Potted history

The Jordan Valley was once populated by a people, now almost forgotten by historians, with whom the pharaoh of Egypt sought favour. That is the conclusion reached by Niels Groot, the first researcher to take a PhD at the Delft-Leiden Centre for Archaeology, Art History and Science.

Niels Groot thinks there might have been a wealthy elite who had luxury tableware made to suit their own tastes.
It is about 1300 to 1200 BC, at the end of the Late Bronze Age. The Egyptian empire is expanding its sphere of influence as never before, subduing many rebellious city-states in Palestine and making them its vassals. Further north, the Hittites from Anatolia hold sway. The two great powers have the Levant (the area comprising modern Syria, Lebanon, Israel and Jordan) firmly in their grasp.

Sandwiched between these powers and the great Arabian Desert to the east is an area that may have retained its independence. “Biblical texts make little mention of this spot in the Jordan Valley, which is why historians and archaeologists disregarded it for so long,” says archaeologist and materials scientist Niels Groot. “We know hardly anything about the people who lived there, their culture, commerce and industry.”

Groot is trying to fill this gap in the history of the Middle East by analysing pottery from the area. He hopes to obtain his PhD from the faculty of Mechanical, Maritime and Materials Engineering (3mE) this autumn.

Groot thinks that the people who lived in the Jordan Valley during the Late Bronze Age were not ruled directly by the major powers. No objects or structures have been found to suggest otherwise, says the researcher. Nevertheless, archaeologists have unearthed many remnants of chic-looking pottery found nowhere else in the Middle East. Might there have been a wealthy elite who had luxury tableware made to suit their own tastes? In collaboration with researchers from institutions such as the Reactor Institute Delft and the Kavli Institute of Nanoscience, Groot has deployed a large arsenal of materials analysis techniques in an attempt to find out.

**Excavations**

Groot’s PhD supervisor is the pigment expert, Professor Joris Dik, of 3mE, the Delft-based coordinator of the Centre for Archaeology, Art History and Science (CAAS).

CAAS is a collaborative venture between TU Delft and the faculties of Archaeology and Art History at the University of Leiden. While this institute has officially been in existence for about two and a half years now, there is a much longer history of collaborative ventures between the two universities.

Groot began his PhD research nearly four years ago, with one foot in Leiden and the other in Delft. He will be the first researcher at CAAS to obtain a PhD.

The archaeologist is building on the work of Professor Henk Franken (now deceased), who was attached to Leiden University’s Palestinian Antiquities Department. From the early 1960s onwards, Prof. Franken led an impressive series of excavations at the Tell (mound) Deir Alla in the Jordan Valley. People have been building and later demolishing houses on that spot since 1700 BC. This activity has created a 30-metre high mound, which is a treasure trove for archaeologists, as it is packed with household goods and scraps of precious pottery from temples. The excavations are now being directed from Leiden by archaeologist Gerrit van der Kooij and pottery expert Bram van As.

Some scholars believe Deir Alla to be the Biblical Sukkot, where, according to the Old Testament, Jacob founded a town or village of temporary dwellings after wrestling with the angel (Genesis 33:16–17). “But until such time as we find a text in the mound that makes reference to this, we cannot say it is one way or the other,” sighs Groot.

The researcher admits to being slightly troubled by archaeologists who carry out excavations with a copy of the Old Testament in one hand, and who attempt to fit all findings into the biblical story. “Fortunately, I’m researching the period immediately preceding the biblical events and an area lying just outside the main biblical sites, otherwise I really would have to walk on eggshells.”

In the basement of the faculty of Archaeology at Leiden, dusty wooden crates and cardboard boxes...
are stacked up to the ceiling. Scrawled on their surfaces in pen are designations such as "Deir Alla 1978", "Deir Alla 1982" and a whole range of other dates. There is a shelving unit holding hundreds of potsherds.

Groot picks up a small jar that has miraculously remained intact for nearly four millennia. "What an ugly thing. In Deir Alla, they also tried to imitate Mycenaean pottery [from Greece, ed.]. However, their efforts were not always entirely successful," he notes with a crooked smile. Lifting some fragments out of a small box, he says, "But now these shards are really interesting. See those black, shiny patches? That is faience."

Groot is particularly interested in faience, a luxury product that is midway between earthenware and glass. "Twenty objects with faience were found in Deir Alla, far more than at any other excavation site in the Southern Levant. Given the presence of this material, the Jordan Valley was probably a prosperous region."

The archaeologist wants to know what raw materials were used in the production process, where those raw materials came from, and how the shiny pottery was made. Such knowledge would reveal something about the desires of the elite and about the structure of the court, as well as details of the requisite industry and commerce.

“During the Late Bronze Age there was a flourishing trade in faience,” Groot explains. “Tableware played a major part in sacred rites. It was used in temples, and in Mesopotamia it was buried with the dead. Rulers also donated faience to temples to show how powerful they were. In this way, they attempted to expand the reach of their political influence.”

The greater part of this material was mainly produced in Egypt and Mesopotamia. Remarkably, some was also produced in the small town of Deir Alla. In the early 1960s, Prof. Franken found two identical small dishes there (measuring about 10 by 15 centimetres), between the remains of two temples.

‘We had never seen anything like this in pottery from that period’

This was a first, as small dishes of this kind had never been found before. Groot: “I subjected them to chemical analysis, but could find no similarities with faience from other regions. It seems the local elite were able to get their craftsmen to produce faience tableware, or that they attracted such craftsmen from elsewhere.”

Metallic colour

Another discovery may be even more important. This consisted of four fragments of a bowl, once again shaped like nothing the archaeologists had ever seen before. The fragments are coated with a copper glaze and a chromite glaze. The use of chrome-containing pigments gave the bowl a sparkling metallic colour.

“We had never seen anything like this in pottery from that period,” Groot says. “It had been assumed that chromium-containing pigments were first used in Roman times, about 1200 years later.”

Chromite (an ore of chromium) is found only in northern Syria and Anatolia. Groot asks: “Did the residents of Deir Alla import the bowl? It’s a possibility. Yet we find no bowls of this shape in the surrounding areas. Perhaps they just imported the pigment and made the bowl themselves.”

Transmission electron microscope studies revealed another important function of the chromium-containing pigment chromite, aside from the colour and brilliance it confers on pottery. The chromium-containing pigment particles also act as nuclei against which the molten quartz crystallises, creating exceptionally fine spherically shaped crystals as it cools.

The researchers combined electron microscopy with energy dispersive X-ray spectroscopy to accurately identify all of the heavy elements in chromite. In
energy dispersive X-ray spectroscopy, researchers bombard a sample with highly energetic X-rays or gamma rays. Next, they measure the radiation emitted by the excited atoms. Using this technique, the researchers discovered that the glaze layer consists partly of the silicate-containing mineral augite. This is a remarkable find, as it is very difficult to get this material to crystallise properly.

“We have tried to reproduce this faience, but without success,” Groot says. “There are many critical factors, such as the rate at which you allow the molten mineral to cool, the exact composition of the augite, and the chromite concentration in the mixture. These craftsmen’s ability to produce faience shows that they were very innovative. The secret of their art has since been lost.”

How did Deir Alla become sufficiently wealthy to acquire an elite capable of having faience made locally to suit their own tastes, and to generate a demand large enough to inspire artisans to develop many new technologies? “This area may have been very strategically located on a trade route between Egypt and Mesopotamia, making it very prosperous,” Groot suspects.

**Gone forever**

Another clue to the importance of the area is the presence of a faience vase bearing the insignia of the female pharaoh Tausert, who reigned from about 1191-1190 BC. Egypt may have donated this vase to a temple in Deir Alla as a token of goodwill. With its empire on the brink of collapse, Egypt may have seen this as a way of boosting its crumbling influence in the region. The Philistines entered the Levant from the Aegean region (Greece). Although the Western part of the Levant passed into Philistine hands, the Jordan valley and Deir Alla did not. Or not in a literal sense, anyway. Shortly after Pharaoh Tausert donated the vase to Deir Alla, the town was destroyed by an earthquake. Afterwards, according to the evidence of the shards, the wealthy court culture never returned.