Introduction to Archaeological Interventions Using the Example of Monte da Ponte

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Excavation Methods, Culture and Contexts in Archaeology

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1 Introduction

The introductory course *Excavation Methods, Culture and Contexts in Archaeology* for ARCH-MAT students was held from October 8th to October 17th, 2024. It combined lectures and laboratory work with three days of hands-on fieldwork, and covered both theoretical and practical aspects of an archaeological intervention. Such projects involve many different activities, including administrative tasks such as securing permits and funding, organizing fieldwork by coordinating volunteers and associated universities, as well as making scientific and technical decisions about methodologies, laboratory work, and site documentation. The course gave an insight into this complex intersection of responsibilities and highlighted the multi-disciplinary nature of archaeological research.

The archaeological site investigated during the course was Monte da Ponte, a prehistoric settlement located near Évora, Portugal. This site, dated to the Neolithic and Chalcolithic periods, is of particular interest because it presents the potential coexistence of positive architecture (walls) and negative architecture (ditches) within the same settlement, which are traditionally considered to be distinct settlement styles (Ribeiro, 2023; Valera, 2024). Monte da Ponte was first studied between 1989 and 1997 under the direction of Philippine Kalb and Martin Höck (Kalb & Höck, 1997) and has recently become the focus of a research project led by Inês Ribeiro at the University of Évora (Ribeiro, 2023).

This paper provides an overview of the archaeological intervention at Monte da Ponte, including the the site's historical significance, previous investigations, applied methodologies, and the findings from the fieldwork conducted as part of the course.

2 The Archaeological Site Monte Da Ponte

The Monte da Ponte archaeological site is a prehistoric settlement located in the Vale de Rodrigo within Portugal's Alentejo region (Kalb & Höck, 1997). Spanning approximately 240 km², this valley contains over 50 archaeological sites, including several menhirs, a cromlech, and two ditch enclosures (Kalb, 2011; Kalb & Höck, 1997). The settlement of Monte da Ponte is situated on a small hill that offers excellent visibility over the surrounding landscape. It is also located near the confluence of two rivers, the Ribeira de São Brissos and the Ribeira de Peramanca (Ribeiro, 2023).

2.1 Prehistoric Context

The settlement at Monte da Ponte is generally dated to the Neolithic and Chalcolithic periods (Ribeiro, 2023). In the Iberian Peninsula, the Neolithic started approximately 5600 BCE with the transition to communities based on agriculture and livestock (Díaz-del-Río, 2023). The period is characterised by a radical transformation of livestyle, technologies and landscapes, with an increase in sedentarism and population densities. The Chalcolithic period, lasting roughly from 3200 BCE to 2200 BCE, followed the Neolithic and is identified by the introduction of metallurgy (Díaz-del-Río, 2023). Chalcolithic sites often feature collective architectural structures such as walls and ditches, reflecting an increase in agricultural production and significant surpluses, which enabled these large-scale communal construction efforts (Díaz-del-Río, 2023).

In the Iberian Peninsula, there are approximately twice as many preserved Chalcolithic sites as Neolithic ones (Díaz-del-Río, 2023). In the Alentejo region, the archaeological sites from these periods show great variety (Ribeiro, 2023). Some settlements, located both in flat areas and on elevated terrain, show no defense structures, while others, typically situated at higher elevations, have additional defensive walls. There are also ditch enclosures, often found in open areas, which remain the subject of many unresolved questions.

Monte da Ponte stands out for its unique combination of architectural structures, as it may incorporate both walls and ditches within the same site (Ribeiro, 2023), which are usually regarded as distinct settlement forms (Valera, 2024). This places the site at the intersection of different settlement strategies of the time and raises interesting questions about the occupational dynamics.

2.2 Previous Archaeological Interventions

The Monte da Ponte archaeological site was first identified in 1989 during an aerial prospection flight (Becker, 1996). Although the site had been used for sheep grazing, several rings of stone walls were visible from the air as can be seen in Figure 1. This discovery led to the first archaeological investigations by Philippine Kalb and Martin Höck, beginning with a topographical survey (Kalb & Höck, 1997). Geophysical studies, including electrical resistivity

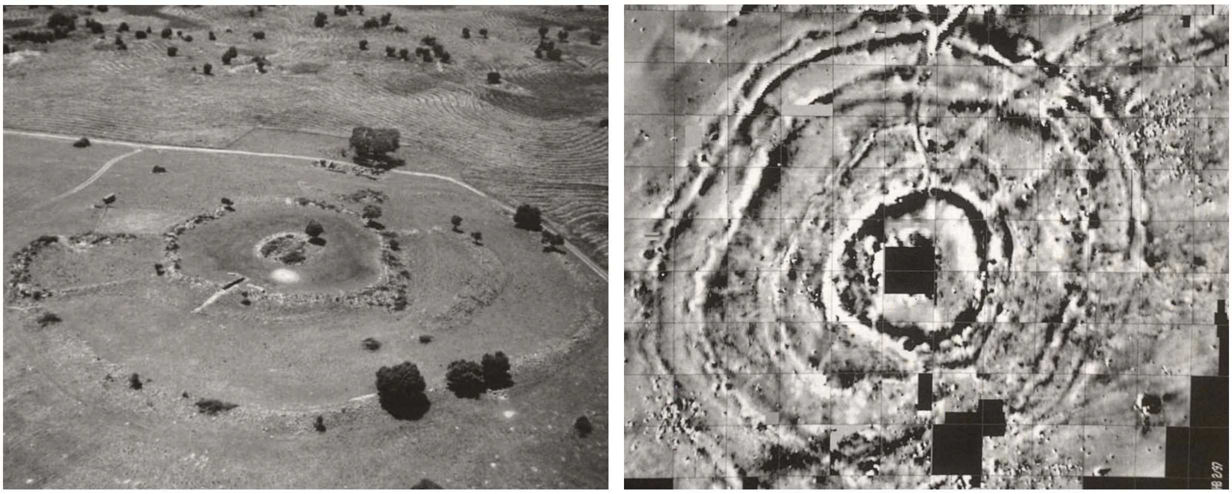

Figure 1: Aerial photograph (left) and magnetogram (right) of the Monte da Ponte archaeological site from 1997. From Becker, 1996.

surveys and magnetic prospection, provided further insights into the site (Becker, 1996). These investigations revealed a geometric layout of the site with a central tower surrounded by four concentric ring walls as shown in Figure 1. The geophysical data also indicated the presence of stone structures between the second and fourth wall, leading the researchers to propose this area as the inhabited zone. In 1996, an excavation was conducted at the first wall, uncovering characteristic prehistoric ceramics. The artifacts collected in this excavation were stored and only analyzed recently in Ribeiro, 2023. The analysis revealed a higher proportion of ceramics compared to lithics, with the ceramics aligning with the occupational dynamics of the 3rd millennium BCE, including a notable presence of plates and bowls (Ribeiro, 2023).

Building on these early interventions, Monte da Ponte is currently undergoing further investigation as the focus a research project led by Inês Ribeiro at the University of Évora.

3 Archaeological Field Work

This chapter aims to give a brief overview of the theory behind archaeological field work and illustrates the practical application in the ongoing research at Monte da Ponte.

3.1 Survey and Excavation

The first steps of an archaeological intervention involve identifying the archaeological site and formulating a research question, followed by detailed planning. This includes obtaining the necessary permits, assembling a team, and conducting thorough background research (Renfrew & Bahn, 2012). In the case of Monte da Ponte, the site is already known from previous archaeological excavations and it is essential to collect and evaluate all existing data to help plan the new archaeological intervention.

Site Surface Survey

Once an archaeological site is identified, the first step in understanding the site and gaining information on its extent and layout is often a site surface survey as this method is cost-effective, quick, minimally invasive, and requires very little equipment (Renfrew & Bahn, 2012). A site surface survey can be conducted either unsystematically or systematically (Renfrew & Bahn, 2012): An unsystematic survey involves walking across the site, examining and possibly collecting artifacts from the surface, and recording the locations of surface features and finds. While this approach is flexible and easily adaptable to different site conditions, it is prone to bias, as archaeologists may focus more on areas that appear richer in surface features or artifacts. In contrast, a systematic survey employs a grid or transect system to ensure that the entire survey area is covered evenly and that no area is over- or underrepresented. The results of the surface survey can help in planning further archaeological interventions as it may reveal whether excavation is appropriate or highlight the most promising areas.

At Monte da Ponte, the site surface survey is the basis of the decision to excavate three pits. One pit is located at the site of the previous excavation, while the other two are placed near the second and third wall.

Remote Sensing

Ground-based remote sensing techniques can be used to investigate a site either before excavation, to identify the most promising areas for pits, or alongside an excavation, to provide a better understanding of the site, especially in areas that cannot be fully excavated (Renfrew & Bahn, 2012). There are various methods, including seismic and acoustic techniques, electromagnetic methods like ground-penetrating radar, earth resistance surveys, magnetic surveys, metal detection, thermography, the study of the site's fauna, and geochemical analysis. The choice of method depends on the site's specific conditions and the research questions.

At Monte da Ponte, soil resistivity measurements are conducted to investigate the site. These revealed a potential stone structure within the first wall. As this is a very interesting feature, it may be excavated in the future.

Excavation

Excavation is both costly and destructive, and therefore requires careful planning and a methodology tailored to the site, research questions, and available resources. Each excavation must balance two objectives (Renfrew & Bahn, 2012): An emphasis on the vertical dimension by cutting through deep deposits will reveal stratification and help establish a potential chronology of the site. On the other hand, emphasizing the horizontal dimension by exposing large areas of a specific layer will lead to a better understanding of the spatial relationships between artifacts and features. There are many different excavation techniques which are chosen depending on the site and project. Some of the most common methods include (Renfrew & Bahn, 2012): The Wheeler–Kenyon method uses a grid system with earth balks left between excavated squares. This enabls the tracing and correlation of stratigraphic layers across the site. In contrast, a open-area excavation removes large horizontal sections and cuts vertical sections only as needed to clarify stratigraphic relationships. And the step-trenching method involves opening a large area at the top, which narrows as the excavation descends in a series of steps.

At Monte da Ponte, the excavation starts with three test pits. The first is placed at the location of the previous excavation, following its established size. The two new test pits are each 4m x 4m in size. They are outlined with nails connected by strings to form a clear grid.

Excavation is conducted by carefully removing layers of soil with handpicks, trowels, and brushes. Buckets and dustpans are used to collect and remove the soil. For Paleolithic and Neolithic excavations, sieving and screening of excavated soil is standard practice to recover small artifacts (Renfrew & Bahn, 2012), and this technique is employed at Monte da Ponte.

3.2 Stratigraphy

The layers of cultural or natural deposits visible in an excavation's profile are called archaeological strata (Renfrew & Bahn, 2012). They follow the principle of superposition, meaning that in an undisturbed sequence, lower layers are deposited earlier than those above them and they therefore form a chronological sequence. Stratgraphic units are differentiated from each other by a change in the material's consistency, color, or composition. After each unit is excavated, the unit is documented in the field diary, including for example a sketch highlighting key features such as structures or artifacts, and the elevation of the unit is determined.

At the Monte da Ponte archaeological site, stratigraphic layers are labeled using a number in the format *pxxx* where *p* denotes the pit number and *xxx* is a sequencial number assigned to the strata during the excavation. Accordingly, for the excavation in pit 2, the stratigraphic unit *2000* represents the surface level. It is characterized by compact grey-brown soil with a heterogeneous composition and includes small stones. Artifacts recovered from this layer include recent fauna, lithic tools, and recent and prehistoric pottery. During the course fieldwork, the stratigraphic unit *2001* was excavated. This layer consists of compact grey-brown soil with a heterogeneous composition and some small stones. Artifacts include both recent and prehistoric pottery fragments, a fragment of an arrowhead, and prehistoric ceramic loom weights. Due to the mix of ceramics from various periods, the chronology of this layer remains undetermined. The next unit to be excavated in pit 2 will be *2002*, which is defined by a change in consistency, color, or composition from unit *2001*.

3.3 Artifacts

The materials recovered from the Monte da Ponte site include clay fragments likely used for hut construction, prehistoric and recent pottery fragments, ceramic loom weights, arrowheads, and some recent animal bones. Photographs of some artifacts can be seen in Figure 2.

The initial sorting of artifacts is based on broad material categories, such as pottery, stone tools, and bones (Renfrew & Bahn, 2012). These categories can later be subdivided for more detailed analysis. For instance, pottery fragments can be analyzed in terms of their consistency, texture, quantity and size of non-plastic inclusions, firing conditions, and surface treatments (Ribeiro, 2023). Such analyses facilitate interpretation, as well as comparison with similar sites.

3.4 Documentation

During an archaeological intervention, a field notebook is used to document the day-to-day progress (Renfrew & Bahn, 2012). For the recording of artifacts or stratigraphic layers, preprinted data sheets with targeted questions can be used. Artifacts are typically removed from the excavation pit for further analysis and it is important to record their exact position, as this information can contribute to their later interpretation. In contrast, larger features and structures are generally left in situ. These can be documented through precise drawings, photographs, and 3D scanning. For photographs of pits or structures, a stadia rod, a calibrated 4-meter pole, is included in the frame, along with an arrow indicating north. This ensures the images are comprehensible and provides a clear spatial context. Figure 3 shows the three pits at Monte da Ponte, along with a drone used for aerial photography.

Position Measurement and Optical Level

To document the location of an artifact or structure, a Cartesian coordinate grid is defined for the pit area, with the edges of the pit as the x- and y-axes and a designated zero point (Barnard, 2023). Coordinates within this grid can be measured using a tape measure. If the absolute

Figure 2: Examples of artifacts found in the excavation at Monte da Ponte. Top Row: Pottery body fragments with different size and quantity of non-plastic elements. Middle Row: Pottery body fragment with discoloration which contains information on the firing conditions and a loom weight. Bottom Row: Pottery rim fragment and arrow head.

Figure 3: Photographs of the three pits at Monte da Ponte taken on October 17, 2024. Top Right: Pit 1. Top Left: Pit 2. Bottom Right: Pit 3. Bottom Left: Drone used for aerial photography above pit 1.

coordinates of the zero point are known, the measured coordinates can be transformed into absolute coordinates if that is required.

For determining the z-dimension or elevation of an object, the commonly used method involves an optical level and a stadia rod (Barnard, 2023). The optical level, a telescope mounted on a tripod, is set up at a distance where the entire survey area is visible. It is adjusted to a horizontal position using three leveling screws and a built-in spirit level. The telescope has a horizontal line in its optical path which creates an optical artificial horizon used for measurement. First, a reference point, called a benchmark, datum or monument, is defined. The stadia rod is placed on the benchmark, and the optical level is adjusted so that the artificial horizon aligns with the scale on the stadia rod. The first reading determines the elevation of the optical horizon relative to the benchmark. The stadia rod is then placed at the point of measurement within the survey area. A second reading is taken to determine the elevation of the artificial horizon at this location. Subtracting the elevation of the artificial horizon at the measurement point from the elevation at the benchmark gives the elevation of the measurement point relative to the benchmark. Although all measurements are relative to this benchmark, knowing its absolute elevation allows for conversion to absolute elevations. For the Monte da Ponte survey, two benchmarks were used to ensure accuracy and redundancy.

Alternative methods can be used if determining the elevation with the optical level is not feasible (Barnard, 2023): A calibrated altimeter can measure changes in air pressure to estimate elevation. Additionally, coordinates, including elevation, can be obtained using Global Navigation Satellite System (GNSS) data.

Aerial Photography and Satellite Images

Aerial photography is a common method of documenting archaeological sites and excavations (Barnard, 2023). It is often done with drones, which allow for capturing high-resolution photographs, or alternatively, satellite imagery can be used. Satellite images may be publicly available, for example through the Copernicus Earth Observation program, or can be purchased commercially. While satellite images typically include GNSS data, not all drones are equipped with internal GNSS receivers. Additional markers can be placed near the survey area to help align aerial photographs with precise coordinates, if needed.

LiDAR

Three-dimensional scanning of an archaeological site can be done using LiDAR (Light Detection and Ranging) (Barnard, 2023). This technique can be performed with specialized scanners or smartphones and tablets equipped with the necessary sensors. The result is a detailed 3D model of the site or object which allows for precise and comprehensive documentation.

4 Archaeological Laboratory Work

Artifacts recovered in an excavation are usually cleaned, labeled and prepared for storage before interpretation. This chapter provides an overview of the steps applied to the artifacts from Monte da Ponte.

4.1 Cleaning

After excavation, most artifacts are cleaned. However, it is important to avoid cleaning items that may have any preserved residues, for example food remnants in pots or blood traces on stone tools, as these can carry valuable information (Renfrew & Bahn, 2012). For the pottery and lithic artifacts from the Monte da Ponte site, the cleaning is done carefully using water and a toothbrush, after which the items are left to air dry.

4.2 Labeling and Storage

Each artifact is assigned a unique identifying number, which is recorded in a database (Renfrew & Bahn, 2012). Ideally, the number assigned carries information on the archaeological intervention in which the artifact was discovered. For Monte da Ponte, artifacts are labeled using the format MdP*yy*-s*n*-*xxxx*, where *yy* represents the last two digits of the year, *n* indicates the survey number, and *xxxx* is a sequential number. For example, materials found in 2024 in pit 2 will be numbered sequentially starting from MdP24-s2-0001.

A small paper label with the artifact's number is glued to each item using nail polish. Once the label is dry, the artifacts are placed in individual plastic bags containing an additional paper label with the same number. These bags are then grouped and stored in larger boxes for safekeeping.

4.3 Archaeological Drawing

Particularly notable pottery pieces and lithic artifacts may be selected for further investigation or even publication. Archaeological drawings of these artifacts follow established conventions to create consistency and clarity and allow a lot of information to be transported through the drawing (Collett, 2012).

The drawing conventions for pottery artifacts are (Collett, 2012): The vessel is initially drawn at full size, but the drawing may be scaled down for reproduction. The item is shown in an orthographic projection, which presents both the profile and the exterior in the same drawing. The profile section is conventionally depicted on the left side of the drawing, while the exterior is shown on the right. Among pottery fragments recovered in the archaeological intervention, only the rim pieces carry significant information about the pottery vessel and can be used for reconstruction. Fragments from the vessel's body generally lack this information

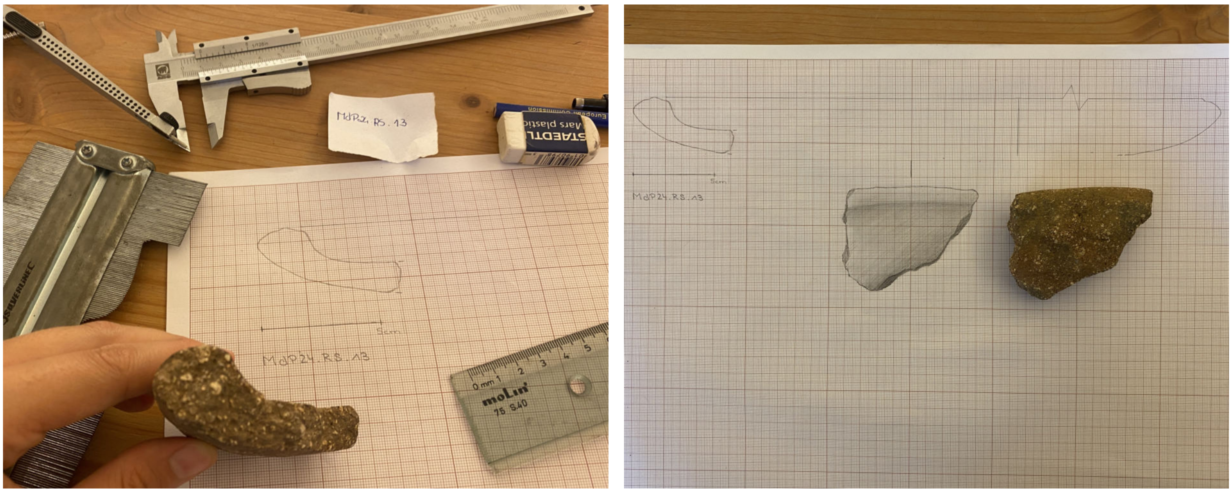

Figure 4: Archaeological drawing of the rim pottery fragment MdP24.RS.13 collected at Monte da Ponte. On the left the pottery's profile can be seen, the right shows the final drawing and the pottery fragment.

and are therefore rarely illustrated. Reconstructing a pottery vessel begins by determining the correct orientation of the rim. This is done by placing the rim against a flat surface and rotating it until it fits snugly and no gaps or light are visible between the rim and the surface. Next, the rim diameter is determined, which for Neolithic pottery is often done by hand using a compass instead of a rim diameter chart. The rim's outer edge is traced onto the surface. Using a compass, intersecting circles are drawn around three points on the edge line. The intersections of these circles are connected by straight lines, and the point where these lines intersect determines the diameter of the pottery. The diameter is the first element added to the drawing as a straight line at the top and serves as the reference point for the rest of the illustration. Next, the pottery's profile is drawn using a profile gauge, which captures the inner and outer contours of the pottery. Using these two contours the profile is transferred to the left side of the drawing. The outer profile is then transferred to the right side of the drawing with transfer paper. If the exterior of the vessel includes decorations, these are added. However, in the case of the pottery examined no decorations were present, so this section remained blank. Optionally, a detailed drawing of the full pottery piece can be included, shaded to represent light coming from the upper left corner. Finally, a scale and the artifact's identifying number are added to the drawing. Figure 4 shows an archaeological drawing of a rim pottery fragment from Monte da Ponte.

Similarly, the process of illustrating lithic artifacts also follows strict conventions (Martingell & Saville, 1988). Lithic artifacts are typically drawn at full size, with lines in the different surfaces used to represent surface conditions, orientation, angle, and manufacturing techniques. Depending on the type of artifact additional conventions for the drawing might apply.

5 Conclusion

The course *Excavation Methods, Culture and Contexts in Archaeology* provided insights into the different steps involved in an archaeological intervention: The first steps are identifying the site, conducting extensive background research on its chronology as well as any previous archaeological interventions and taking care of all administrative procedures like applying for permits and funding. On-site work starts with a surface survey to better understand the site's extent and layout. Geophysical remote sensing methods can be used to supply additional information. The excavation itself requires decisions on the selection and adaptation of methods based on the characteristics of the site as well as the research questions. Detailed documentation is essential throughout the intervention, including maintaining a field diary, taking photographs, aerial pictures or 3D scans to document the site in the various stages of the work, recording stratigraphic layers, and documenting artifacts and their precise locations. After the exacavation, artifacts are carefully cleaned, labeled, and stored. Particularly significant artifacts may be selected for drawing, following precise rules and conventions.

All these steps were applied during the course to the investigation of the archaeological site Monte da Ponte, as detailed in this paper alongside relevant theoretical background. The Monte da Ponte site proved to be an exceptional case study due to its possible unique combination of positive and negative architectural features, which are traditionally considered to occur separately (Ribeiro, 2023; Valera, 2024). The ongoing research by the University of Évora aims to further investigate the occupational dynamics and promises exciting results.

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