

# Introduction



This is a book about enchantment and digital archaeology. It is a book about trying to pull together the connective threads on nearly twenty years of work in simulation, agent modelling, video games and Roman economic history. These are not, on the face of it, ‘enchanting’ topics. But hear me out. It’s about trying to remember what it was that was magical about archaeology when I first began, and why I find digital approaches to archaeology to still be magical.

This book is about, in a narrow sense, the ways in which I’ve reanimated Roman society using agent-based modelling and archaeogaming. But in a larger sense, it’s about digital *enchantment* in the ways that scholars like Sara Perry (2018, 2019) and Russell Staiff (2014) envision. It’s about responding to archaeology not as a crisis to be solved, but as a source of wonder. It is about responding to digital archaeology as if it is ‘sensible’ in the ways people like Yannis Hamilakis (2014) have written. It’s about whether digital archaeology is fast or slow, whether it is engaging or alienating, whether or not it is sensory and sensual. My aim is for you to be enchanted and delighted by digital archaeology as I trace a line through my own history of disenchantment and the reawakening of wonder through agent modelling, archaeogaming and artificial intelligence.

What are computers *for*, in archaeology?

The question might seem absurd. What is a pencil for? A shovel? A database? Our tools are only ever appropriate to particular situations. Not every moment on an excavation requires a mattock or a pail; a dental pick and a dustpan might be called for. By the same token, maybe we don’t always require a desktop computer to achieve a digital archaeology. Maybe a smartphone is all we need. Maybe an iPad. Maybe we just need what Jentery Sayers (2018, elaborating on Kirshenbaum 2009) calls ‘paper computers’, or the habits of thought that are themselves digital.

The point is, if we stop simply accepting the ubiquity of a computer, we can see again some of the enchantment these amazing devices possess, and we can begin to imagine again the kinds of questions to which they might be best suited. There is plenty of criticism of computing and of digital archaeology that focuses on the alienating aspects of the work. Caraher (2015, 2016, 2019), for instance, has argued that to use a computer as part of your process, whether in the field or in the lab, is to somehow be pushed away from the tacit and sensuous ways-of-knowing that characterize the doing of archaeology.

Perhaps we are asking the wrong questions of these devices. For me, the use of computation in archaeology is a kind of magic, a way of heightening my archaeological imagination to see in ways I otherwise couldn't. It lets me raise the dead (digital zombies?) with all the terror, wonder and ethical problems that that implies. Shouldn't we raise the dead? Why shouldn't we put words in their mouths, give them voices and talk with them to find out more about their (after) lives?

This is a book that shows a way to raise the dead. It is a practical digital necromancy.

I'm making an argument that a slow, reflexive, sensorial, enchanted engagement with the past is possible (even desirable) when we use digital computational approaches. That is not to say that it is not a rigorous approach. The first step in this approach is a clear formalism, a clear restatement *in code* about what I believe to be true about the past. It has to be that way because the fundamental action of the computer is to copy. Decisions we take in a computational medium are multiplied and accelerated, so those initial decisions can have unintended or unforeseen consequences when they are rendered computational.

Such formalisms also have to be rendered as relationships as well. Research on artificial neural networks demonstrates that meaning can emerge through cascades of coordinated firings of neurones through weighted channels, backwards and forwards. These weights do not need to be known beforehand, but can be learned as the network is exposed to stimuli. To my mind, this points to a way of computing the past that does not rely on higher-level equations that describe a social phenomenon, but rather a way of letting interaction precede the equation. We set up and describe the conditions for interactions, relationships and networks to emerge. Understand that I am not arguing for a naive use of computing and letting answers percolate out. That is nonsense. Rather, I am arguing for the correct level of complexity to model, to put into a simulation. In chapter 1, I consider networks as a substrate and then I revivify these networks, raising the dead through simulation in chapters 2 and 3.

These are games that play themselves, these simulations. Wouldn't it be interesting to enter the game ourselves? This is part of the enchantment. In chapters 4 and 5, I discuss what it takes to make this archaeogaming happen. In chapter 6 I look at what chatbots and other playful digital toys can offer to our research and, more importantly, for the audience for whom archaeology holds wonder. I weave throughout my engagement what makes digital work sensuous and enchanting in the ways that Perry and Staiff describe. It is unapologetically a personal engagement. In which case, the tone of this book will often be rather informal. It is not necessarily an academic book, but a book that emerges from academic thinking.

Insofar as the actual archaeological data in this book and my computational engagements with them are concerned, I have collected together and edited some of my previously published papers that employ a variety of small thought experiments and agent-based models and toys (the tone in these sections will be somewhat more formal, an artefact of their genesis and original audience). The computational parts are tools-to-think-with, rather than things that will prove a hypothesis. They are arranged in a logic that reflects the way that I have come to think about Roman society, especially cities and the social life within them. It seems to me that Roman cities and societies can be thought of as nodes of entangled systems, as biological processes that smear across boundaries and scales, and whose actions can be modelled upon those entanglements. With video game technologies, we can insert the researcher/student/public into the model for deeper learning, or engagement: a first person perspective. Not, I should hasten to add, a *Roman* perspective; rather, a deformation of our own just-so stories we tell about the past with the authority provided by a disembodied narration. If there is truth in the stories we tell, then there is truth in the embodied perspective provided by a computational rendering of that story.

I have tried to write as accessibly as I can. Forgive me my failures. I write not so much for an academic audience invested heavily in modelling and simulation, but rather for my archaeology and history students afraid to engage with digital work. It is when things break and in the cleavages that we see most clearly the problems and potentials of technology, and so failure is a necessary part of the process. We have to talk about things that do not work, as much as (if not more than) the things that do.

These particular case studies are wrapped in a larger argument about the proper role of computation in archaeology. In the end, I do not subscribe to a techno-chauvinism that sees digital responses as the

obvious goal for archaeology, nor a techno-utopianism that describes what ought to be (see Broussard 2018). Rather, I see space for a creative engagement with digital tools that opens up a landscape, a taskscape, for returning some enchantment to what we do.

### **What This Book Is Not**

This is not a typical academic book, and the tone and voice will vary from time to time. Portions of the present work republish or reproduce materials that first saw the light of day in academic articles. I have been blogging my research since 2006, a process that began when I was an unemployed/underemployed archaeologist, and I was trying to develop agent-based models at second hand from the archaeological data I found in repositories or university websites. Blogging is a platform, not a genre; a blog post can occupy any tone or style the author chooses. However, my blogging is often in the style of trying to tell the story of what I've done back to myself, to try to see what I've missed. I imagine, as I write, that I'm speaking to a person sitting across the coffee table from me. It is in many ways my 'teaching' voice. As the years have passed, the blogging has gathered a larger audience, but the discipline of telling the story has (you may disagree) improved my writing and teaching. Over the same period, my work began to be published, and I had to learn the very different style of writing that formal academic articles require. An academic article aims for economy of expression, and, while it is about furthering knowledge of a subject, it is also about signalling one's authority or positioning in various networks of academic capital. We can cast the difference here, in simplified terms, as being informal versus formal. One is not inherently better than the other, but they do have different aims. Academic books tend to not go for an informal voice, but it is important here to do so because anything with 'digital' in the title tends to frighten people off needlessly. I recently had reason to go and dig back through my early blogging, and found a post from 2007 that in many ways seems as if it is one of the kernels from which the present work springs. In that post, I wrote, "The serious face of archaeology we present to the public is so lifeless: how can we expect government and the public to be excited about our work if we ourselves give every indication of not being excited either?" I am excited about digital archaeology. The tone of this book is chosen deliberately to convey and capture some of what it is I find exciting about doing digital archaeology, and so it deals with a lot of things I have already done and only a few of

the things that I am starting to do; these latter things (including the explorations of what artificial intelligence or neural networks offer archaeology) are still coming into focus for me. I have settled on the idea of ‘enchantment’ as the leitmotiv that connects the various elements of my work together: playfulness, the craftwork of pulling code together and storytelling. I am speaking to students whom I wish to enthuse and who might, so inspired, seek out their own ways of enchanting archaeology for themselves.

## Groundwork

My first encounter with ‘real’ archaeology was as an eighteen-year-old college student on his first real adventure out of the country (out of the backwoods, in truth). We were working (paying to work) on an excavation in the Peloponnesus, in the hinterland of Corinth. In the bottom of the high mountain valley of Zaraka, you will find Lake Stymphalos, where Hercules defeated the Stymphalian Birds. Not much of note happened in this valley. The Romans marched through on their way to annihilating Corinth in 146 BCE. The crusaders of the Fourth Crusade built a monastery. During the Second World War and subsequent Greek Civil War, bitter battles were fought for control of the area. Sometime in the fifteenth century, a person was buried and their head lopped off, for future archaeologists to find, and to feed stories of Balkan vampires. But that’s about it.

My trench? My trench was full of bricks. The trench next to mine? *That* was the trench with the vampire in it. Every day, I cleared the bricks from my trench, slowly getting down to the doorstep of the monastery, while I watched the experienced excavators carefully record and remove the body; at night in the quiet, I could easily imagine the terror of watching someone waste away and die, not knowing what – or who – was responsible. I wondered about those lives and those people, as I trudged back to my trench full of rubble, quietly irritated that nothing in my trench afforded any sort of connection to . . . well, anything at all. They were just bricks.

Fast forward a few years, and I’m now in Rome, hot on the trail of aqueduct remains across the Roman countryside on a Vespa scooter. Thomas Ashby and Esther van Deman had done this during the interwar years (without the Vespa), but Rome and its countryside were a very different place then. Armed with copious photocopies, a dog-eared edition of Trevor Hodge’s *Roman Aqueducts and Water Supply* (1989) and a military topographic map (thirty years out of date), I

zoomed down the lanes and byways and industrial estates on the modern periphery of Rome. When I found some ruins, I tried to correlate what I found with the descriptions in Ashby and Van Deman. I measured, I photographed, and I drew. The point of these exertions was a massive Excel database that used my basic understanding of the geometry of solids (*is it pi-r-squared or half the width times the height or . . .*) to build a beautiful mathematical model of the finished aqueduct. I spent three months pulling this model apart to figure out the quantities of human labour and materials to make the Aqua Claudia. Then back on the road, to double check, to find the missing pieces – a glorious summer of roadside picnics, coffees in truck stops, shepherd dogs chasing me from the fields, climbing down into ravines or up onto brick-lined vaults. I wasn't much concerned with, or imagining the life of, the people who built the aqueduct. But I was proud of *my* model, *my* wrestling with data to learn something new.

A few years later, and it's just me staring at a storage shed full of bricks. Roman bricks are heavy. They are large, and they are thick. They litter the fields of Italy. When they are collected, it is sometimes to take a geochemical peek at their composition. Where might the clays come from? More often, it is because they contain very complex makers' marks, these bricks from near Rome. They tell you a year, an estate, a brickmaker, a landlord. They remind me a lot of how marks on timber floated down the Ottawa River were used by the timber barons to keep records straight, for paying for the use of timber slides, for working out who owned what. They are interesting, but I'm having a hard time imagining what I can do with them that is new. In self-defence against the teasing I receive – hey brickstamp boy! – I play up the boring bit. Hell, we're archaeologists; we can't always excavate vampires, right?

Vampires.

Raising the dead.

Hmmmm . . .

It's about this point where I first encounter the idea of 'social networks' – a full decade before Facebook – and I start to wonder what I might see if I tie these estate owners, estate names, brickmakers, makers' marks and so on together. In the blue glow of the cathode-ray monitor, the tangled hairball of connections starts to emerge, and I begin to see changing patterns over time, patterns that begin to *give life* to these long-dead workers, and they start to become *people* again, in the way I first imagined I might know the past, when I started all of this archaeology business. I learn their names and can dimly see the outlines of some of their lives.

This is a book about the practical magic – the practical necromancy? – that digital archaeology brings to the larger field. To use computers in the course of doing archaeological research does not a digital archaeology make. Digital archaeology requires enchantment. For me, enchantment as a concept captures the playfulness and craftwork and indeed magic that I have come to see as key elements in the useful employment of computers for the work of archaeology. Enchantment is not just a mode of being but also an enactment, a spell-casting, a singing-into-being (*chanter*, as Bennett 2001: 6 reminds us). Enchantment is the opposite of disenchantment, or that mode that requires a disinterested, distanced, dis-intermediated approach to the past. Enchantment works against the decoupling of the world that splits it into two halves, me and everything else. It requires an alertness to both how I affect, and am affected by, the world. It requires that we attend to emotion. R.G. Collingwood's work on folktales and magic (published in 2005 as part of a collection of previously unpublished manuscripts and titled *The Philosophy of Enchantment*) is apposite here:

We all have a feeling – not an intellectual idea, but an emotional one – of an intimate connexion between ourselves and the things which we have made. These things are felt as parts of ourselves, in the sense that an injury to them is felt as an injury to us. If a picture I have drawn, or a letter I have written, or some trifling thing, useful or useless, which I have made, is destroyed by accident, my sense of loss bears no relation to the intrinsic value or merit of what has been destroyed; it is like a wound or blow to myself, as if the destroyed thing had been a deposit or outpost of my personality in the world around me. (Collingwood 2005: 196–97)

It is in this feeling that Collingwood located the operations of magic in a society – not 'magic' as a byword for a superstitious awe at unexplained natural forces, but rather magic as the ritualized expression of that emotion. In his discussion of ghosts and their appearance and function across multiple cultures, he identifies the role of the magician as one who banishes the emotional vulnerability (Collingwood 2005: 205). He goes on:

If magical practices are not utilitarian activities based on scientific theories whether true or false, but spontaneous expressions of emotion whose utility, so far as they have any utility, lies in the fact that they resolve emotional conflicts in the agent and so readjust him to the practical life for which these conflicts render him unfitted; then a new problem arises about our own civilization. We pride ourselves

on always acting from utilitarian motives or scientific theories; but that very pride should warn us that this belief about ourselves may perhaps be unjustified. We may be conceiving our own civilization not as it actually is, but as, with our utilitarian obsession, we should like it to be. We think that our rationalism has done away with magic because that is what we want to think; but is it true? (Collingwood 2005: 208)

What is more rational than a computer, reducing all phenomena down to tractable ones and zeros? What is more magical than a computer, that we tie our identities to the particular hardware or software machines we use? Collingwood (2005: 279) saw modern Western society as no less magical than any other, in that it is now ‘science’ doing the work of resolving the ‘emotional conflicts’. Archaeology, as conventionally practiced, uses computation to effect a distancing from the world; perhaps not intentionally, but practically. Its rituals (the plotting of points on a map, the carefully controlled vocabularies to encode the messiness of the world into a database and thence a report, and so on) relieves us of the task of feeling the past, of telling the tales that enable us to envision actual lives lived. The power of the computer relieves us of the burden of having to be human. An enchanted digital archaeology remembers that when we are using computers, the computer is not a passive tool. It is an active agent in its own right (in the same way that an environment can be seen to be active). The way it is built, the way the code is designed, contains so many elements of unconscious bias from all of its myriad creators (and blood: do not forget how much actual human blood is shed to obtain the rare earths and minerals upon which computing rests; see, for instance, Crawford and Jolen 2018) means that the computer is our co-creator. It uses us as much as we use it. In a video game, the experience of the player is not the result of a passive reception of representation by the game author. The player’s active engagement with the emergent representation of the rules put in motion by the author but interpreted in the context of the local game environment implies that the meaning of the game is the product of at least three authors, and one of them is not human. We can see this in video games, but it’s not always apparent to us that this is also true of, say, GIS or 3d photogrammetry.

In that emergent dynamic, in that co-creation with a nonhuman but active agent, we might find the enchantment, the magic, of archaeology that is currently lacking. Sara Perry (2019) identifies the lack of magic, the lack of enchantment, in the ‘crisis’ model of archaeology that animates our teaching, our research and our public



outreach. If archaeology is always in danger, then every act of archaeology is an act of rescue, and every act of rescue implies a morality play, a this-is-good-for-you ethic to which the public should respond appropriately. April Beisaw (2017), in her reflection on the role local archaeology might play in a community, contrasts the way archaeologists talk about the past and the way ghost hunters talk about it:

Ghost hunters don't go into a new community and explain their past to them – they listen to what the community has to say about a place and then explore their stories. Ghost hunters bring others along to participate at every level of that exploration. They show their methods and their results and ask the audience to help draw conclusions. Ghost hunters leave questions unanswered so that wondering can continue. . . . Archaeologists can learn how to become more relevant to the wider public. . . . Find their mysteries, but don't spoil them. Encourage participatory exploration of the past but leave room for continued speculation.

Archaeology – academic archaeology – has lost its grip on wonder and enchantment and romance. This is not a plea to sanitize the past or to pander to tired tropes (but remember: most of those tropes were created by archaeologists who went out of their way to communicate their research to the public. It is not their fault that subsequent archaeologists turned their backs on the public and let those tropes fester). It is a plea to reinscribe the magic and wonder in what they do – to leave space for, and acknowledge, mystery: 'Archaeology has always been where non-archaeologists turn for stories about adventure and the unexplainable. . . . If my [local] community forgot someone or something, or invented a tale to explain something, they did so for a reason' (Beisaw 2017). Be scholarly, be rigorous, but leave space for enchantment and wonder, and understand what work these stories do (MacDougall 2019) for those who tell them.

And so I offer this book in that spirit. By pulling together the connective threads on nearly twenty years of work in simulation, agent modelling, video games and Roman economic history, which re-enchanting archaeology for me, I want to map out a way for digital archaeology to connect with what Andrew Reinhard has identified as 'archaeogaming': if I take the fossils of a Roman social network and reanimate them with autonomous software agents, just what kind of digital archaeology have I created? What other kinds are out there? Where does an archaeology so enchanted intersect with public archaeology, public stories, the work of archaeology in a community?

I want a digitally enchanted archaeology.

## An Apologia for Simulation

In 2000, J.P. Marney and Heather Tarbert published a paper in the *Journal of Artificial Societies and Social Simulation* called, 'Why Do Simulation? Towards a Working Epistemology for Practitioners of the Dark Arts'. It was a tongue-in-cheek way of acknowledging the peripheral status of work in simulation in many of the social sciences, and the piece is a philosophical reflection on the methods of simulation and how simulation constructs knowledge.

To call something a dark art, though, is to draw on the long history of magic, ritual and religion (particularly in the West). It is a rhetorical move meant largely to cast certain practices as part of the in-group versus the out-group. To be accused of being a magician in Greco-Roman antiquity was to be accused of practicing rituals that did not have the imprimatur of 'official' sanction. The priest – the representative of the in-group, per the ancient author's experience or approval – examines the entrails, watches the flight of birds, performs the rituals correctly and is rewarded with some glimpse into divine will. The magician, on the other hand (the representative of the out-group), compels the spirits to visit her – necromancy, in fact – through spells and carefully guarded craft, and wrests the certain knowledge of what is to come by dint of her own skill (Otto 2013 provides an accessible overview of the subject).

In the humanities, when we are concerned about the human past, we read the texts closely, we follow our rituals correctly, and we are rewarded with a story about history; in simulation, our skill enables us to raise the dead, putting them through their paces, and we are rewarded with not just one history, but an entire landscape of possible histories – simulation as dark art, as the pursuit of peripheral academics, indeed; and dark arts, as Harry Potter taught us, must be defended against.

'Agent modelling might be useful for those nonliterate societies, but we've got more than enough materials to work on here, Shawn' is the gist of a conversation I have had more than once with some of my Romanist colleagues. Nevertheless, Marney and Tarbert (2000) argue that simulation is perhaps the only way of addressing situations

1. where there are complex emergent global processes and dynamics from simple local behaviour
2. where coordinated global outcomes are generated by the heterogeneous local decision rules [amongst others]

... both of which describe Rome pretty nicely. Or human culture more generally.

The next criticism that we often encounter when we do simulation is that our agent models – any computational model – are simply tautological, that we only get out what we put in. This weary chestnut fundamentally misunderstands a significant characteristic of complex systems. The dynamics of one level of organization do not lead linearly to, or necessarily imply, the dynamics of another level. Hence if we are interested in culture, we model at the level of an individual. What comes out of the model is the emergent by-product of countless individual interactions. What comes out is definitely not what went in.

A final issue is about what, exactly, we are modelling. Are we really simulating the past? Of course not. We are actually creating zombies.

#### Zombies?

In popular culture, a zombie can be understood as a resurrected partial human, animated by a limited set of appetites and urges, and responding to its wider environment in limited or particular ways. In the same way, the computer lets us resurrect or create similarly limited partial humans, or agents, whose aggregated actions and emergent patterns give us insight. It is an attainable necromancy.

I used to call these autonomous software agents ‘zombies’ partly for the reason that it is a lively metaphor for driving home what the agents in an agent-based model do – the agents are mindlessly driven by their appetites. I have to clearly specify these appetites, these motive desires for the zombies to mindlessly carry out.

I was thinking of John Romero *Day of the Dead*-type zombies, but the original ‘zombie’ of Haitian folklore represents compelled labour after death (e.g. McAlister 2012: 459); when we reflect on the compelled labour that goes to underpinning our digital lifestyles, to speak of ‘zombies’ is too glib. We might do well to explore those networks stretching from rare earth mining in Africa to factory conditions in China to retail networks in America, a fitting subject for an archaeology of the Anthropocene. For my present purpose then, a better metaphor might be ‘golem’, of the kind envisioned in Terry Pratchett’s *Discworld* stories: creatures that have to follow the words written on paper placed in their heads. (The golem emerges in our world from Jewish folklore as an ‘unfinished man’ and is most famously the protector of Prague’s Jewish population. Unlike in the *Discworld*, which implies that the words animating a golem can include quite precise instructions [see Pratchett, *Going Postal*, 2004], the golems of Jewish folklore are animated by mystical wordplay related to the name of God. Cohen 2015 points to similarities between golems and zombies in current popular understandings).

In any event, I need to clearly specify what it is I believe about some phenomenon in the past in order for these golems to perform that behaviour. They do not think: they follow instructions, my model of past behaviour at the individual level. What I end up simulating then is not the past, but the story I am telling about the past. This lets me escape nearly all of the criticisms that my colleagues in the humanities raise about this dark art of simulation.

If I am simulating in effect a historiography, then the results, the landscape of possible emergent outcomes, are the consequences of that story I am telling about the past. Simulation becomes a way for me to explore the surprising outcomes about my stories about the past. I perform the past; I deform it.

The method forces me to become clear about what it is I believe about the past in an utterly transparent way. If I cannot encode those beliefs, then clearly I need to think more deeply. I use NetLogo (Wilensky 1999) for my agent modelling for a couple of reasons. One, its near-English syntax makes it easier for me to develop simulations. It also makes it possible for my colleagues to examine the procedural rhetoric (Bogost 2007), the argument-in-code of my simulation. A simulation is not complete until somebody else opens the hood and examines the code for your mistakes, your assumptions and the rhetorics hidden therein. I often tell my students that unless they can look at the code for themselves, they have no reason to believe the results of a simulation. My students are history students, without any great affinity for computing, but, with a bit of help, they can easily flow-chart a NetLogo simulation to get a sense of what is going on.

The end result, then, is that I have found that I have to keep my models as tightly focused as possible. If my model becomes too ambitious, I typically have two problems. One, it becomes difficult for me to tell the story of what is going on in my model, to tease apart the critical interactions that are producing the landscape of possibilities that have emerged. Two, there is little engagement with my code by those who could best critique it, as it becomes seemingly too complex.

Let me give you a brief example. I became interested in the social networks surrounding landholding in the immediate vicinity of Rome during the first three centuries CE. I did some network analysis of this data (stitched together from the epigraphy of stamped bricks), but I wanted to reanimate these patterns. There are many episodes in Roman history of elite self-extermination, as different factions vying for power eliminated rivals through murder, forced suicide or exile. How much disruption could these networks I observed endure? Thus, I be-

came interested in the sources of civil violence in the Roman world (I explore this in depth in chapter 3).

I created a simulation where a population of agents were interlinked in the patterns suggested from the archaeology. Over this network would flow prestige, gifts and money as the agents vied for status, drawing on the literature connected with the Roman tradition of the *salutatio*, or morning greeting given by a client to his patron(s). No patron has to accept a client who is not suitably prestigious, and no one gains prestige without a patron, thus shutting individuals out of the networks – the source for civil violence in the Roman world, I argued.

I was able to put these agents in a world where the economy ranged from one where everything was roses to one where everything was sackcloth and ashes; I imagined that there would be no violence in the rose world and lots of violence in the sackcloth world. And yes, this is duly what I saw, but there were surprising, unpredicted bouts of violence where there should be peace, and peace where there should be violence. This is something worth exploring.

In another model, I simulated an excruciatingly simple mechanic representing the contentious process of ‘Romanization’. In my model, which is based on an even simpler model of disease transmission, an agent is ‘non-Romanized’ until they run into an agent who has become ‘Romanized’. Poof! The first agent now becomes Romanized. Romero Zombies indeed. (And of course, there are models of zombie infection too!) (I explore this model in more depth in chapter 2).

The key element here was that the agents were not wandering around in an amorphous space. Rather, they were constrained to move along the paths suggested by the third century Antonine Itineraries, the lists of towns one would use in order to figure out how to get from point A to point B. To get to Honolulu from Ottawa, go to Toronto, Winnipeg, Calgary, Vancouver, Seattle, Honolulu.

Thus, I was interested in exploring the consequences of this list-like, networked conception of geographic space. I could measure the amount of model time it took for everyone in the model to become ‘Romanized’ as they moved over the network of Roman Spain versus Roman Britain, versus Roman Gaul, versus Roman Italy. I graphed these results, and the shape of this diffusionist model implied something about the way ideas of Romanness could penetrate, and how deeply, in these different regions. The model then became a guide for looking at the archaeology in a new way.

This use of agent-based simulation fits into a kind of experimental archaeology mindset, of building as a way of knowing; indeed, it also puts it in the developing traditions of the digital humanities. Trevor

Owens (2012), a digital archivist with the Library of Congress, wrote about the mutual incomprehension of computer scientists and humanists: ‘I don’t think the issue here is different ways of knowing, incompatible paradigms, or anything big and lofty like that. I think the issue at the heart of this back and forth dialog is about two different contexts. This is about what you can do in the generative context of discovery vs. what you get can do in the context of justifying a set of claims.’ What Owens argues is that, in the humanities, computational approaches are best suited for ‘the generative world of discovery’. He continues:

If you aren’t using the results of a digital tool as evidence then anything goes. More specifically, if you aren’t trying to attribute particular inferential value to a particular process that process is simply producing another artifact which you can then go about considering, exploring, probing and analyzing. I take this to be one of the key values of the idea of ‘deformance’. The results of a particular computational or statistical tool don’t need to be treated as facts, but instead can be used as part of an ongoing exploration. (Owens 2012)

Allow me to be contentious: the proper role of agent modelling in archaeology is not to try to justify stories of the past, but to generate new stories, new ways of looking at the evidence. The proper role is to deform. We are not simulating the past, but rather building what we believe to be true (or what might be true) about the past in a computer model. We are raising simulacra of the dead, we are breathing life into digital golems and putting words in their head, and we watch them so that we can tell stories that help us make sense of the past in the present. The emergent results of our simple models, our active nonhuman agents, help the past intrude on the present. We see *a* past performed in the present. And this is uncanny. This encounter with the uncanny is also part of the enchantment.

## **Deep History of Field and Bog**

There is a field near my parents’ home. In the summer, the heat shimmers off the field and the June bugs’ roar gets louder the hotter it gets. In the middle of the field is a stand of trees – ancient maples, some apple trees and, on the windward side, a row of spruce trees. This is the site of my ancestor’s first homestead in Western Quebec. On a summer day nearly two hundred years ago, he and his family walked up the six miles from the riverboat landing and said ‘Here’. I can imagine his

walk was much different than mine – in the cool of the deep forest, free of undergrowth, dappled light through the branches of the white pine, but still the June bugs' roar.

In those days, the requirement was to clear a certain amount of land every year in order to retain ownership of the one hundred acres. The results of his work are all around me – the flat open field on this ridge from which I can see the ridges and hills on the Ontario side of the Ottawa River. There is a faint depression in the ground, the filled-in cavity of his root cellar. Nothing else but the trees remain.

In my part of the country, perhaps this can count as deep time. We live every day in this constructed landscape, but seldom reflect on the labour and violence necessary to build it. But if I walked the six miles down to the river, I would encounter burial mounds and camp sites of the archaic Woodlands peoples who portaged around Chats Falls. I would encounter intrusions from this deeper time, ghosts and hauntings. The modern hydroelectric dam has obliterated most of these, but still, when you walk through the quiet of the bogs and flooded marshlands, you will encounter these mounds as they rise above the high-water line. The area is now mostly nature or hunting preserve. Its human history is largely forgotten or, at best, recast as the history of colonization. Recent work in the environmental humanities has discussed encounters with deep time via various 'modes' – enchantment, violence and haunting: 'Deep time has an uncanny ability to telescope into and out of everyday moments. We never really encounter deep time: deep time pulls at us as it manifests through places, objects, or affective atmospheres' (Ginn et al. 2018: 5).

Enchantment, for archaeologists, is perhaps this uncanny encounter with deep time. Because it *is* uncanny, we need to be aware of violence (whether effected by us or in the past) and haunting. Enchantment collapses time into the present and unsettles our relationship to the past (Fredengren 2016: 7). Fredengren (2016) discusses how the ways we experience enchantment are similar to the ways we experience 'authenticity' or 'aura'. She draws on the work of Jones (2010), who discusses the way 'authenticity' is constructed in modern discourses. On the one hand, authenticity is a principle of matter, with measurable characteristics – the ash of the handle of this axe dates to the nineteenth century; the iron of the axe blade was smelted from the local mines in the nineteenth century. On the other, there is the experience of the axe as a node in several different networks – this was my great-great-grandfather's axe; a different branch of the family held it for many years, but now it is mine. Over the years, it has seen much use, and perhaps the handle has had to be replaced from

time to time, perhaps the head has had to be refashioned, *but this is my great-great-grandfather's axe*. For Jones, authenticity resides in this tension between, on the one hand, modernity's need to delimit and define and order and purify, and, on the other, what might be called 'enchanted practices' that emerge at the entangled knots of different networks of objects and people and places (Jones 2010: 3, 19). 'However, when we look at how people experience and negotiate authenticity through objects, it is the networks of relationships between people, places and things that appear to be central, not the things in themselves' (Jones 2010: 1). These networks co-generate authenticity as they generate themselves (Fredengren 2016: 12, elaborating on Jones 2010).

When I walk in the bush and the bog by the river, I am entangled with the place through ties of family and through my training as an archaeologist. My encounters with deep time emerge as I confront the ghosts of colonization and dispossession. Enchantment is not always pleasant.

Now consider how this bog, this marshland, is often represented in archaeology. We would mark these mounds, these trackways, the campsites, the scatters of artefacts, as polygons and dots on a map in a geographic information system (GIS). The GIS as a technology emerged first in Canada as a tool of land management, often of lands from which Indigenous peoples have been dispossessed. The technology is not just about representation of the land, but also about representation about who gets to speak about the land, who gets to tell the stories of the land (see Risam 2019: 136 on which kinds of human are imagined in digital technologies). A digital archaeology should foreground this. Huggett argues that the 'New Aesthetic' – which emerges in the world of digital art and primarily was about glitching digital data in order to reveal the ways 'technology insinuates into modern life, changing perceptions and understanding' (Huggett 2015: 86) – is very much an archaeological way of looking at data, even if digital archaeologists haven't done this very much yet. He elaborates on what a 'New Aesthetic' perspective offers digital archaeology:

Digital data containers are not neutral, nor are they an 'empty vessel' into which data can be poured: data have to be structured in order to be represented, and the choice of representation has implications for the data. What effect does the process of structuring data for a database have on the way that we think about that data, on the way we go about recording that data, the way in which we retrieve that data, and the way in which we subsequently analyze that data? . . . The theory-laden, purpose-laden, and process-laden nature of the data remains largely hidden. (Huggett, 2015: 90; see also Risam 2019: 30–35)



Bennett (2001) argued that encountering or seeking out enchantment would move one towards an ethics of generosity. Perry (2019) argues that an archaeology of enchantment would move us away from a crisis-driven mode of engagement in archaeology and make our stories about the past more compelling, more affective and effective, in the world. The first people on whom such enchantment should work should be we archaeologists ourselves. Enchantment is present in digital archaeology, and, when we detect its effects, its moral imperative should be to move us to understand also the violence and ghosts, the New Aesthetic, in our data and processes.

### Sense, Sensibility and Enchantment

‘Enchantment never really left the world but only changed its forms’, says Jane Bennett (2001: 91). In her meditation on the sources of enchantment in the modern world, Bennett (2001: 131) argues that to be open to enchantment is to enter into productive assemblages of the type familiar from the work of Deleuze and Guattari (an idea she develops further in her 2010 *Vibrant Matter*, especially her chapter 2). The assemblages, the *agencement* (layout) that Deleuze and Guattari (1980) describe, have entered into the archaeological literature and, to my mind, might be consonant with what Ingold (2011) has called ‘meshworks’ and Hodder (2012) calls ‘entanglements’ and Wylie (1989, 2002) calls ‘cabling’.

As I read this literature, I understand these assemblages/meshworks/entanglements/cables as extended networks of people, things, moods and modes of being, where flows of energy (of whatever kind) move along the (nonlinear) relationships, allowing for emergent phenomena that exist at a higher level of complexity. To be enchanted, then, is to participate in a mood that allows us to identify and be moved by the extraordinary ‘that lives amid the familiar and the everyday’ (Bennett 2001: 4). The point of being attuned to enchantment is that it offers a compelling counternarrative against modernity, against alienation and disconnection. What is more alienating than the computer, the algorithm, the black box of digital archaeology?

Bennett tells many parables of enchantment, and one place where she finds enchantment is in complexity theory, far from equilibrium systems. Such systems are familiar to any archaeologist who dabbles in agent-based models. Indeed, Bennett (2001: 103) discusses one of the first models novice agent modellers encounter, the termite mound. In the termite mound model (which is bundled as one of the exam-

ple models in the NetLogo modelling environment), termites wander aimlessly across a landscape. When they encounter a wood chip, they pick it up. When they encounter another wood chip, they put their wood chip down. From this simple dynamic, a complex structure – the termite mound – emerges. Is there not something extraordinary about this? That simple actions can give rise to complex results? That there exist points of bifurcation in the world where an individual moment, an individual choice, can send the system down another path entirely? She also points out that our machines, our computing devices, are also sources of enchantment because they satisfy a need for magic (Bennett 2001: 171): ‘it just works’, in Steve Jobs’s famous formulation. To enchant: *chanter* (*fr*), to sing; sing a new song or a new thing into being; to cast a spell (Bennett 2001: 6). Remember our golems who are brought to life by the words in their heads.

Enchantment drives joy, and joy moves the body into an ethic of generosity. Being alive to the possibilities of enchantment in our world, according to Bennett (2001: 156), opens us to this ethical stance:

Enchantment is a feeling of being connected in an affirmative way to existence; it is to be under the momentary impression that the natural and cultural worlds *offer gifts*, and, in so doing, remind us that it is good to be alive. This sense of fullness . . . encourages the finite human animal, in turn, to give away some of its own time and effort on behalf of other creatures.

Generosity is part of being enchanted. What would archaeological generosity entail? An enchanted archaeology, a generous archaeology, would be attuned to the full complexity (never possible to fully map) of things and people and animals and the environment. It would be delighted in the unexpected, the pleasure of knowing and the liturgy of archaeological work (liturgy: the rites, rituals and formalisms of fieldwork). It would be motivated to share and enfold others in that enchanting moment – including the messy methods of the field and the untidy code at the computer; it would offer an invitation in: come help! It would not say ‘archaeology is important!’ while at the same time denigrating the work of archaeology (‘digging is boring, tedious work’) or the ways that people come to want to know about the past (‘huh, ghost hunters’). It would not be an archaeology of crisis (as Perry 2019 argues) written from the perspective of disenchantment (a place of cold reason and control), but an archaeology that celebrates not only the subject but also the archaeologist’s own process of coming to know, of coming to be enchanted.

In this way, it would also intersect with the work of people like Yannis Hamilakis (2014) on sense and sensibility in archaeology, or

Cornelius Holtorf (2009), who discusses archaeology's brand, or McKinney (2018), who opens up the possibilities of empathy, the most important of which is to tell compelling stories. I have already told some of my own personal stories about how I come to the past, of how I am enchanted by the powerful work of deformation that the computer permits me to do. In this volume, I will tell more: how digital archaeology moved me from a profound *disenchantment* with the discipline to a point where I find something akin to magic every day. I am unapologetic about this. In the current political moment, with the resurgence of white nationalism and the abuse of Greco-Roman antiquity as a source of authority for these narratives of white supremacy, we are losing the battle. We lose the battle when we undermine our own powerful narratives about the past by appealing to a crisis mode. We lose the battle when we tell people that 'archaeology is actually very boring; we don't have adventures'. We lose the battle when we try to inject a spurious objectivity into archaeology. Understand me clearly: I am not saying that we should not practice archaeology properly. I am not arguing against fieldwork, stratigraphy, archaeometry, or careful statistical analysis. I am not saying we should use antiquity in the same ways the white supremacists do. I am saying that we made a mistake when we stopped admitting the wonder in what we do, the affective nature of our work, our practice. We made a mistake when we removed ourselves from the stories we tell to other people.

As an archaeologist, I exist in a complex assemblage at the intersection of computing power, computing networks, technological history, Roman history, the Italian countryside, the histories of resource extraction in Italy and Canada, the networks of ancient and modern imperialism, of migrations and economic upheavals, of the academy and of publishing. Enchantment lets me participate in the great stories, the great adventures, and it makes great adventures of my own small archaeological contributions: and if I tell the stories to you of what I do such that I provide moments of enchantment for you, perhaps we can change the world a bit.

Let me put it this way: what's the point of an unenchanted archaeology?

## Enchantment and Seduction

A powerful critique of 'datafication' is provided by Gavin Smith (2018: 2–3), who is interested in exploring how repeated encounters with data (through everything from the ad trackers, to health monitors, to the increasing normalization of facial recognition) normalize and le-

gitimize the transfers of power and capital that surveillance capitalism profits from. He argues that there are three types of relationships with data that allow this to happen, *fetishisation*, *habit* and *enchantment*: ‘Each of these relations come to mediate public understandings of digital devices and data, obscuring the multifaceted nature and hidden depths of data and their propensity to double up as technologies of exposure and discipline’ (Smith 2018: 2).

It is this last one I want to explore: if I am arguing for an enchanted digital archaeology, am I unwittingly arguing for the exploitation at scale that currently enables the power and wealth of Google, of Facebook? Am I participating in the sensibility that Smith (2018: 5) calls ‘data doxa’, ‘a sensibility that limits critical engagement with data beyond the immediate ends they serve’? Smith goes on to gloss his three ‘doxa’, where to fetishize data is to inflate its explanatory power; to make data is to forget about the ways data are constructed; and to be enchanted by data is to be seduced, to slip into the easy flow that modern digital media technologies promote (while hiding how they shape and promote habit and fetish).

Jeremy Hugget (2018) has wrestled with these issues in public on his *Introspective Digital Archaeology* blog. Discussing Smith in a reflection on meanings of the word ‘data’, he writes,

A digital environment which increasingly facilitates the aggregation of datasets into meta-analyses or large-scale synthetic analyses, based on the availability of large quantities of variable-quality data held in open repositories and used for purposes for which they were not originally intended, can inadvertently heighten the risks of fetishisation, habituation, and seduction of our digital data. (Hugget 2018)

I think in these discussions we are getting away from the idea of ‘enchantment’ as framed in the work of Bennett and elaborated in the work of Perry. Seduction and enchantment are not equivalent. As I understand ‘enchantment’, it is precisely in the ruptures and things that break when doing digital work, delighting in the inefficiencies of digital work, that we become enchanted. As I will show later, ‘more data’ actually gets in the way of doing effective digital work, of understanding what’s happening.

On the other hand, Smith and Hugget are definitely right to warn against fetishization, habit and seduction when we see digital as a synecdoche for ‘efficient’. This, I think, is where Caraher’s (2019) formulation of ‘slow’ archaeology intersects with Hugget and Smith. Caraher (2019: 4–6) locates his concern in the evolution of twentieth-century archaeology as an industrial practice, its atomization and the

use of digital tools to accelerate practice in the service of efficiency. Efficiency requires logistics, and logistics ‘fragment data so that it can be rearranged and redeployed globally for an increasingly seamless system . . . each generation of digital tools makes it possible to shatter the integrity of the site, the link between the individual, work, and knowledge, and to redefine the organization of archaeological knowledge-making’ (Caraher 2019: 10).

But . . . what if digital work is *not* efficient? I think Caraher here has been seduced by the digital in the way that Smith warns, seeing in the easy flow of certain digital technologies an equivalence with ‘faster’. Digital archaeology understood in this way might well accelerate some tasks, but if the acceleration leads to poor archaeology, that’s a bad outcome. If digital archaeology is about a creative engagement, where the computing device is a prosthesis for thought, where ‘you try things out and see what happens’, to create an ‘art of inquiry’, to explore ‘correspondence with the world’ (as per Ingold 2013: 5–7), it is necessarily not ‘efficient’. An enchanted digital archaeology is not efficient in the logistics sense that worries Caraher.

In which case, what *does* digital archaeology enable? In my mind, it is the ability to iterate, to recombine, to remix, remesh, replay, replicate, reuse. If the use of computation does accelerate some aspects of practice, in this acceleration it creates spaces of possibility for other aspects. This means that digital archaeology is not an ‘industrial’ mode of knowledge production, but a ‘craft’ mode. It requires that you engage with the particularities of each situation to make ‘good’ archaeology. Responding to Caraher’s (2016) thought on my blog, I wrote,

To get digital stuff to work involves a constant cycle of feedback and productive failure. ‘Digital archaeology’ is sometimes the slowest archaeology around. There’s nothing inherent in the *craft* aspect of ‘slow’ archaeology that isn’t also true of digital work. Digital work **is inefficient** in my view – it never works the first time. That’s its strength. It allows us to fail faster, and that’s where the illusion of ‘efficiency’ comes from. Let’s consider 3d photogrammetry. It is not the case that one clicks the button and *poof* a 3d model is born and we are absolved of having to *know* the artifact, the context, any less deeply than if we were drawing it. Indeed, this is something that my own students have commented on: that it is remarkably hard to produce a decent 3d photogrammetry model and in the *process* of taking the photos over and over again, building and rebuilding the model, they come to know the object very well indeed. It is because these steps are the ones that are intuitive when one puts pen to paper: the digital

forces the students to think these normally unexamined steps out in full. (Graham 2017b)

As I imagine digital archaeology, it guards against the ‘data doxa’ that Smith warns us about. In fact, it resembles what Caraher (2019: 2), in his response to critiques of his developing ideas of ‘slow’ archaeology, terms an ‘archaeology of care’, where we consider how various digital technologies ‘shape the structure of the discipline, social conditions in field practice, and obscure the place of individuals in producing knowledge of the past’, noting that there are ‘social responsibilities inherent in archaeological knowledge-making, both to the discipline itself and to the communities where we work’.

This is precisely what an enchanted digital archaeology pushes us towards.

### **A Concluding Thought**

Enchantment can be magical. But it can be terrifying too – not just in what it unleashes, but in how it makes visible the violence and hauntings that generate the past in the present. Digital archaeology exists at this knot of entangled networks – of new media technologies and their networks of capital, labour and power, and of networks of extraction and colonialism that allow these magical devices to exist, and the tension between perceived efficiencies and productive failures. Narratives of disenchantment, of modernity, serve to create a crisis mode whose subtext is ‘things can’t change for the better; everything is destruction’. Enchantment, then, is necessary to envision a better world, to enable engagements with deep time, to create affective and effective archaeologies. Enchantment requires a focus on process and making that is open and reflective, which would guard against the data doxa. An enchanted digital archaeology folds its audience into itself.

This book is a spell book. This book is an autobiography. This book is a book about how to be an archaeologist when you can’t get your hands in the dirt and have to make do with second-hand data. It’s a book about how to generate the compelling stories, the enchanting stories, to re-run the past for yourself, to put words in the heads of digital golems and to see what happens next.