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Infrastructural temporalities: Facebook and the differential time of data management

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Facebook presents itself as a tool in the service of humanism: it connects people through the sharing of information and experience. This article contests these assumptions about the innate humanness of Facebook's connections through an examination of its information management and network architecture. It argues that Facebook depends on a number of radically different milieus expressed by way of different, competing conceptualizations of *time* that it does not or cannot negotiate. Consequentially, Facebook should not be imagined as a single network of human connectivity that will somehow realize newly identified human rights through technology. Facebook should be thought of as a multiplicity of incommensurate networks, not all of which can be brought into human experience. The time of infrastructure directs us to an uneven 'social' that emerges from the negotiation of multiple, often obscured forms of temporal difference, managed through multiple, often obscured systems of hardware and software that forever remain beyond the conscious experience of most Facebook users.

Near the end of Journalist David Kirkpatrick's *The Facebook Effect* (2010, 325), Mark Zuckerberg is quoted as saying:

> One of the things that is critical … in my mind is that in some sense humans maintain mastery over technology, rather than the other way around. The value of [Facebook] economically, politically, culturally – whatever – stems from the idea that people are the most important thing.

This rhetoric has intensified throughout Facebook's existence. If Zuckerberg is to be believed, communicative connectivity is now an obvious human right, and part of Facebook's mission is to technologically achieve this right (Facebook 2013). Similar attitudes are common among theorists of technology (cf. Castells 2012; Rainie and Wellman 2012). Social media, the argument goes, permit new forms of networked social organization because it has always been part of human nature to desire connection to others. Thus, the power of Facebook lies in the hearts and minds of humans connected online, not in the formal capacities of the medium; its power stems from the ability to realize eternal human desires in the form of technology.

Aside from some of the more Marxist readings of social media and user-generated content as a form of 'free labour', along with the emerging perspective of 'software studies' (e.g. Fuchs 2015; Terranova 2004; Grosser 2014), the vast majority of research on Facebook, and social media in general, tends to look at how it intervenes in the daily

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life of human users and human institutions, enabling pleasures and producing anxieties in people online, perpetuating 'humanist' assumptions that ground Zuckerberg's definition of Facebook's mission. But the importance of human agency is an *a priori* assumption perpetuated by the methods used to study social media, such as ethnographies and interviews, which inherently give privilege to human actors. As over a decade of Facebook comes to pass, however, the specific material attributes of the most successful social networking website thus far in history call into question the role of technology as a subservient assistant in the maintenance of human connections.

Instead of an examination of human uses of social media, I suggest we look directly – or as directly as possible – at social media's material infrastructures. These infrastructures are suspiciously absent in most work on social media within cultural studies. In turning towards infrastructure – to servers, data management algorithms, and storage techniques – we can see how the 'human' is never something that exists independently of technological networks. Instead of embracing an uncritical 'humanism' that asserts the primacy of human agency over social media, we should interrogate just what this 'human' is and how it relates to the technological mechanisms in which it is embedded. In *The Order of Things*, Michel Foucault argued that the human sciences did not dispassionately observe, but rather produced 'man' as an object of study (1970, 386–387). Analogously, social media are not technological manifestations of the human will to connect, of the realization of a community made up of humans finally able to communicate through new technologies. Rather, social media produce the possibilities and limits of 'the human' through data management and network infrastructure.

In this article, I contest assumptions about the innate humanness of Facebook's social connections by explicitly examining Facebook's infrastructure and data management systems. I argue that Facebook depends on a number of radically different milieus expressed by way of different, competing conceptualizations of *time* that it does not or cannot negotiate. Consequentially, Facebook should not be imagined as a single network of human connectivity (cf. Mejias 2013) that will somehow realize newly identified human rights through technology. Facebook should be thought of as a multiplicity of incommensurate networks, not all of which can be brought into human experience. The time of infrastructure directs us to an uneven 'social' that emerges from the negotiation of multiple, often obscured forms of temporal difference, managed through multiple, often obscured systems of hardware and software that forever remain beyond the conscious experience of most Facebook users. And yet the 'human' that uses social media is expected to willingly and seamlessly negotiate these multiple temporalities, even though the specific technological effects of social media's infrastructure will only indirectly enter human consciousness.

According to Robert Gehl, the ideology of Facebook, like post-industrial capitalism, emphasizes acceleration, immediacy and efficiency in producing and maintaining communicative connections over social media. Yet Facebook and other social networking websites 'are not simply surfaces dedicated to immediacy; they are also comprised of vast server farms, rooms of computers humming away' (2011, 1229). Contemporary capitalism is thought to produce an increasing speed of everyday life, both hastening and homogenizing time through technological means of acceleration. Facebook would seem to be no exception, yet the server farms that provide the actual means enabling Facebook's existence have little to no effect on the phenomenological experience most users have when engaging with the platform. There is a disjuncture between Facebook's server infrastructure and everyday experience. This experiential absence elsewhere enables fantasies of 'cloud computing', of being 'on' and 'connected' constantly, awash in a sea of

ubiquitous distributed information. Yet these metaphors of 'cloud' and 'ubiquity' have literally no relationship with the reality of material infrastructure, instead obscuring how wireless, distributed network architectures actually operate (Franklin 2012).

Thus, right from the outset, contemplating the material architecture of social media directs us to at least two possible forms of temporality: one of an accelerating immediacy of communication provoked by post-industrial, communicative capitalism, and another of seemingly invisible hardware and software. But to explain how the divide between human users and server infrastructure points to issues of temporal difference – and why temporal difference is an issue at all – requires some unpacking. The remainder of this essay first expands on the theoretical and political issues surrounding temporal difference before examining the multiplicity of networks that comprise Facebook, concluding with an examination of responses to Facebook that reveal how the separation of human experience and infrastructure is one that orients us towards this differential politics of temporality.

What I ultimately chart in the following pages is how social media make demands on human users to constantly 'recalibrate' the experience of time in relation to technologies and temporalities that are never fully part of human experience. I'm taking the concept of 'recalibration' from the work of Sarah Sharma, defined as 'the multiple ways in which individuals and social groups synchronize their body clocks, their senses of the future or the present, to an exterior relation' (2014, 18). In following the various temporalities of Facebook's data management, along with the temporalities experienced by human users, I demonstrate how the relations of immediacy and instantaneity that appear to define contemporary post-industrial society disguise a proliferation of different temporal relations found in the materiality of storage, processes of data management, and human techniques for adjusting and relating to something that can never be fully brought into conscious awareness. Looking to these multiple temporalities is a political move, as users of Facebook are compelled to manage their online identities in accordance with the controlling agency of a material infrastructure that is never fully present to human knowledge.

The temporal politics of social media

Following Sharma (2014), the 'temporal' is a form of social power and social difference. Many commentaries on the contemporary politics of time – including those explicitly about social media – note how life is 'accelerating' because of a complicity between seemingly instantaneous digital technologies and post-industrial capitalism. Yet the acceleration of capitalism relies on other classes and other temporalities for the maintenance of its dominance. Any acceleration comes with temporalities that are neglected or forgotten in the name of increasing speed – marginal temporalities that are far more common and are often articulated to other classed, raced, or gendered subjectivities. Some people move at the speed of capital, others are forced to sit and stand and wait behind a service counter. Technologies that mark time, from clocks, calendars and train schedules to Facebook's Timeline, all contribute to larger forms of temporal control. These technologies do not impose a uniform, singular temporality that speeds up throughout history. They control through the negotiation of multiple relations in time, imposing a sense of managed 'synchronicity' between different individuals and technologies that remain forever negotiated (7). These temporal margins do not speed up, but instead adjust relationally given the demands of the centre of the contemporary capitalist order. Technologies serve as 'temporal architectures' that sort and arrange bodies

according to different political investments, in which some bodies are 'recalibrated' to account for their temporal relations, while others are merely left out-of-time and beyond acknowledgement. The temporal is a power dynamic, and some temporalities are more valuable than others (16–19). And the demand for recalibration is one that can easily be adapted to other neoliberal logics of exclusion. If one cannot manage their own time in relation to contemporary technologies that mark and control temporality, then they have failed to be a properly adjusted, managed, flowing subject of contemporary capital.

This differential relation of time is reproduced in the relationship human users of Facebook have with the technologies of Facebook itself, as temporality is negotiated between users, data and networked servers. There are multiple networks that make up Facebook and multiple databases expressed through Facebook's programming and materiality. Most users never actually conform to the assumptions about data generation expressed in claims made by social media companies. In spite of numerous fantasies otherwise, Facebook profiles are not full and complete depictions of one's 'true' identity (cf. Bollmer 2012). Users are not 'always on' and do, in fact, keep much hidden from Facebook, negotiating daily life with strategies for managing online 'traces' (Robards 2012).

Nonetheless, human strategies for personal data management often ignore the technical materiality of data storage that exists beyond human consciousness. As Mark Hansen (2015) has suggested, Facebook and its role in accumulating, storing, analyzing and sharing information is 'pharmacological', in that it could be thought to contain both 'poison' and 'remedy'. 'What is lost', Hansen claims, 'is control over one's (digital) memory since … digital traces are just as permanent as the networks hosting them' (72). At the same time, users gain the ability to 'share and access information' in new and innovative ways. But this 'pharmacology' is a 'perversion' because it differs from almost all past forms of media. Where, in some form, past effects of media could usually be comprehended within human consciousness, this is not the case with Facebook:

> Indeed, with respect to a social-media network like Facebook, it is difficult even to say whether what we gain compensates in any way at all for what we lose, since what we gain *doesn't appear to have any common ground* – outside of a shared technical basis – for what we lose … What we *can* say is that the experiential affordances of Facebook cannot possibly counterbalance the loss of control over data generated by user activity *for the simple reason that there is no direct experiential connection between them*. (73)

This lack of association between the various ways of understanding Facebook is a serious problem for the study of social media. From one perspective, we have a world of 'user-generated content' that is shared between people. From another, there's a political economic apparatus of exploitation that relies on unconscious data accumulation and analysis that charts social phenomena at a 'big data' scale that can never be fully comprehended by any one human being. And from yet another, there are the methods Facebook uses to extract data from users that rely on a kind of 'technological unconscious' (Thrift 2005) that manages bodies and their abilities, without the full awareness of human users – which includes the algorithmic manipulation of Facebook's news feeds, the automatic tracking of status updates (including those that are never actually posted), the use of the 'Like' button on websites beyond Facebook to track a user's web histories and so on. And this doesn't even go into methods and mechanisms Facebook has for studying its own servers and infrastructure – analytics that may appear to have nothing to do with its 'social' side at all.

This implies that there is never any direct access to what Facebook 'is', but rather our experience is partial and mediated though systems of data analysis that are likewise designed to generate more data to be analyzed, a phenomenon Hansen refers to as 'feed-forward'. This is even apparent in Facebook's own names for their systems for server and data maintenance. Because Facebook has grown 'organically over time in a culture that favors innovation over standardization' (Chow et al. 2014, 217) many of its systems for data analysis do not and cannot work together. Facebook has recently developed an algorithmic framework named 'The Mystery Machine' to automatically analyze these different systems without direct human input. Computational processes are employed that separate human observation from what specifically is happening within Facebook – in part because human observation would mean little in grasping what happens, anyway. Human acts are too slow and too diverse – an accurate modelling of Facebook would require 'either assimilating the collective knowledge of hundreds of programmers responsible for the individual components or restricting the ways in which components interact' (217). And even the algorithmic processes designed by these engineers are often too slow to sufficiently move at the speed Facebook requires. Forms of 'big data' analysis employed within Facebook solve a 'Mystery' that results from data being too large, too complex and in countless different formats, thus satisfying a need for speed that simultaneously pushes direct experience beyond the mediation of data to the background.

The multiple networks of Facebook

So, we can state that, first, there are multiple elements that make up Facebook, not all of which can be said to be operating at the same speed. This includes human users and engineers, whose own knowledge of the social networking giant is partial and fragmented. And second, this multiplicity points to how any claims about instantaneity and synchronicity involve the management of these multiple temporal relations – in ways that are intentionally obscured to enable the propagation of an ideology of acceleration and speed. Before I return to these themes of temporality, I want to expand on this problem of multiple, incommensurable experiences of Facebook – a problem apparent throughout Facebook's published internal research. The vanishing of Facebook's infrastructure is even an issue in writings that are explicitly about describing how Facebook's infrastructure works. In these publications, there is a disjuncture between the social graph of connections between users and the physical materiality of Facebook's actual network infrastructure and data storage devices. At times it seems as if Facebook's engineers know neither what data they have gathered nor where that data exist on their servers. This is an effect of the supposed anonymizing of data performed to maintain user privacy (Jones et al. 2013) along with the simple fact that the sheer amount of data Facebook has gathered is too large to directly process in any efficient way (Chow et al. 2014). These two observations are connected. If there is a disjunction between recorded data and the physical servers upon which that data are hosted – along with a disjunction between networks of social connection and networks of informational infrastructure – then truly accounting for Facebook's data appears problematic, if not impossible. Consequentially, there are at least two Facebooks – one apparently for human sociality, charting people (or, more accurately, their represented data), and another seemingly outside of human perception beyond the physical structures of data management.

As is widely known, Facebook refers to the network of its users and the connections between them as the 'social graph', 'a database of the inter-relationships between the

people and things in the real world … it consists of *nodes* signifying people and things; and *edges* representing a relationship between two nodes' (Curtiss et al. 2013, 1150). These definitions repeat other conceptualizations of graph theory in the visual and mathematical models that underwrite most – if not all – ways of representing a network (Galloway 2012, 85). The social graph corresponds to the cultural and scientific imaginaries of social networks and social network analysis. It is a map that supposedly charts the totality of relationships between people, their shared investments, and the transmission, contagion, and association of beliefs, affects and desires (Bond et al. 2012; Kramer 2012).

While Facebook can claim, following Stanley Milgram's original small-world experiment, there is an average of only 'four degrees of separation' between any two users of Facebook over the social graph (Backstrom et al. 2012), the papers outlining the technical specifications of Facebook's infrastructure make problematic a simple equating of a network of human relations with the technological network involved with storing and managing data. If the social graph is 'a database of the inter-relationships between the people and things in the *real world*' (Curtiss et al. 2013, 1150, emphasis added), then Facebook's engineers are somehow claiming that their servers and software processes are less than real because they remain absent from the graph while acting as the material support for any possible Facebook 'sociality'. While one may object that Facebook's claims to map the real world do not actually include the totality of reality, there has been a long-standing discourse perpetuated by Facebook and other online companies that equates the networked graph of online data with all of lived reality (Bollmer 2013). The social graph, consequentially, is a map that divorces the materiality of infrastructure from the 'reality' of online data – data that can supposedly substitute for the materiality of human relations beyond Facebook itself.

This erasure of materiality is complicated by the fact that Facebook maps multiple versions of the social graph with its data – data that exist in various distributed positions around the world. Facebook's 'data sets are so large that it is impossible to deliver the Facebook experience from a single server' (Farrington and Andreyev 2013, 49; cf. Bronson et al. 2013). The amount of compressed data served daily by Facebook was, as of June 2010, between 10 and 15 terabytes – about 60–90 terabytes uncompressed. These numbers seem to be expanding exponentially, as at the beginning of 2010 Facebook was only serving around 5–6 terabytes of compressed data each day (Thusoo et al. 2010). At the same time, users uploaded one billion new photos each week – approximately 60 terabytes of data (Beaver et al. 2010). Facebook makes and stores four different versions of each photo uploaded, which amounted to over 260 billion images and 20 petabytes of data in 2010. By February 2014, the number of photos stored had increased to over 400 billion (Muralidhar et al. 2014). Many of Facebook's research papers examine problems that emerge when managing the massive amount of data accumulated, the distribution of that data across multiple servers, the potential of server failure, and the ability to quickly locate and retrieve each data object and its numerous copies. Using software processes, databases and algorithms with names like Haystack and pitchfork, f4, TAO, HBase, Hive, and the Apache-based file system Hadoop, Facebook has created multiple mechanisms for organizing data – mechanisms that do not appear to correspond to the social graph but instead are software processes for negotiating the human side of Facebook with the server side – and all of the issues and concerns that come from engineering problems such as server failure.

For instance, in an article on the Haystack system for organising and serving photos, the authors note that 'Haystack replicates each photo in geographically distinct locations. If we lose a machine we introduce another one to take its place, copying data for

redundancy as necessary' (Beaver et al. 2010, 47). This is a standard concern in network storage design. Servers and storage fail, often because they wear out from use over time. Failure, however, is more a problem for data access. Even if a drive fails the data may still exist – it just can't be accessed with any form of immediacy. In Haystack, the photo 'Store' – one of the three main components of Haystack, along with the 'Haystack Directory' and 'Haystack Cache' – is organized through the partition of 'physical volumes' into 'logical volumes'. While 'physical volumes' refers to the actual, physical storage capacity of Facebook's photo servers, Haystack groups a number of these different physical volumes on different machines into the 'logical volumes' that Haystack then uses to create and locate different, redundant copies of the photos uploaded and stored by Facebook. 'When Haystack stores a photo on a logical volume, the photo is written to all corresponding physical volumes. This redundancy allows us to mitigate data loss due to hard drive failures, disk controller bugs, etc'. (50). The Haystack Directory maps the relationship between the logical and physical volumes, while the Haystack Cache serves as a temporary store for only the most popular photos accessed on Facebook.

Because of the increasing size of Facebook's photo storage, it has recently implemented a system named f4, which further separates photos and other forms of digital data (termed 'BLOBs', or Binary Large OBjects) into temperature-coded divisions based on how often a specific object (a photo, a video, etc.) is accessed. Haystack now only deals with 'hot BLOBs' and f4 with 'warm BLOBs'. This is, again, to manage server failure and additionally deal with server latency and access rates (Muralidhar et al. 2014). Changes in data storage infrastructure are designed to deal with different temporalities in conjunction with different material relations, including human perception and how long it takes before a hard drive or router fails. The management of data is designed so BLOBs can appear as if they permanently endure over time, even when infrastructure cannot.

We can see that there are already multiple networks of Facebook even if we only examine Haystack and f4, differentiated by multiple separate mechanisms for organizing and mapping data – and this is not to mention that there are other processes, such as TAO (Bronson et al. 2013), that perform similar, but not identical mappings of Facebook database objects. There is a network of hardware and its physical connections, and there is another of software-organized data, which overlaps, but does not fully correspond to the network of hardware – and given the number of different processes Facebook uses to map its data, we can state that there are multiple software-mapped data networks that do not directly correspond to the ones already mentioned.

Even if one claims that the 'real world' social graph of users is completely mapped by Facebook's different data algorithms (which it isn't), then this would mean that the different nodes of the social graph are, at any one point in time, in multiple positions across a physical network of servers that does not reflect the formal organization of the sociality assumed to characterise the human side of Facebook. Instead, this data-based 'real world' reflects a infrastructural, algorithmically processed model that cannot be simply graphed onto the human connections of users in the so-called 'real world' outside of Facebook. The software that organizes Facebook's many databases of photos, status updates, locations and associations are not completely mapped onto each other, indicating the presence of numerous software negotiations and translations hidden by the edges that supposedly make up the social graph.

While there are ontological issues with making a pure distinction between hardware and software (Kittler 1997, 147–155), software, nonetheless, is a 'thing' separate from

hardware that serves to make visible some technological attributes while making others seemingly invisible or autonomous (Chun 2011). With Facebook, along with much of the internet, there is a clear distinction between the network of data and the network of infrastructure – with the latter often neglected for the former. On one hand, we have technological networks that are not organized in a properly distributed fashion, if they can even be said to be arranged as a network at all. On the other, there is a network of mapped data, organized through software processes and projected onto hardware in a distributed and redundant network in way that can be reduced to neither hardware nor the 'real world' social graph of humans and their interests.

From data management to the Facebook timeline

The seeming erasure of Facebook's infrastructure from 'reality', along with the proliferation of different mappings of networks that underpin Facebook, contributes to a rather odd understanding of temporality – odd in that it seems to both emphasize absolute instantaneity and ephemerality as well as an enduring permanence. It can only do this if the actual physical systems on which Facebook depends are obscured and forgotten. As Wendy Chun argues, the imaginary power attributed to software and digital storage 'seems to promise destruction and forgetfulness, as much as it promises permanence and stability' (2011, 177). We can already see this in Facebook's photo storage systems. Infrastructure fails, but methods are designed to make it seem as if data can persist forever. And yet our own experience of Facebook's data, marked by timestamps that tell us precisely when something happened (be it years, hours, minutes, or mere seconds ago), is one that seems devoted towards a constantly updated immediacy (Grosser 2014) that nonetheless archives the past in a complete, ever-present way. This is temporality pushed in two different directions, in ways that are often about an imagined materiality of the technological rather than its actuality – imaginaries that substitute for the inability to grasp the temporality of the computer as something that operates beyond human experience. This 'enduring ephemeral' (Chun 2011) demonstrates how the time of the computer is projected upon human users, who then invent methods of adjusting and managing time relationally in response to a temporality that remains forever beyond conscious experience. This serves to normalise a broader temporal political regime in which the dominant requirements of speed are projected onto marginal subjects who then manage and adjust in relation to the demands of the dominant temporal order (Sharma 2014) – demands that, with digital databases, are ultimately unable to be brought into human experience.

These negotiations can be seen in two different ways. First, in human responses to the visible approximation of Facebook's social graph, especially upon the introduction of Facebook's 'Timeline' feature, which was introduced in New Zealand on 6 December 2011 and made standard worldwide in January of 2012. The second we've already touched on a bit with the techniques Facebook's engineers have developed to deal with – and obscure – the temporal limits of data storage and data processing, maintaining the separation between human experience and infrastructure through software.

In a 22 September 2011 blog post, Facebook's users were told, 'Now, you and your friends will finally be able to tell all the different parts of your story – from the small things you do each day to your biggest moments'. This 'story' results from Timeline:

> Back in the early days of Facebook, your profile was pretty basic – just your name, a photo, where you went to school … stuff you'd cover in the first five minutes you met someone. Over time, your profile evolved to better reflect how you actually communicate

> with your friends. Now you can can [sic] share photos of what you did last weekend, and updates about how you feel today. But since the focus is on the most recent things you posted, more important stuff slips off the page. The photos of your graduation get replaced by updates about what you had for breakfast … Imagine if there was an easy way to rediscover the things you shared, and collect all your best moments in a single place … With timeline [sic], now you have a home for all the great stories you've already shared. They don't just vanish as you add new stuff.

Timeline is supposed to be a navigable archive of one's individual experiences made public for the consumption of others, uploaded to Facebook and stored on its servers. Instead of having a few introductory remarks, Timeline is presented as one's 'life story', permanent and archived.

As is the case with almost any change to Facebook's user interface, the initial response to Timeline was negative. In a story for the *Atlantic*'s website on 15 December 2011, we are told that we'll hate Timeline because there are 'too many photos', 'nothing is in the right order', and, in the end, it's just 'so much work' to manage one's online identity. The next day, *Wired*'s website suggested that, with Timeline, 'your life can be exposed for everyone to see – and *scrutinize*', and, as a result, 'you may be interested in curating the new interface'. This initial reaction to Timeline happened in part because it revealed the disjuncture between a number of different forms of temporality. While the time of computational processes will remain forever invisible to human users, Timeline is a closer representation of the logic of a digital archive, maintained through software processes designed to produce the appearance of stable, enduring data. While the previous interface of Facebook relied on a temporality characterized by a constantly becoming present moving into the past, Timeline represents something closer to the creation of a stable and predictable identity to be managed as a 'total' and constantly updated archive of an individual.

In its discussion of the limits to the performance of memory online, Facebook remarks that the movement of the present to the past to that which is forgotten is a problem to overcome through new technological tools. Facebook is characterizing human time consciousness and human forgetting, at least in the form similar to that outlined by Husserl (1991), as something to overcome to achieve the true potentials of human memory. Husserl's phenomenology of time consciousness relies extensively on the movement of present perception to past memory, privileging the flow of consciousness as essential for human experience (88). In this view, an archival record is not an unchanging point that can be approached outside of the flow of time, but rather is a marker that contributes to the flowing experience of time itself (Stiegler 1998). A recording marks change and difference as the present flows into the past – ultimately to the limit of human time as one's individual finitude and eventual death. Many modern philosophical conceptualizations of time – at least from a phenomenological perspective – conclude that time itself flows in some direction and that the future of the human is open, if in ways that are ambivalent or contradictory.

A common strategy for managing Timeline's apparent flattening of time advocated on websites like that of *Wired* is the deletion of all status updates and photographs from the past now found embarrassing or incriminating. Once these bits of personal data are again hidden they are assumed no longer threatening. One retains the control of one's own memories and the possibilities of future change by performing a form of digital repression through deletion, returning to a modern sense of temporality by 'opening' the future through the erasure of one's records of the past. But the belief that one can mitigate against

Facebook's storage of memory through techniques of deletion is problematic for many reasons, including the sometimes surprising permanence of digital storage (Kirschenbaum 2008). While its terms of service suggests Facebook claims no ownership over what users post – anything on Facebook is merely licensed to the social networking website – deletion does not prevent Facebook's continued use of user data. While one supposedly 'controls' their personal data, this is not really the case if '*it has been shared* … Unless the user's "friends" also delete the shared data, it will always be licensed to Facebook' (Gehl 2011, 1240). In other words, just because something isn't visible doesn't mean it's not there, somewhere, in Facebook's servers.

   This returns us to the divides between the different networks that comprise Facebook. While we think of the human tasks of 'sharing' and 'connecting' as the reality of Facebook, its technical reality remains invisible to the human, even to the point of being excluded from Facebook's own descriptions of its network. Technologies of storage multiply and distribute images across the globe in a way that will ideally persist forever, recording a total image of the individual, reconstructing a digital self instantaneously – even though this 'permanence' is only maintained through software designed to hide the materiality of infrastructure.

   This is further compounded by the sheer number of Facebook's technical documents dedicated towards the reduction of latency in information transmission and the management of time in storage infrastructure (e.g. Goel et al. 2014; Perry et al. 2014). From these technical documents, the problem for Facebook isn't that technology accelerates human relations, but that technology is *too slow*. The distinction between Haystack and f4 systems for storing BLOBs discussed earlier also has an odd relationship to time (Muralidhar et al. 2014). Haystack is designed to work with 'hot BLOBs' and f4 with 'warm BLOBs'. The distribution of photos between Haystack and f4 is based on their age, as they get less 'hot' over time. These systems are designed because storage systems fail over time because drives and routers wear out, and even entire datacentres may fail for any number of reasons. These ways of managing data are designed to make sure the temporality of infrastructure never enters into the direct consciousness of human users. To return to Sarah Sharma's terms, Facebook's servers are in a continuous process of 'recalibration' by engineers, enabling a temporality that appears simultaneously infinite and instantaneous, even when their technical specificities are neither infinite nor instantaneous. And human users are asked to 'recalibrate' themselves, in relationship to a massive system that is only made visible through data analytics that are themselves produced through data management techniques.

Conclusion

What I've argued above is that, first, there are multiple 'networks' that comprise Facebook that do not correspond – networks of hardware, software and 'human sociality'. The constant mediation and adjustment – or 'recalibration' – of temporal experience draws from the technological to produce multiple forms of temporality on Facebook – in ways that users negotiate and contest, certainly, but also in ways that demonstrate how the limits and possibilities of 'human' and the 'social' do not simply emerge from the lived, everyday reality of social media users. It is neither the case that all media are social by definition, nor is it that social media merely reproduce relations that already exist. Instead, the possibilities of the 'human' and 'the social', the relations individuals have and the collectives of which they find themselves a part, are always already mediated, and the specific conditions of mediation shape the very limits of the

'social'. With Facebook, this social is one in which the preconditions for relation involve a negotiation of technological temporalities alien to historical formations of 'human' time. The processes of Facebook, rendered invisible in the charting of the social graph, are here the ones with the power to dictate the potentials of temporality – with the time of users constantly negotiated with phantasmagorical norms of infinitude and instantaneity that are never fully brought into experience, and are never fully part of the material infrastructure that is Facebook itself.

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No potential conflict of interest was reported by the author.

Notes on contributor

Grant Bollmer is a lecturer in the Digital Cultures Program, Department of Media and Communications, at the University of Sydney. He is currently completing a book titled *Inhuman Networks: Social Media and the Archaeology of Connection* and working on another titled *Theorizing Digital Cultures.* His work can be found in journals such as *Cultural Studies*, *The Information Society*, *Cultural Studies Review*, *Digital Culture and Society* and *Memory Studies*. His current research examines the intersections between the digital encoding and storage of the body, the history of psychology and the visualization of affect.

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