Unravelling Cyberinfrastructures

written by Jeremy Huggett | 29/09/2016



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Infrastructures are all around us. They make the modern world work – whether we're thinking of infrastructures in terms of gas, electric or water supply, telephony, fibre networks, road and rail systems, or organisations such as Google, Amazon and others, and so on. Infrastructures are also what we are building in archaeology. Data distribution systems have increasingly become an integral part of the archaeological toolkit, and the creation of a digital infrastructure – or cyberinfrastructure – underpins the set of grand challenges for archaeology laid out by Keith Kintigh and colleagues (2015), for example. But what are the consequences and challenges associated with these kinds of infrastructures? What are we knowingly or unknowingly constructing?

Patrik Svensson (2015) has pointed to a lack of critical work and an absence of systemic awareness surrounding the developments of infrastructures within the humanities. While he points to archaeology as one of the more developed in infrastructural terms, this isn't necessarily a 'good thing' in the light of his critique. As he says, "Humanists do not … necessarily think of what they do as situated and conditioned in terms of infrastructures" (2015, 337) and consequently:

> "A real risk … is that new humanities infrastructures will be based on existing infrastructures, often filtered through the technological side of the humanities or through the predominant models from science and engineering, rather than being based on the core and central needs of the humanities." (2015, 337).

This seems very reminiscent of the situation in archaeology where digital infrastructural developments have been largely driven by digitally knowledgeable archaeologists and built upon essentially scientific and technological foundations. Furthermore, as Svensson says, any infrastructure comes with its own built-in predispositions (2015, 342). What might the implications of this be? And what are the predispositions of the archaeological cyberinfrastructures that are already in place?

Behind these questions lies an increasingly extensive body of research into infrastructures and platforms which has yet to cross over into archaeological debate. As Plantin *et al* (2016) have recently argued, infrastructures and platforms shade into one another – platforms are essentially the software which provide the means of creating new digital objects and hence support infrastructures, while infrastructures are widely accessible, shared and essential services built on one platform or another. Both bring their own set of affordances, constraints, logics and connections, interacting in different ways. But these are not areas which have seen much investigation within the context of archaeological cyberinfrastructures.

For example, one aspect of cyberinfrastructures is their implicit rationality. The benefits of the technologies and solutions offered seem unarguable. As Rob Kitchin says:

> "… it is difficult to contend that being less insightful and wise, productive, competitive, efficient, effective, sustainable, secure, safe, and so on, is a desirable situation … Of course, the argument being presented is narrow and selective and deliberately avoids highlighting potential negative consequences" (2014, 126).

The kind of consequences of concern may be associated with neoliberal governance, regulation, standardisation, technological lock-in, control creep, and restricted perspectives, amongst others. Yet the very essentiality of the infrastructure draws us inexorably in.

Infrastructures may also affect our approach to data. The availability, accessibility, and sheer quantity of data provided by cyberinfrastructures changes our relationship to those data. For instance, we tend to overlook the way in which the search tools provided filter our perspectives. Ronald Day, for example, writes about how "algorithms and indexes have become both more opaque and more mobile, hiding the logical and psychological assumptions that once were very clear in traditional top-down and universal classification and taxonomic structures" (2014, 4). Indeed, the proponents of 'big data' have long argued that quantity trumps quality, that more data somehow creates a higher form of knowledge. As Day argues, data have become equivalent to facts:

> "claims for knowledge are presented as immediate – 'factual' – rather than as emergent through technologies, techniques, and methods, on the one hand, and interpreted through theory or a priori concepts, on the other hand. *The data says …; the data shows us …; we are only interested in data (not justifications/excuses/your opinion/your experience)…; big data and its mining and visualizations gives us a macroscopic view to see the world anew now* – these and similar phrases and tropes now fill the air with what is claimed to be a new form of knowledge and a new tool for governance that are superior to all others, past and present" (2014: 134).

The arms-length relationship with data encouraged by cyberinfrastructures increases the distance, isolation, even remoteness, of the data consumer from the data producer (see Huggett 2015).

Svensson concludes that "What is most important is to connect infrastructures to ideas about the

humanities and what intellectual challenges we want to tackle" (2015, 353), which is not all that different to the approach adopted by Kintigh *et al* (2015) for instance. The argument here is for a more nuanced and considered understanding of the effects of the infrastructures and platforms we are building. Nor is this an especially original suggestion. As Kansa and Kansa conclude in their discussion of the Open Context infrastructure:

> "Making mountains of data informative and useful for creating knowledge … involves technology, information architecture, data modelling, and service design, areas in which archaeologists have little experience or theoretical guidance … We hope that the conversation will expand beyond the technically savvy to include the theoretically sophisticated, the practically oriented, and others who think about, produce, and want to share and reuse data" (2011, 88).

The important thing is that this conversation takes place before we are locked into infrastructures which are situated culturally, socially, politically, technologically and spatially (Svensson 2015, 338), and over which we have had little control.

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