

## Visual interpretation, survey and graphics: adding value to archaeology

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*Grime's Graves during the Mesolithic (Artist's reconstruction by Judith Dobie – an interpretation drawn from data captured by archaeologists, archaeobotanists, archaeozoologists, surveyors and archaeogeologists © Historic England)*

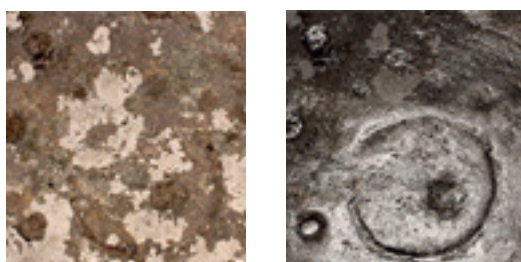
Technology is wonderful. Its development makes our lives simpler in all sorts of ways. In the archaeological sector there is no doubt that advancing technologies and their applications have enabled us to reveal far more about our hidden past than the pioneers of the field like Kathleen Kenyon or Gertrude Bell would ever have conceived. We are collecting more data, processing more data, turning it into meaningful, valuable, information that breathes further life into dusty pot sherds and microscopic remains. And once we have discovered their secrets, technology allows us to present that knowledge creatively, and share it more widely and collaboratively.

The impact of technology in the specialisms of graphics and survey has been as noticeable as anywhere. Our enormous drawing tables, noisy plotters that take up half the room, plane tables and trusty 'dumpy' level are mostly gone. In their place are computers on every desk – dual screens obscuring the earnest faces of the illustrator and surveyor. Global Navigation Satellite Systems and digital total stations

have replaced kilometres of measuring tape. Every output is never more than a few simple steps away from the printed (or digital) page.

Undoubtedly, advancing technology has added value to the visual interpretation of archaeology. Look at a 30-year-old archaeological publication in contrast to one printed recently. Affordable colour printing and digital publication allow us to show information much more efficiently and clearly through photos and coloured maps and plans, even allowing the viewer to interact and further interrogate the information interactively. Geospatial Information Systems (GIS) allow the illustrator and surveyor to start to build visual interpretation from the data processing stage. The viewer is now able to examine 3D surfaces and objects from their own computer screens. The information we can now share was beyond the reach of the remote scholar even ten years ago.

An example of a (reasonably) recent method and technology providing us new information is Multi-light or Reflectance Transformation Imaging (RTI). This method, developed in 2001 by Malzbender and Gelb, uses images captured under multiple specific lighting conditions to record surface details that may not be visible to the naked eye and examine them using virtual lighting. This method was further adapted to suit cultural heritage organisations, using a lower-tech approach at Cultural Heritage Imaging, and has successfully been used to record



*A rock carving at Roughing Linn, Northumbria shown using standard photography (a) and digitally lit using multi-light imaging (b) © Sarah Duffy after Historic England, 2018)*

objects from the microscopic to surfaces with an area of up 2m and has even been used under water. The results have contributed to a better understanding of artefacts and sites, including identifying microscopic worked antler from Star Carr and recording ancient rock art in Armenia. Furthermore, recording using RTI allows further remote interrogation of the surfaces captured (Historic England 2018).

Other advancements in technology focus not on capturing new data, but rather capturing data more efficiently. Automation allows us to both record more and interrogate the data further, creating more information. For example, total stations record exactly the same data as plane tables, using the same basic methodology, trigonometry – still going strong after all these millennia – but in a process which takes minutes, not days.

The use of aerial survey is not a new development, ‘taking off’ at the start of the 20th century (Bewley 2003, 16). It created a new perspective, giving rise to new interpretation and inspiring a new style of reconstruction art (Dobie 2019), but the availability and flexibility of drones (Small Unmanned Aerial Vehicles – UAVs) has renewed the value of this unique perspective.

Even photogrammetry, or Structure from Motion (SfM), a technique now widely used to record all sorts of things, has been around for a couple of centuries (Bewley 2003, 16); it is the availability of high definition photography and enormous processing power in the office environment that have allowed this surge of 3D information, and the development of lightweight viewing platforms that allow us to share our findings.

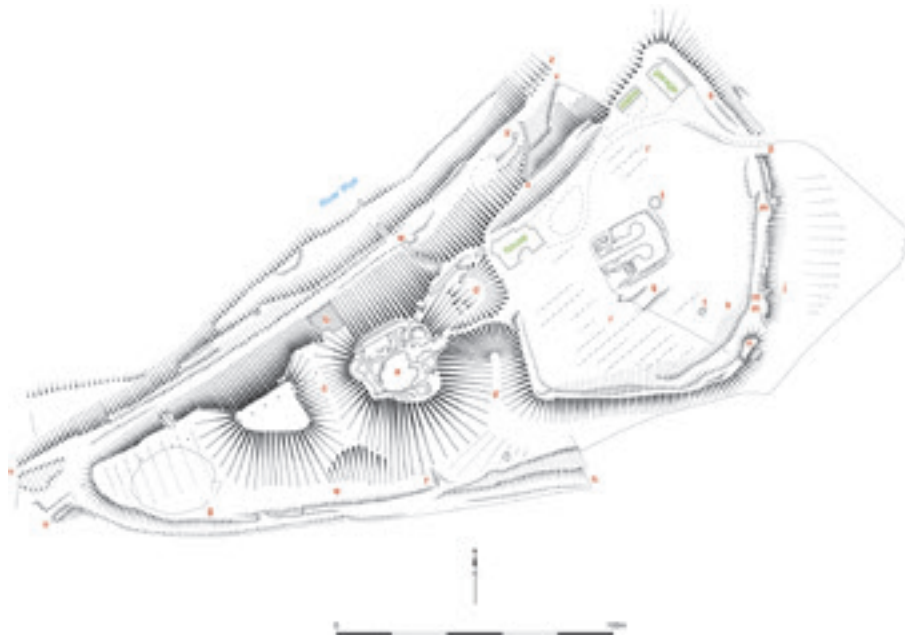
Despite these advances, the constant is that through all of these technologies, for the mass of data to be of any value, there must be a skilled recorder and primary interpreter of the data. All of the data in the world is worthless without interpretation. Just as the archaeologist interprets the different colours of earth in a trench and presents it as written and drawn record, so too do the illustrator and surveyor interpret and present the crude data captured by mechanical eyes. It takes skill and knowledge to direct these machines to capture data that is fit for purpose, whether using a total station, a laser scanner or a camera, just as it takes skill and knowledge to understand where to dig an intervention to reveal maximum information. There is an appropriate adage to explain this – Garbage In, Garbage Out (GIGO). Although it is easier than ever to operate these machines, without an understanding of how accurate data is required to provide us with meaningful information, the data is less valuable, and at worst, completely worthless. The hidden danger in the era of easy technology is that the unsuspecting can be fooled into accepting a product that looks good, but is not fit for purpose.

Furthermore, with so much information already out there, it may be less clear why methodical, in-depth archaeological work is needed. A clear example of why data needs to be intentionally and methodically captured can be seen in the efforts to salvage information from the tragic event of the destruction of Palmyra, where tourist photos were collated into photogrammetric models of the city, with some visually decent results. The issue, however, is that while there was a huge wealth of hundreds of thousands of photographs of Palmyra, they do not represent good data. For example, they tend to be largely from the exact same few locations. The Arch of Triumph has been recreated digitally, as have a few other notable treasures – the interior of the circus, the Lion of Al-lāt. However, a number of structures only exist in the background of these high-profile attractions. Even the most popular attractions suffer from limited views – very few people take photos of the back of a statue, even fewer the top of the head, and SfM requires multiple views to carefully map the surface of an object and avoid occlusions (data voids), meaning the models can only be approximations at best. Anywhere you see a melted, waxy-looking texture on a model it is due to inadequate data for that particular area. A surveyor carrying out a photogrammetric survey of an object understands at the point of recording where to expect occlusions and will make every effort to accurately record the entire object, not just the bit that people like to look at.



*The number of photographic views required to make a thorough photogrammetric model of this silver coin (Jon Bedford © Historic England)*





An interpretive, digitised hachure plan of earthworks at Clifford Castle, Herefordshire (Digitised by Amy Wright from hand drawn plans by Mark Bowden, © Historic England)

The importance of the role of the interpreter is only underlined as we discover new ways to record and collect data. However, the role of the surveyor and the illustrator is not only that of interpreter; we also serve as translators. The art of illustration is not in recreating what is in front of you: illustration is about giving understanding to the viewer – taking data and presenting it in such a way that the information contained is more readily understood. As technology advances, we must adapt and augment our visual language to incorporate this new information. In some cases this means discovering new ways to present, as with RTIs or photogrammetric models – discovering and inventing ways to illustrate 3D or even 4D datasets for a 2D medium. In many instances the most useful and accessible output of a 3D dataset may still be a hachured drawing – an analytic and interpretive output, and one that can still really only be drawn by hand, even if digitally.

Similarly, the skill of object illustration is not something that can be replaced by high-definition photography or SfM. The act of illustration is in itself interpretive, with the illustrator seeking to interpret and demonstrate the composition, material, treatment and use of an object to the viewer with just a few drawn faces. The finds illustrator uses conventions and style refined over a century to effortlessly impart knowledge about an object. Photography and SfM models can supplement this information, but the illustration remains the best method to share the interpretation of the specialist and illustrator.

In conclusion, technology *is* wonderful. It provides us the opportunity to gather new information; it expedites the capture and processing of data; and it can provide us access to places that were previously difficult to reach. New techniques allow us to see archaeology

through fresh eyes. We can record more data than previously thought possible and leave a record of value for future archaeologists to do even more with. However, the data is only of value if it is strategically, skilfully and accurately acquired. Accidentally captured data may provide the basis of some later interpretation, such as at Palmyra, but will never provide the value of a designed archaeological survey and will rarely be a sufficient record. Therefore, the true value of this wealth of opportunity lies with those who plan for it, record and interpret it. The information would be forever out of reach but for the skills and knowledge of those responsible for acquiring the data, interpreting the information and presenting the knowledge. The archaeologist, the scientist, the surveyor and the illustrator are the basis for the creation of new knowledge; they add value to the profession and subsequently to society and business.

### References and further reading:

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