NAVAL TACTICS IN ANCIENT GREECE:
The diekplous and periplous

The Greek trireme was the principal warship that enabled Athens to become a strong naval power and dominate the Aegean in the 5th century BCE. The name trireme refers to the arrangement of oarsmen into three rows, which in combination with its light build and slender shape made it not only fast and manoeuvrable, but also highly dangerous in skilled hands. Using the bronze-sheathed batting ram on the prow, a trireme could efficiently disable an enemy ship by puncturing the hull, causing it to flood, lose stability and making the oars unworkable. The ramming technique played an important role in advanced naval tactics.

**Diekplous—sailing through and out**—was by Polybius referred to as the most effective manoeuvre in sea-fighting. By sailing past the enemy line through gaps between the ships, the Greek triremes could easily turn around and ram the vulnerable side of the opponent’s vessel. However, there are only three battles to which it is said to have been successful, Lade, Chios and Side. A counter-formation to the diekplous was the kuklos (diekplous-fleece), in which the fleet formed a circular formation with the ram facing outwards.

A periplous manoeuvre involved a scaling around in order to expose the enemy’s stem for ramming. Thucydides describes this happening during the Peloponnesian War in the Gulf of Curneth an Athenian trireme was chased by a Laccadese trireme until the Athenian ship sailed around an anchored merchant vessel and rammed the Laccadenser. The success of this manoeuvre lies in the speed and being the faster of the two ships.

Both Thucydides and Xenophon write of the diekplous and periplous as if they were the two most important tactical options available to skillfully handled vessels. It is debated among scholars whether these tactics were performed by a whole fleet on a large scale or if only a small tactical manoeuvres by single ships.

**EXPERIMENTAL ARCHAEOLOGY:**
Reconstructing an Ancient Greek trireme

Using historical sources and archeological discoveries, naval architect John Coates and historian John Morrison wanted to design and complete a functional ancient vessel of the 4th and 5th century BCE. Financed by the Hellenic Navy and the Greek Ministry of Culture, construction of Olympia began in 1983 by a shipbuilder in Piraeus based on blueprints drawings by Coates. Even to this day, Olympia is one of the most important examples of experimental naval architecture, proven by its successful launch at sea in 1987.

Complete archaeological accuracy is never the main priority. Investigating the use of ancient tools, man-hours needed for construction and authentic use of tools and materials has already been investigated by other archaeologically pure reconstruction projects. Instead, the scientist wanted to determine the sailing characteristics and her strength, as well as battle tactics and examination of the living conditions inside the vessel.

**As a simulating hypothesis,** the primary focus of the sea-trials of Olympia was to test and validate the three-level car system, its performance and whether it conformed with ancient sources. In the first trials, coordination of the 150 volunteering rowers, both university students and professionals, became the main priority. Her manoeuvrability under car exceeded expectations and fully matched what was implied in ancient sources and the manoeuvrability of modern warships. The speed performance results were not quite as satisfactory, but this is dependent on how one interprets the ancient sea. If triremes normally achieved and sustained cruising speed of 5 knots under car, Olympia met this estimate, but struggled to reach speeds of 7 to 8 knots, as implied by more severe interpretations.

**SIMULATIONS IN ARCHAEOLOGY:**
Agent-based versus systems modelling

In recent years, simulation models, whose methods derive from the physical and computer sciences, are becoming more widely used within an archaeological framework. Through these kinds of simulations, one can explore the range of possible outcomes for different past behaviors in an artificial space using variables, in addition to addressing the cognitive processes and dynamics behind social changes.

**Agent-based models (ABM)** focus largely on the behaviour and reasoning of goal-driven agents in a chosen environment, which could simply comprise of other agents in a network or be a geographically referenced model in GIS. Systems models, on the other hand, determine change through time or one or more properties of a system in order to determine how much a variable increases or decreases in a certain amount of time. Both approaches can be employed to test different hypotheses.

The **Diekplous project**, currently in its initial stages, aims to combine the performance data from Olympia with operational information from ancient sources, consequently enhancing the analysis of historical decision-making on a sequence of events. Particularly the operational movement of one or several triremes may be researched in a system model by identifying the different components and how these interact with each other.

Similar work has been done in the "Medieval Wars on the Grid" project for a logistical analysis of the Byzantine army’s march to the AD 1071 battle of Manzikert in Anatolia. This project used agent-based modelling in a distributed environment to help understand how medieval states moved and fed armies. On a larger basis, the movement of each individual was traced so that different scenarios regarding the size and composition of the army, the different possible routes and different levels of food availability could be investigated.