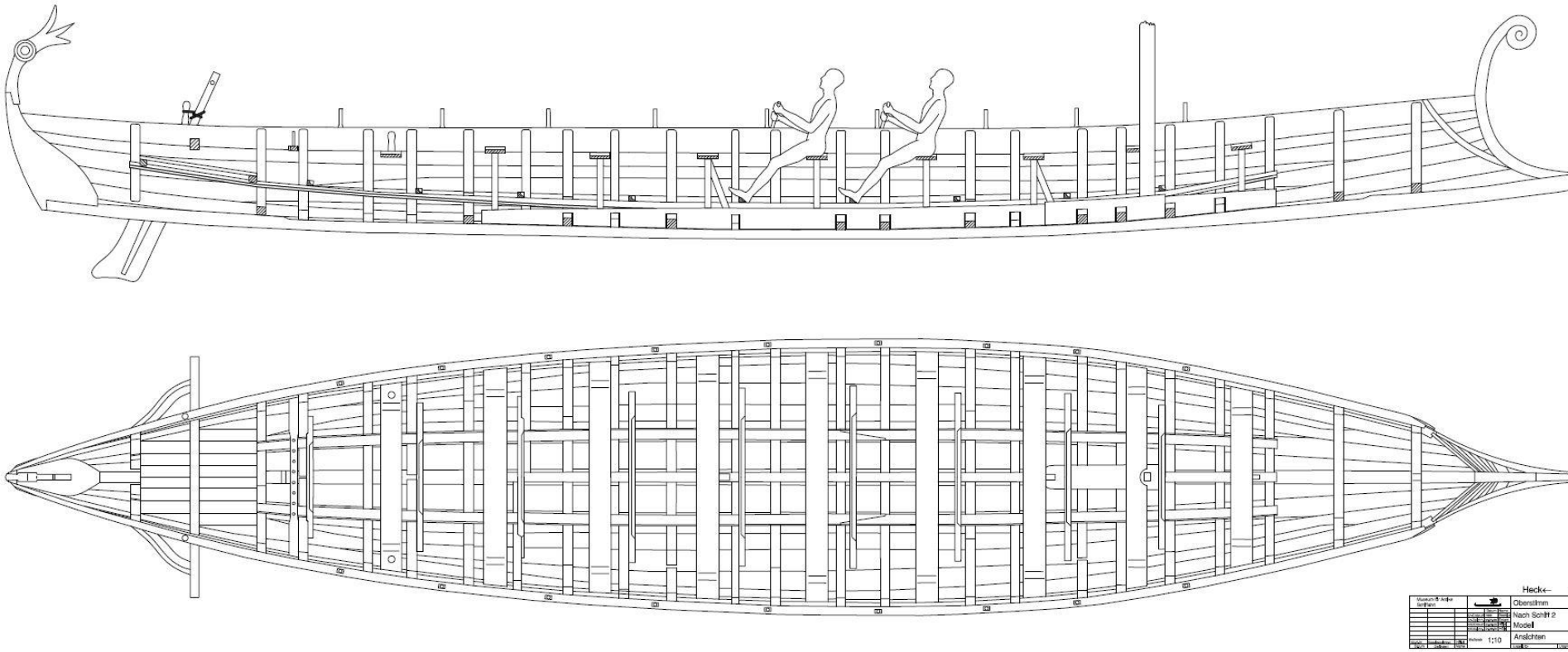
Reconstruction was done by a team from the Friedrich-Alexander-University, Erlangen-Nuremberg



Crew: 18-20
Speed: 6 knots, faster under sail
Construction: Oak (keel and frames), fir (planks) and pine (mast), oak nails

Length: 52 ft (16 m)

Beam: 9 ft (2.7 m)

Draft: 2.3 ft (70 cm)

Hull Testing

1:10 scale models were tested in a test tank at the Institute of fluid mechanics at the University of Erlangen.

Two different models, one with round- and one with concave-bow, with and without sails ere tested. Without the sails, the round bow version did better in an open sea environment, but the concave bow was better in inland waters.

Most ancient boats are constructed shell-first around a template. Then the template is replaced with timber frames.

The FAU team felled trees in the ‘Reichswald’ which had a natural bend along their longitudinal axis. This meant only lateral steam bending was needed to make them fit the template

The Roman shipbuilders in Germania brought with them their Mediterranean boat- and shipbuilding skills and practices. The carvel built – planks fastened edge to edge -- of the Oberstimm wreck were 4 cm thick and connected to each by mortises and 10 cm long oak-tenons, spaced every 30 cm.

The tenons were secured by small oak dowels when the planks were set, as shown here.

Some things were missing

The mast. There is evidence for both a square and a sprit sail rig in the historical record. Both were tested. The boat did have a mast because the mast step survived.

Anchors. Anchors have been found with other similar boats from the same period, so those were reconstructed.

Oars. There are examples from other boats, but several types were tested to determine which was best.

Bilge Pump. There is evidence for the existence of the pump and one was definitely needed, so a reconstruction was built.

The ship after launch in March 2018. It sat in the lake for about a week to allow the planks to soak up the water, expand, and thereby make the hull watertight.

Paint!

"It is well known, though not very well-established, that antiquity was coloured – frankly overwhelmingly so for modern senses."

The boat was probably painted with "encausting paint," a hot mix of beeswax, resin and pigments.

According to Pliny the Elder, this kind of paint was "in common use by way of ornament for ships of war"

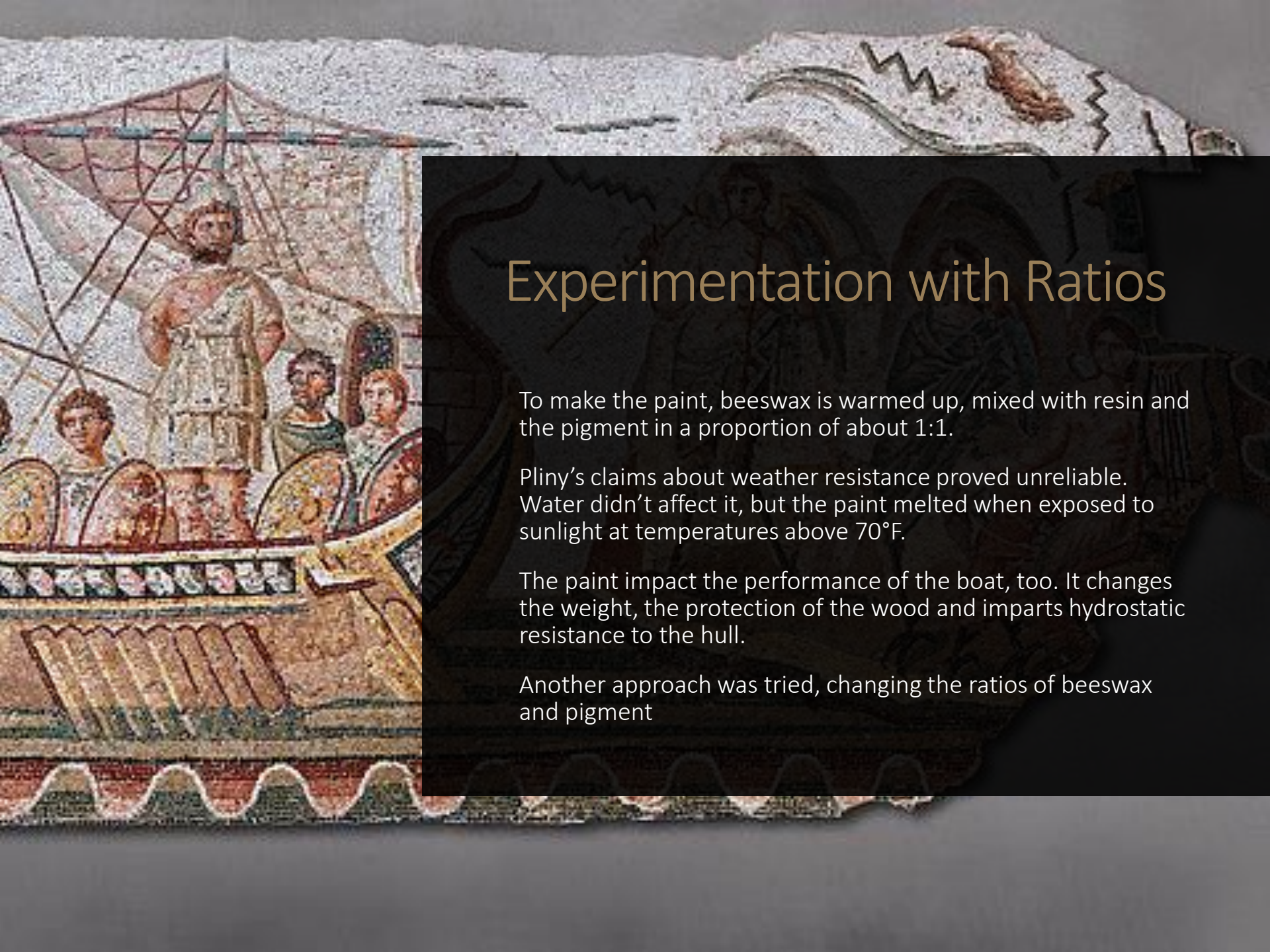
Pliny the Elder on paint

"…With the same colors the wax used for the burnt-in paintings is mixed. Walls are not painted with it, but warships in general, even cargo ships … It is known that there were only two types of encaustic painting in the past … A third type was added when the warships were first painted, which is done by applying wax, which was melted over a fire before, with a brush; this painting suffers neither from the sun , nor from the sea water, nor from the winds."

According to Philostratus – and backed up by surviving artifacts -- ancient ships were painted either for the purpose of recognition or to impress the enemy.

Vegetius, a writer not very familiar with ships, states that ships were painted to camouflage them. He wrote that sails, rigging and the crew's clothing were 'Venetic' blue. Blue is one of the most expensive colors in Antiquity and not readily available.

Locally available colors that help disguise the ship in its natural environment were used. The Ship Hall Fresco, the Porticus of the Temple of Isis in Pompeii, as well as the so-called Ulysses Mosaic from Bardo were also used as a color guide.



Experimentation with Ratios

To make the paint, beeswax is warmed up, mixed with resin and the pigment in a proportion of about 1:1.

Pliny's claims about weather resistance proved unreliable. Water didn't affect it, but the paint melted when exposed to sunlight at temperatures above 70°F.

The paint impact the performance of the boat, too. It changes the weight, the protection of the wood and imparts hydrostatic resistance to the hull.

Another approach was tried, changing the ratios of beeswax and pigment

First Formula:

- 380 g resin (course dammar gum)
- 380 g beeswax
- 760 g (Portuguese) turpentine (oil)
- Pigments:
  - 200 g burgundy or gold ochre
  - 260 g green + gold ochre

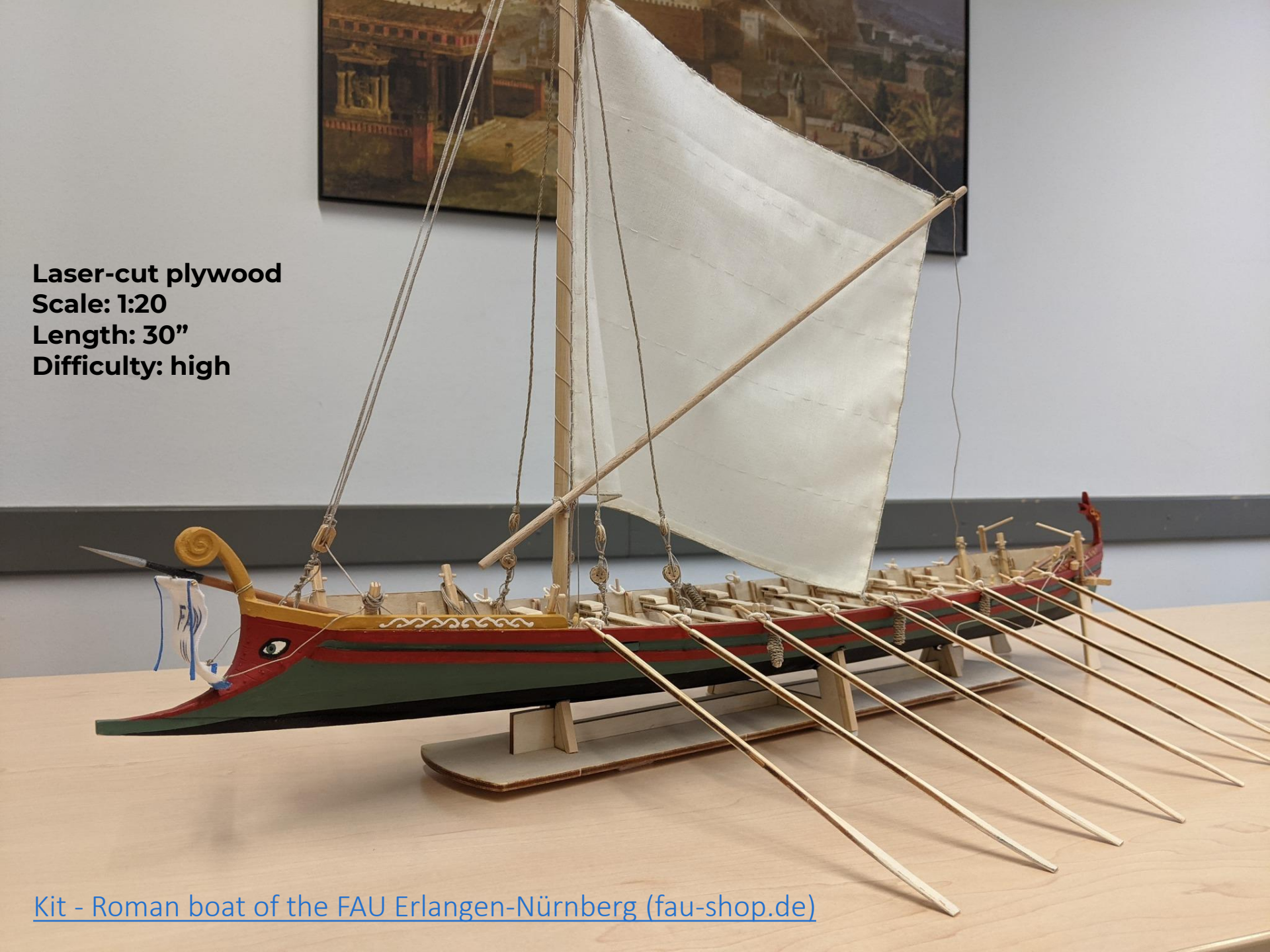
Second Formula

- 237.5 g resin
- 142.5 g beeswax
- 475 g turpentine
- 150 g pigment

Success!

The new paint can be applied with a roller.

It resists fading and it performs just as Pliny the Elder said it would.


Laser-cut plywood
Scale: 1:20
Length: 30”
Difficulty: high
Kit - Roman boat of the FAU Erlangen-Nürnberg (fau-shop.de)

Sources

- Ancient Warfare Magazine
  - Issues XII-4, XIII-2, XVII-1
- UNESCO World Heritage Convention
- Friedrich-Alexander-Universität, Erlangen-Nürnberg
- Prof. Dr. Boris Dreyer
  Professur für Alte Geschichte
  Department Geschichte
  Universität Erlangen-Nürnberg