



Power through the algorithm? Participatory web cultures and the *technological unconscious*

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Abstract

The movement toward what is often described as Web 2.0 is usually understood as a large-scale shift toward a participatory and collaborative version of the web, where users are able to get involved and create content. As things stand we have so far had little opportunity to explore how new forms of power play out in this context of apparent ‘empowerment’ and ‘democratization’. This article suggests that this is a pressing issue that requires urgent attention. To begin to open up this topic this article situates Web 2.0 in the context of the broader transformations that are occurring in new media by drawing on the work of a number of leading writers who, in various ways, consider the implications of software ‘sinking’ into and ‘sorting’ aspects of our everyday lives. The article begins with this broader literature before exploring in detail Scott Lash’s notion of ‘post-hegemonic power’ and more specifically his concept of ‘power through the algorithm’. The piece concludes by discussing how this relates to work on Web 2.0 and how this work might be developed in the future.

Key words

new forms of power • performative infrastructures •
post-hegemony • Scott Lash • social networking sites •
social participation • *technological unconscious* • Web 2.0

INTRODUCTION

Recently, web cultures have been transforming in ways that we have so far had little opportunity to analyse or understand. The central defining characteristic of these changes has been the increasing involvement of users in the creation of content. Terms like 'Web 2.0' (Beer and Burrows, 2007; O'Reilly, 2005), 'social network sites' (boyd and Ellison, 2007), 'user-generated content' (BBC, n.d.), 'me media' (Garfield, 2006), amongst many others, are already becoming familiar staples in attempts to locate a conceptual terminology that might be used to account for these changes.

The popular term 'Web 2.0' provides a useful illustrative example. Made popular by Tim O'Reilly (2005) in 2004, the 2.0 suffix acted as reference to the terminology used to label updated versions of software packages. The 2.0 denotes an 'improved' or progressional version of the web that builds upon and develops Web 1.0, and will presumably be followed by Web 3.0 (or Web 2.1). Indeed, Web 3.0, or the semantic web, is already an established part of some discourse (Baker, 2006; Waineright, 2005). Implicitly rooted in this vision of the web is a sense of teleological progress, of purposeful and directed development, of continual and designed improvement. It is perhaps not surprising that Web 2.0 – which has been defined as the shift toward user-generated content and the move from desktop storage to webtop access (Beer and Burrows, 2007) – has become associated in popular depictions with empowerment and liberation as 'the people' apparently reclaim the internet and exercise their 'collective intelligence'. This we can think of as a *rhetoric of democratization* embodied in phrases such as 'how the people took over the internet' (Garfield, 2006) and other terms that are more closely associated with the practices of Web 2.0 such as 'social software' (Kamel Boulos and Wheelert, 2007; Various, n.d.), 'social utility' (www.facebook.com), 'collaborative' or 'collective intelligence' (Bryant, 2007; O'Reilly, 2005), 'participatory cultures' (Jenkins et al., 2006; Unicom, 2007), 'broadcast yourself' (www.youtube.com), and so on. Although, as the polarized accounts of the commentators Andrew Keen (2007a) and Charles Leadbeater (2008) would indicate, the consequences of these transformations are far from being a matter of consensus.

In general terms, Web 2.0 is a concept that forms part of the lexicon of a range of emerging accounts that commentate on a large-scale shift toward a 'participatory' and 'collaborative' version of the web, where users are able to get involved and create content. As things stand we have so far had little opportunity to explore how new forms of power play out in this context of apparent 'empowerment' and 'democratization'. This article suggests that this is a pressing issue that requires urgent attention. There is a need to work toward conceptual and empirical investigations into power in the context of 'social participation'. To begin to open up this topic this article situates

Web 2.0 in the context of the broader transformations that are occurring in new media by drawing on the work of a number of leading writers who, in various ways, consider the implications of software ‘sinking’ into and ‘sorting’ aspects of our everyday lives. The article begins with this broader literature before exploring in detail Scott Lash’s (2007a) notion of ‘post-hegemonic power’ and more specifically his concept of ‘power through the algorithm’. The piece concludes by discussing how this literature relates to work on Web 2.0, and how this work might be developed in the future.

OPENING UP THE *TECHNOLOGICAL UNCONSCIOUS*

The prominent new media theorist Scott Lash (2007b) has recently spoken of what he describes as a ‘new new media ontology’. This is a term designed to capture a shift toward forms of living in which information becomes active in shaping lifestyles and environments. What is useful about this slightly oblique terminology is that it can be used to group together a range of emergent work in the social sciences, and particularly in urban studies, that picks up on the technological challenges to human agency offered by the decision-making powers of established and emergent software algorithms. In an earlier work Lash foregrounds the use of this more recent terminology:

What may be happening in the information order is such a collapse of ontology and epistemology. Ontology itself is increasingly epistemological. And of course the notion of information implies this. What else could informational being be? But equally epistemological or modes of knowing are increasingly also modes of being. Being always necessarily shifts over into modes of classification. (2006: 581)

The point here could easily be lost in the complexity of the discourse, but it is a point of great enough importance to dwell upon. In attempting to translate Lash’s work, Roger Burrows has suggested that the difference here is that information technologies now ‘comprise’ or ‘constitute’ rather ‘mediate’ our lives. As he puts it:

... the ‘stuff’ that makes up the social and urban fabric has changed – it is no longer just about emergent properties that derive from a complex of social associations and interactions. These associations and interactions are now not only *mediated* by software and code they are becoming *constituted* by it. (2009)

The suggestion here is that we can no longer think of our lives as mediated by information and software, but that they are increasingly constituted by or comprised of them. In Lash’s words, ‘[w]hat was a medium ... has become a thing, a product’ (2007c: 18). The shift that Lash is intimating, and which is being picked up on across a variety of contemporary new media work (as I discuss in a moment), is toward information becoming a part of how we live, a part of our being, a part of how we do things, the way we are treated,

the things we encounter, our way of life. The result is that information is not only about how we understand the world, it is also active in constructing it.

Lash's 'new new media ontology' is useful in categorizing the shared analytical objectives of a range of writers who are concerned with the various ways in which 'software is increasingly making a difference to the constitution and production of everyday life' (Dodge and Kitchin, 2008: 2). This literature is concerned with how 'software has come to intervene in nearly all aspects of everyday life and has begun to sink into its taken-for-granted background' (Thrift and French in Thrift, 2005: 153). This work, by writers including Nigel Thrift, Katherine Hayles and Steve Graham, describes the ways in which software acts in often unseen and concealed ways to structure and sort people, places and things. Hayles, for instance, is concerned with how relational databases and locational hardware communicate to gather information and use it to take decisions. Most of these communications, Hayles notes, go unnoticed. Hayles claims that in 'highly developed and networked societies ... human awareness comprises the tip of a huge pyramid of data flows, most of which occur between machines' (2006: 161). What Hayles calls the 'cognisphere' acts as the:

... emblem and instantiation of dynamic cognitive flows between human, animal, and machine, the cognisphere, like the world itself, is not binary but multiple, not a split creature but a co-evolving and densely interconnected complex system. (Hayles, 2006: 165)

Hayles' description then is of a vast set of automated communications that are a part of how we live but are often not a part of our day-to-day conscious existence. We are faced, for Hayles, with 'active and interactive technologies with cognitive potential' (Hayles in Gane et al., 2007: 351), operating without the need for human agency. Indeed, the notion of a 'cognisphere' suggests that human agency is a part of much broader assemblage of interconnected agencies. She continues:

Most of the communication will be automated between intelligent devices. Humans will intervene only in a tiny fraction of that flow of communication. Most of it will go on unsensed and really unknown by humans. (Hayles in Gane et al., 2007: 350)

What Hayles describes here is what Thrift, in his key work on 'knowing capitalism', refers to as the 'technological unconscious', the operation of powerful and unknowable information technologies that come to 'produce' everyday life (2005).

The crucial issue here is, of course, that of affect. How do these developments have the 'power to affect cultural formations' (Hayles in Gane et al., 2007: 355)? For Hayles, the emergent technologies do not just gather

information and hold it, they also use it in a variety of ways. Hayles' recent work has been focusing in particular on the way in which Radio Frequency Identity Tags (RFID), small embedded identification chips, are providing the 'legs' that inform the relational database 'brains' (Hayles in Gane et al., 2007: 349; for more on RFID see Crang and Graham, 2007; Mitchell, 2005; Sterling, 2005). The significance of RFID has come to the attention of a range of writers; the urban theorist William Mitchell describes them as a 'pinhead-sized wireless transponder that costs pennies and can be embedded in just about anything, from consumer products to pets' (2005: 61). He explains, when:

... you ping a RFID tag with a suitable RF (radio frequency) signal, it returns a unique ID number. Thus it is much like the familiar barcode, except that it can be read silently, invisibly, and at a distance. (2005: 62)

Hayles describes this as 'the movement of computation out of the box and into the environment' (Hayles in Gane et al., 2007: 349). Terms like 'SPIME' (Sterling, 2005), 'coded objects' and 'logjects' (Dodge and Kitchin, 2008), 'blogjects' and 'transducting space' (Crang and Graham, 2007) are used, among others, to capture this movement – as well as the popularized vision of an 'internet of things' (see Sterling, 2005). The result for Hayles is that these transformations in the mobility and connectivity of technologies 'pose unprecedented challenges and opportunities to humans because they will be moving within an intelligent and context-aware environment' (Hayles in Gane et al., 2007: 349). Vast information sources will be generated, where any item, thing or person can have its own unique identity tags. Relational databases feed on and become informed by the data generated from these tags and are able then to create inferences that will enable 'new correlations' to 'emerge' and 'create genuinely new knowledge' (Hayles in Gane et al., 2007: 350). Clearly the suggestion is that these technologies will become increasingly powerful and ubiquitous, but Hayles, like others (see Crang and Graham, 2007), does not suggest that they will be infallible or without fault. Rather, she suggests that the mistakes and glitches may play out as complex forms of emergence that affect people in unforeseen ways.

On this issue of the affective powers of the 'new new media ontology', Steve Graham's (2004, 2005) work is particularly useful in developing some concrete illustrations of how software orders and divides. In his work Graham describes how algorithms act to 'sort' and filter thus enabling service providers to provide individuals with differentiated services or service levels (see also Burrows and Ellison, 2004). The suggestion here is that software algorithms are making decisions for organizations about who to deal with and how to deal with them (automated call centre queuing is an often cited example).

Graham's work represents an attempt to broaden debates about the familiar image of the digital divide. His claim is that:

... digital divides are not just about the usual focus of debate – uneven access to the internet. Perhaps just as important are the powerful and often invisible processes of prioritisation and marginalisation as software and code are used to judge people's worth, eligibility and levels of access to a whole range of essential urban spaces and services. (2004: 324)

This is a process that Joseph Turow describes as 'marketing discrimination', which occurs as 'marketers increasingly use computer technologies to generate ever-more-carefully defined customer categories – or niches – that tag consumers as desirable or undesirable for their business' (2006: 1). Once these niches have been established then businesses can treat different niches differently to maximize efficiency, profit, or whatever their goals may be. Clearly we find a resonance here in the attention given by Graham, Hayles, Thrift and Turow to the ways in which 'computer algorithms are being used at the interface of databases and telecommunications networks to allocate different levels of service to different users on an increasingly automated basis' (Graham, 2004: 325). In particular we see the lack of 'human discretion' (Graham, 2004: 325) in these automated processes as being highlighted as a significant part of a shift toward 'performative infrastructures' (Thrift, 2005: 224).

The writers I have focused on here all point toward increasingly powerful and active technological environments that operate without the knowledge of those upon whom they are taking an effect. As Graham puts it, '[c]rucially, these techniques of prioritisation and inhibition are often so invisible and automated that neither the losers nor the beneficiaries are even aware that they are in operation' (2004: 329). Unpicking the 'embedded politics' of this 'haze of software' (Crang and Graham, 2007) appears as a common theme in this literature, particularly as it attempts to understand how these unseen technological communications implicate life-chances. For further examples of this concern with the politics of 'software sorting', the work on geodemographic classification systems and how they categorize and impact on people and places provides some particularly useful insights and illustrations (see Burrows and Ellison, 2004; Burrows and Gane, 2006; Parker et al., 2007; and for a surveillance focused account see Lyon, 2007).

As things stand little attempt has been made to draw on this literature in understanding developments in collaborative and participatory online cultures and Web 2.0. There is now a pressing need to set the new participatory web cultures in this wider context of a 'new new media ontology' or whatever term we might use to stand in for this emergent research. As this brief discussion of the key works within this literature indicates, there are a

number of issues that can be drawn out and used to inform a more critical and contextually rich analysis of Web 2.0. In this instance I focus in particular on the issue of power as a pertinent and pressing issue in the Web 2.0 context. In pursuing this issue the article focuses on one example amongst this emergent literature that deals directly with the emergence of new forms of power – Scott Lash’s (2007a) writings on ‘post-hegemonic power’.

LASH’S POST-HEGEMONIC POWER

The first thing to make clear is that it is not possible or appropriate here to discuss Lash’s (2007a) article ‘Power after hegemony’ in the detail required to explore all of its content. As Venn points out, Lash’s arguments formulated in the development of his ‘new problematic of power are complex and complicated’ (2007: 50). In lieu of a more detailed discussion, I offer here an overview of the key points alongside a brief summary of the central underlying concept of ‘power through the algorithm’.

Lash’s article describes (and endorses in places)¹ a shift toward forms and understandings of power that in some way defy description through a notion of hegemony – this is accounted for as a material change in social structures and as a more gradual reworking of approaches to power by cultural analysts. Lash’s aim is to encourage the reader to revisit the political leanings of the first hegemonic wave of cultural studies to repoliticize its analysis in a post-hegemonic context (for more on the depoliticization critique of the ‘cultural turn’ see Eagleton, 2003; Nash, 2001; Rojek and Turner, 2000). His recommendation is that our analytical focus should be on generating more nuanced understandings of the power potentials and dynamics of digital or new media.

Much of Lash’s article is dedicated to fleshing out what might be described as a *power binary*. Through this power binary Lash develops in detail a vision of a hegemonic age, concerned with ‘power-as-hegemony’ and dominance through ideology, and a post-hegemonic age, where the hegemon has moved out into the everyday and power operates from the inside rather than from above. A simplified version of the power binary that Lash develops is summarized in Table 1.

Table 1 illustrates Lash’s concern with using a series of juxtapositions to illustrate how we might draw this line between a hegemonic and post-hegemonic age. The decreasing role and suitability of the concept of hegemony in an analysis of power is the key dividing principle. Table 1 can be read as a classic depiction of a paradigm shift as the theoretical frameworks of one movement fall away to be replaced by another – in this case taking with it the political leanings of the previous era which were tied up with its conceptual terminology, its disciplinary context and its conceptual fashions.

• Table 1 A table depicting Lash's power binary

ASPECTS	HEGEMONIC AGE	POST-HEGEMONIC AGE
<i>Cultural studies</i>	First wave	Second wave
<i>Politics</i>	Normativity	Factivity
	Counterfactuals	Facts
<i>Rules</i>	Constitutive	Constitutive
	Regulative	Regulative
		Generative
<i>Organisation/form</i>	Epistemological	Ontological
	From without	From within (immanent)
	External organization	Self-organization
	Semiotics/discourse	Being
	Cognitive judgments	Vitality
<i>Culture/artefacts</i>	Realm of value	Realm of fact
	Outside of profane everyday	Inside of the profane everyday
<i>Social relations</i>	Social bond	Communication
<i>Mode of legitimation</i>	Legality	Performance
<i>Cultural logic</i>	Reproduction	Invention
<i>Empiricism</i>	Positivism	Empiricism of the thing, of the event

A close reading of Lash's article reveals a series of overarching claims or juxtapositions that develop the binary (and form the rows on the above table). These include the following:

If the hegemonic order works through a cultural logic of reproduction, the post-hegemonic power operates through a cultural logic of invention, hence not of reproduction but of chronic production of economic, social and political relations. (Lash, 2007a: 56)

In place of reproduction, defined by technologies like film, records, and print, Lash, in line with the other related approaches described in the above paragraphs, advocates a vision of dynamic interfaces and virtual spaces of engagement where users are involved in acts of invention or *content creation* (both actively creating content and passively generating informational traces as they got about daily routines). The issue of content creation is clearly a crucial point as we consider the ongoing emergence and mainstreaming of user-generated online content in the form of rating and reviews, blogs, posts, tags, friending and so on – content creation in this sense is comparable with Bauman's (2007) recent descriptions of what he terms a 'confessional society'.

Elsewhere in the article Lash claims that the difference between this and power structures that could be understood as hegemonic is that now 'it is not just resistance in our post-hegemonic culture, but also domination that works ontologically' (2007a: 58). Resistance to the coercion of the hegemonic era happened on ground level in everyday processes, the everyday provided

spaces to react and resist, but now, Lash describes, we also find domination here as an active part of what we do (thus taking up and filling the space where resistance formerly took place). We are reminded then of Lash's (2002 and 2006) earlier work concerning what he describes as 'immanence' and the lack of space and time outside of ubiquitous information flows. Furthering this vision of close up and inescapable power, Lash suggests that in place of 'discourse' and 'cognitive judgment', power 'has become more sinister in a post-hegemonic age ... it penetrates your very being' (2007a: 59). Lash describes this as the 'vitalization of power' (2007a: 69), where power is a part of our 'being', it lives with us and reacts to us. This is where 'power, previously extensive and operating from without, becomes intensive and now works from within' (2007a: 59).

This movement of power to the inside has a knock-on effect on 'organization', which is usurped by forms of 'self-organization', as we find in the following claim that echoes Hayles' imagery:

Organization in the older hegemonic politics had to come from the outside ... In a post hegemonic politics, there is organization from the inside: there is self-organization ... now the brain ... is immanent in the system itself. (Lash, 2007a: 60)

The contention here, as with the key works of Hayles (2006) and Mitchell (2005), is that the system starts to think and organize itself as we live increasingly in the types of environments described by the commentators discussed earlier. The point here is that rather than the hegemon operating outside and above, instead the social and cultural structures of the day, exemplified by Web 2.0 applications, organize themselves through the self-organizing and predictive powers of the software with which we live. We have, to pick a more obvious example, user-generated metadata tags classifying online content enabling the data to 'find us' (Lash, 2006). Rather than power at a distance, this is power up close. Depicted here then is a shift in the directions in which power operates as software sinks into the everyday:

The hegemon is above. It is outside and over. In the post-hegemonic order, power comes to act from below: it no longer stays outside that which it 'effects'. It becomes instead immanent in its object and its processes. (Lash, 2007a: 61)

Lash's point is that unlike hegemonic power, power now 'enters into us and constitutes us from the inside' (2007a: 61). The analytical problem for Lash, which will become pertinent as we consider ways forward, is that power working from the inside of the system is less visible and 'becomes far more difficult to unmask' (2007a: 61).

Finally, resonating with a range of well-known commentaries on individualization, Lash claims that 'the social bond of the hegemonic order

is in decline' (2007a: 65). His suggestion is that in 'the global information society, the social relation is reduced to communications' (2007a: 65). Lash's claim here is that in this 'communication order, power is not just in the flows: it is in the emergent non-linear socio-technical systems that channel, block and connect the flows' (2007a: 67). Clearly then Lash's power binary is underpinned by the notion that power structures have got closer to us as they move into our everyday communications. Or, as he puts it, 'now domination is through the communication' and communication is 'among us' (2007a: 66). Rather than power being a dominant presence acting on us, it is instead localized in our communications. Connecting with debates about a crisis of empiricism and the rise of transactional data (Savage and Burrows, 2007), the answer for Lash is to ground our analysis through an engagement with 'raw sense data' and the development of the 'empiricism of the thing, of the event' (Lash, 2007a: 64; see also Lash and Lury, 2007).²

'POWER THROUGH THE ALGORITHM' AND THE NEW 'GENERATIVE' RULES

Underpinning Lash's argument, and that of the more general set of literature outlined at the beginning of this article, is the increasing prominence and power of algorithms in the social fabric. The new forms of power that Lash describes, although complex, are built on the central premise that algorithms have the capacity to shape social and cultural formations and impact directly on individual lives. For Lash, the consequence of this development is that we are now faced with a new set of rules to live by. 'Computer scientists understand algorithms in terms of "rules"', he claims, 'but these rules are far different from the sorts of rules that human scientists have dealt with over the decades' (Lash, 2007a: 70). Where we might once have spoken of 'constitutive' and 'regulative' rules, Lash suggests, 'in a society of pervasive media and ubiquitous coding, at stake is a third type of rule, algorithmic, *generative* rules' (2007a: 71). These generative rules are in the software with which we engage, a process we can understand as 'power through the algorithm' (2007a: 71).

Lash explains:

'Generative' rules are, as it were, virtuals that generate a whole variety of actuals. They are compressed and hidden and we do not encounter them in the way that we encounter constitutive and regulative rules. Yet this third type of generative rule is more and more pervasive in our social and cultural life of the post-hegemonic order. They do not merely open up opportunity for invention, however. They are also pathways through which capitalist *power* works. (2007a: 71)

These are not just about creating opportunities for communication and the generation of content, they are not merely portals for the global

dissemination of self-expression, these are also spaces where capitalism acts on or with the user. It acts in complex and even 'knowing' (Thrift, 2005) ways as information about us is harvested to inform and predict. It is perhaps no surprise that web applications like MySpace and Youtube are commercial ventures, particularly as we consider the possible values of the information that they hold, how they are embedded in the routines of the users, and what they know about their collective users – Facebook has recently been valued at \$15bn, and was the centre of controversy with the development of its 'social ads' (Keen, 2007b; Van Duyn, 2007). As yet these applications have received little attention with regard to the possibility of their part within new forms of power and/or their part in the operation within the 'cultural circuits of capitalism' (Thrift, 2005).

Before continuing, it should be noted that Lash does not claim that these new forms of power erase the power structures of the past, but instead that a 'society of ubiquitous media means a society in which power is increasingly in the algorithm' (Lash, 2007a: 71). According to this vision it is now the 'task' of new media analysts 'not to be less political, but to be more political' (2007a: 75; see also Eagleton, 2003). In short then, the sinking of software into our mundane routines, escalated by mundane technologies such as those found in the popular social networking sites, means that these new vital and intelligent power structures are on the inside of our everyday lives. Developments like those categorized as Web 2.0 are at the forefront of these processes and need to be dealt with as such.

PARTICIPATORY WEB CULTURES AND POST-HEGEMONIC POWER

What does this mean though for research into Web 2.0 (or whatever we might call these new participatory web cultures)? How can the themes of this literature be brought to bear in the form of new analytical strategies for studying participatory web cultures? There have been some successes in attempting to create empirical insights into the workings of the 'new new media ontology', particularly in relation to urban classification, but so far little attempt has been made to understand Web 2.0 from these perspectives. Creating insights where software and the web are so much a part of how we live is inevitably fraught with difficulty. Not only do we have this problem of familiarity but, as already mentioned, these communications technologies often operate at the level of the 'technological unconscious' (Thrift, 2005). In other words, they operate in unseen and unknown ways. Unsurprisingly then, researching these systems is highly problematic. As Graham notes:

... [g]iven the inevitably confidential, proprietary and highly technical nature of the core algorithms that now socially sort so many key social domains, what research techniques and paradigms can offer any genuine assistance here?... the worlds of software-sorting tend not to be amenable in any meaningful

way to traditional geographical or social scientific research techniques or conceptualizations. (2005: 15)

What we have are forms of power that are reactive, concealed, and which are shaped on the ground at the multifarious points of communication. However, it is possible to begin in this article to make some connections between Web 2.0 and post-hegemonic power that might be useful in shaping an agenda for research into participatory web cultures – an approach, that is, that takes account of the way Web 2.0 interweaves with the ‘technological unconscious’.

In relating Web 2.0 to Lash’s post-hegemonic power and its algorithmic rules, as outlined in Table 1, the particularly poignant aspects of *self-organization*, *inside the profane everyday* and *invention* stand out. These three features are prominent characteristics of Web 2.0 developments, where users are generating metadata ‘tags’ that organize and categorize the user-generated content, where social networking site profiles often provide detailed impressions of people’s lives, where these profiles are clearly integrated as mundane and ordinary parts of how people live, and where the emphasis is on the ‘invention’ of new content, new ‘social relations’ and even new ways of presenting content in the form of creative visualizations of ordinary things.³

The role of profiles suggests itself as being of importance in relation to these three key aspects. The profile is a common feature of Web 2.0, and is the place where information is gathered about us, our activities, our choices, tastes and preferences and so on. We find that most of the well-known Web 2.0 applications have some form of profile that the users complete with information about themselves. If we take www.last.fm as an example, here the information we give over about the music we like (by choosing a favourite artist or by expressing an interest in or dislike for various tracks) is used to generate a playlist of music we are likely to be interested in. This is a playlist of songs that are ‘like’ the songs we have shown a preference for. Here the algorithm is informed by the user’s profile, by the profiles of other users and by the tags that the users have collectively allocated to particular songs – this is not prediction based purely on what we do, but on what the user base does, a kind of communal informing and self-organizing of the system. The connections here become ones of similarity between users and metadata linkages with and between songs. The greater the depth of information held about the user the more accurately this playlist fits and predicts their tastes. The point to consider here, as we think about these new knowing power structures, will be the part played by the information harvested from profiles. The power of the algorithm in this instance is to shape auditory and cultural experiences.

The reason that a focus on Web 2.0 is significant and needed is because the popular web applications it represents are driven by users providing

endless and virtually unlimited information about their everyday lives. To put it in Lash's terms, they are clearly on the inside of the everyday, they are up close, they afford direct and routine connections between people and software. We have not yet begun to think through how this personal information might be harvested and used. A starting point would be to find out how this information about everyday mundane lives is being mined, how this feeds into 'relational databases', and with what consequences: the very types of question that are being asked by the writers discussed here. Alongside this it is also important that we consider how the information provided by users, and other 'similar' users, might affect the things they come across. If we return to Last.fm, which 'learns' users' tastes and preferences and provides them with their own taste-specific online radio station, it is possible to appreciate how the music that people come across and listen to has become a consequence of algorithms. This is undoubtedly an expression of power, not of someone having power over someone else, but of the software making choices and connections in complex and unpredictable ways in order to shape the everyday experiences of the user. How we find the books that shape our writing could be a question we might ask ourselves if we wish to consider the power that algorithms exercise over us and over the formation of knowledge within our various disciplines. (I know of at least two occasions when Amazon has located a book of interest for me that has then gone on to form an important part of a published work.) This is not just about Amazon, it would also include searches on Google Scholar, the use of the bookmarking site Del.icio.us, the RSS feeds we might use, or the likely coming applications that will predict, locate and recommend research articles we might be interested in. Readers based in the UK will also by now be considering the power of algorithms to decide the allocation of research funding as the role of metrics in the forthcoming Research Excellence Framework (REF) are finalized.

This is not to say that individuals are unable to reflexively play with algorithmic power to their own advantage. It might be that as users begin to see how the information that they provide in the form of content impacts on the constitution of their life-worlds, so they may begin to actively shape the information so as to direct the way that the software reacts to them. Rather than resistance we may encounter reflexive and skilled agents shaping their profiles so as to anticipate the effects the information they provide might have and steer things in the direction they wish – a process we can think of as being about, as The Clash put it, having the *right profile*.

Of course, this article is only a cursory work that is intended to be suggestive of a larger-scale series of projects. Given these cursory discussions it becomes possible to begin to shape a research agenda for developing work on Web 2.0, participation and the new performative environments.

The questions to be considered are vast. Three layers of analysis are required in beginning to address them. The first concerns the organizations that establish and cultivate Web 2.0 applications. This would require an understanding of the economics of the sites, how they create money and for whom, who is building the sites, what involvement they have after the initial stages and development, how they (or third-parties) harvest or data-mine the information that is created as users participate in creating content (often about themselves), and so on. The second level of analysis would be concerned with the software infrastructures and their applications on the web. This would attempt to understand how these systems work, how algorithms are deployed, which data is fed into the algorithm, which relational databases are drawn upon, how metadata tagging feeds into searches and into what people find, and how the information held in profiles determines what the individual encounters. In short, this level would be concerned with the functionality and operability of the software. The third and final level of analysis would be concerned with how the concerns of the previous two levels play out in the lives of those that use (or do not use) participatory web applications. This would consider how and why individuals divulge information about themselves, how they play with and within the boundaries of the software, how they react to and resist the impulses written into the codes, how they reflexively design profiles, how they hold back or give information, what they know about how they are being sorted, how and with what consequences they employ a *classificatory imagination* as they tag and classify content, what they come across on Web 2.0 and how they come across it. This is only an outline, but this series of analytical levels can be used as a framework to shape projects that aim to ground Web 2.0 in the broader context of the 'performative infrastructures' outlined at the opening of this piece.

Web 2.0 applications are clearly 'close-up' technologies that are on the 'inside' of the lives of users. The acts of participation and collaboration that define the Web 2.0 era are generating information, sensitive and private information, to be harvested and used in the algorithmic processes of sorting and the like. As data comes to 'find us' (Lash, 2006), so the things we encounter, and consequently our experiences and views of the world, will be shaped by the sorting and filtering of algorithms. The developments of Web 2.0 should not be fenced off from these developments. It is important to consider how the activities of content generation and participation of Web 2.0 feed into 'relational databases' and are then used to sort, filter and discriminate in automated ways and without users' knowledge. Viewing Web 2.0 through the prism of the writings of the new media theorists encountered in this piece – including Lash, Hayles, Thrift and Graham – affords this set of questions to be opened up for analysis.

CONCLUDING THOUGHTS

What this article implicitly suggests is that the Web 2.0 bandwagon will need to be counteracted by some strong and perceptive criticism that works out the commercial underpinnings, new hierarchies (of celebrity, notoriety, popularity and fandom), and rules of engagement, as well as the powerplays that are occurring through and within Web 2.0 applications. Lash's post-hegemonic 'power through the algorithm' is one conceptual option that might be used to inform such an analytical framework. It is not that these algorithms are all encompassing and dominant but that they offer integrated affordances and boundaries around which Web 2.0 users participate. These boundaries and affordances react and reorganize themselves around the users' engagements. The reading of the literature provided in this article suggests that what is needed are descriptions of 'power through the algorithm', developed by focusing on those working with and designing the applications and software, by focusing on the applications and software as material entities, or by focusing on those who engage with the software in their everyday lives (or through a combination of these three areas).

Considering how popular Web 2.0 applications like MySpace, Facebook, Youtube, Delicious, and Flickr have become, there is a pressing need to explore with some detail this vision of power through the algorithm operating in their incorporation into users' lives. It is likely that we will find that these algorithms are carving out new complex digital divides that emerge in unforeseen and often unnoticed ways in the lives of individual agents. We might well uncover creative, bespoke and surreptitious forms of resistance (Geesin, 2007), discoveries that might well call into question the more deterministic aspects of Lash's conceptualization of power. It could well be that to understand power in the Web 2.0 context we will need to look for local resistances (or lack of resistance) if this is where the reactive and vital organizing structures are working *in* how we live. Spotting the new generative rules that Lash speaks of will be the real challenge. By their very definition they are reactive, local and built-in, or, as Lash puts it, they are 'compressed and hidden' (2007a: 71). Where there are resistances agents will have identified something to resist against and, therefore, might be able to offer the researcher some insight into these hidden processes.

Overall though, what following through on Lash's article suggests is a complex underweave of power at play in the digital mundane. Clearly understanding the exact nature of these tensions and compatibilities is something that will require some time and, more importantly, some creative and bespoke research methodologies and conceptual frameworks. This may be informed by some of the trusted concepts of the past, or may turn toward embracing a post-hegemonic future: a future defined by attempts to develop theoretical and empirical points of analytical reference through an

engagement with designers, marketers, users and the software itself. Lash's piece and the other related literature on the new performative infrastructures that I have outlined in this article open a range of pressing questions about the nature of power as media shift toward so called participatory and decentralized models, user-generated content and collective intelligence. Whether or not we are convinced by Lash's power through the algorithm, it is now, I think, of crucial importance that we find ways of working toward more complete and wide-ranging understandings of collaborative and participatory web cultures.

As things stand we simply do not understand how the material infrastructures of Web 2.0 play out in the lives of individual users, how the software constrains and enables, how it formulates hierarchies, shapes the things people encounter, and so on. This article suggests that there is a need to filter existing accounts of Web 2.0 through the emergent literature that we might describe as being about a 'new new media ontology' (Lash, 2007b). Understanding participation requires an understanding of the 'performative infrastructures' (Thrift, 2005: 224) in which this participation is taking place. The literature I have drawn on here is already doing this in other contexts, most prominently in urban studies, but it is essential that we now ensure that developments in contemporary web cultures get the same informed analytical treatment. As Graham has identified, in relation to a range of urban software sorting systems, 'the algorithms that support ... choices, simulations, orderings, and classifications ... remain completely and utterly unscrutinized' (2005: 10). Web 2.0 now needs to be incorporated into the analysis of the 'very guts' (Graham, 2005: 10) of these emergent systems that constitute the 'technological unconscious' (Thrift, 2005).

Notes

- 1 Lash's article appears to move interchangeably between description, sometimes tinged with a sense of favourability or disapproval, and suggestion. The problem for the reader is that this mixes together what has happened, what is happening, and what Lash thinks should happen next.
- 2 We can also see here Lash beginning to move the agenda toward what he has described elsewhere as the 'products of the global culture industry' and the 'sociology of objects' (Lash and Lury, 2007). This is also highlighted by his contention in the article that cultural studies 'will deal with facts as artefacts, as prisms through which to explore the relationships of cultural worlds' (Lash, 2007: 62).
- 3 See the mashups at <http://www.programmableweb.com/mashups> or <http://www.webmashup.com/> for a particularly inventive sphere of Web 2.0.

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