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The Work and the Net: a Critical Reflection on Facebook-Research Methods and Optical Mediation

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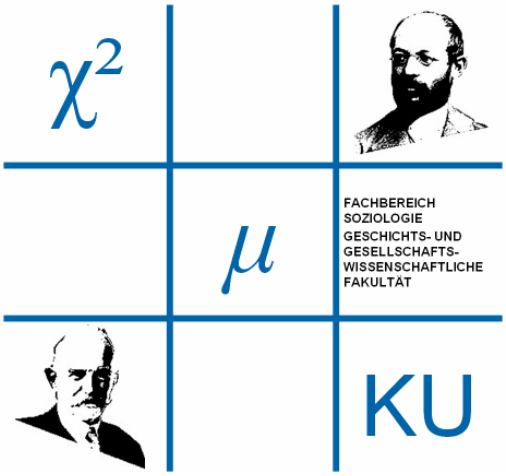

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The Work and the Net: a Critical Reflection on Facebook-Research Methods and Optical Mediation

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Abstract

In his recent writings, Bruno Latour (e.g. 2013: 31) has insisted on distinguishing social science that treats networks as results from research that concerns itself with networks as process. Whereas the first type of research focuses on what circulates once everything has been put into place, the second focuses on the assembling itself. For Latour Actor Network Theory (ANT) only refers to the second and therefore has to be strictly separated from other kinds of Network Theory, such as "Relational Sociology" (Crossley, 2010; Donati, 2010; Emirbyayer, 1997, Häußling, 2010) or Manuel Castells' (1996) conception of "Network Society". In this contribution, we are asking the question whether this implies that there can be no analysis of digital social networks on the basis of Actor-Network Theory? By focusing more closely on practical methods of researching Facebook (in particular, we will analyse a Fan Page in terms of *modalities of association, actual occurrences or entities, temporality* and *degree centrality and betweenness centrality*) and how they are being deployed, we will argue that, in order trace the process of assembling a network, we need to take into account the technologies that enable the quantification and visualization of network-flows. By opening up ANT to a conceptualization of the virtual, we hope to establish a new direction in network research that can benefit from both existing traditions by showing that (1) ANT can help Network Analysis to become more theoretically precise and sociologically relevant; (2) Network Analysis can further support ANT in developing an analytical grasp of the empirical dimension of the technological infrastructure of social networking through its distinctively graphical modes of visualization, and (3) any empirical account of networking requires from the outset a thorough engagement with
optical mediation including its technical facilitation and a conception of the virtual in order to understand the social.

Keywords

Network Research; Actor-Network Theory; Facebook; Optical Mediation

1 The Sociology of Associations: a very brief introduction

Actor-Network Theory has become very popular within the social sciences over the last 20 years. In particular the charismatic figure of Bruno Latour has been elevated to become one of the leading French intellectuals of his age. This might be an accolade he himself prefers to abstain from, but his tendency to polemicize his specific approach to theorizing "social" phenomena has produced a kind of "cult of personality" that has marked French intellectual history since the Second World War.[1]

In one of his major recent works, *Reassembling the Social*, Latour (2005) proposes a new form of sociology that is based on Actor-Network Theory, which he calls "the Sociology of Associations". It is a philosophically upgraded version of what Michel Callon (1986) referred to in the early 1980s as "The Sociology of Translation" (which was then soon thereafter replaced by the phrase "Actor-Network Theory"). *Reassembling the Social*, however, is also pitched as being *"An Introduction to Actor-Network Theory"* (which is its subtitle).

From the outset, the book immerses the reader in a polemic against what Latour calls "the Sociology of the Social" which - in his view – comprises all of western sociology after Durkheim (with a few exceptions, such as Ethnomethodology). The fact that Latour does not seem very interested in, for example, differentiating between Durkheim, Simmel or Weber, or engaging with the legacy of the early Chicago School, is understandable when considering the book's major strategic objective: to establish the Sociology of Associations as a radical alternative that is capable of turning the whole of sociology upside down (a kind of Copernican Revolution or at least a Kuhnian "Paradigm Switch").

However, Latour has never claimed to be the genius behind this radical alternative. The first sociologist who enabled the development of the sociology of associations was Gabriel (de) Tarde (e.g. 1899; 1903), a contemporary of Durkheim. Because Tarde and Durkheim developed their different kinds of sociology in deliberate opposition to each other (they were involved in a major and very heated public debate at the *École Normale Supérieure des Sciences Sociales* in Paris in 1903, see Vargas et al. 2008), it was extremely convenient to reconstruct the history of sociology as a dualism of the sociology of the social and the sociology of associations as defined in opposition to each other and the first being clearly the dominant form. As a result, *Reassembling the Social* is an extremely powerful and convincing book. It revisits the Durkheim-Tarde debate and proposes a form of sociology that could have become the dominant one, had Tarde and not Durkheim been proclaimed the winner.

[1] It is perhaps for this reason that his most recent project entitled "An Inquiry into Modes of Existence" (AIME) is from the outset conceived as a collaborative endeavor using a digital platform (www.modesofexistence.org).

Latour asserts that the Sociology of Associations is an empirical sociology. It does not engage with (Grand) Theory but instead, pragmatically sets out to engage with "things" *(pragma)* as they unfold. As soon as a thing has an impact on (or affects) some other thing, it becomes an actor. Impact or affect is a quantity: a thing is more or less affected by other things.[2] That is, action is a quantity. Latour had discovered the work of Tarde via Gilles Deleuze, in particular his book *Difference and Repetition* (1969/1994). Deleuze is not a philosopher whose work evolves through polemic. Instead, Deleuze is more like an experimental painter, except that he does not paint with colors but with words or better concepts. Deleuze's philosophy is one of quantities and intensities. Even qualities are ultimately "merely" differentiations of quantity that have been moulded into separate attributions by means of "thresholds". Deleuze used the example of colorimetry to illustrate this. Colors are not distinctive qualities but quantitatively differentiated intensities of saturation, lightness and hue; which are all attributions of light frequencies.

With actor and action as quantities (in fact, action and actor are attributes of the same monad), the empirical task of sociology starts with a specific impact: the emergence of something. From this emergence, the sociologist follows the action as it unfolds; usually this is easier when one follows an actor (e.g. as in "follow the money"). That sociology usually focuses on a specific human actor/action is not a real problem as long as it does not forget to take notice of non-human actors/actions that are usually also involved in the process of an unfolding event.

Latour makes a small leap from the perhaps somewhat mechanistic world view of monads impacting on each other as developed by Tarde (2009), to a concept of association, which we might refer to as "lasting impact". Impact or affect could be seen as forms of "being moved by" or "being set into motion by" or simple "being motivated by". Motivation is a far more interesting and rich concept compared to causation, simply because it not only involves the force of impulse (*puissance*) but also the willingness or ability to be affected (*pouvoir*). Although Latour himself has not always been extremely explicit about this, it is hopefully clear that this conception of actor/action has *everything* to do with power. Indeed, it would be quite a stupendous achievement to follow the Spinoza-(Nietzsche?)-Tarde-Bergson-Whitehead-Deleuze lineage and lose the concept of power on the way.

Association (as an affect that lasts beyond the moment of impact) must not necessarily be conceived of as an absolute continuity. Like a nerve signaling pain, it may be more the case of a repetitive pulsation. Habit could also be thought of in this way. A habit only exists by virtue of its repetition. To break the habit is thus nothing more than to interrupt the sequence of repetition. Unfortunately, *Reassembling the Social* does not engage us more intimately with the phenomenon of association. Therefore, in this chapter, we postulate that

[2] This notion of quantification is the cornerstone of Tarde's "Monadology" (Tarde 2009; Latour 2002).

this work still needs to be done *before* we can fully get to grips with Latour's most recent work *Inquiry into Modes of Existence*. Although this work has been hailed by some as a major break from his previous myrmecological exploits[3], we want to show that this is a misconception based on a failure to think through the missing link which is rooted in Latour's own unfinished conception of association. This, we argue, has major consequences for the way in which we are able to research understand and conceptualize networks.

2 Net-Work as Not-Work?

For years, those closely associated with Actor-Network Theory have been insisting that they are not involved in "Network Analysis". Network research has its own traditions. For example, in Political Science it blossomed during the 1960s as a means to explain how power works, but its roots are arguably much longer, dating back to, for example, Robert Michels' (1911/2001) analyses of political oligarchies at the turn of the century. In Sociology, C. Wright Mills (1956) became famous for his research of power elites and Norbert Elias' (1969; 1982) concept of Figuration as a means to explain the durability of social processes has been extremely effective in developing social explanations of power-relations. In the 1980s, network research returned to the fore with specific reference to processes of globalization. Here the focus had shifted to business networks and networked organizations. A particularly famous example was Manuel Castells' (1996) work *The Rise of the Network Society*. Key to such studies is to show how multinational conglomerates secure advantageous positions by entering into cooperative relationships. A simple example of this is "outsourcing" which enables businesses to create quasi-internal markets for non-core-business processes.

A second major factor in the development in network research was the arrival of the Internet. The Internet started to rapidly expand in the early 1990s. The very idea of decentralized communication systems based on networks might have been an older and tried-and-tested military concept; few could have predicted the astonishing expansion of digital electronic communication and information systems. However, it should come as no surprise that as soon as they started using the Internet for their own research, social scientist were also quick to recognize its vast and radical potential (Rogers 2013).

Although the use of drawings and graphic displays as a means to map social relations is nothing new (indeed, what would genealogy be without it?), the fact that digital devices are now being used to establish relationships has enabled their tracing to become *immediate* (even if it is of course a highly mediated action). During the 1990s, there was a growing belief among sociologists, that they finally had the means to break through the structure-agency stalemate, which had plagued their discipline since Durkheim onwards. For example, in his "Manifesto for a Relational Sociology", Mustafa Emirbayer (1997) proposed a relationalist

[3] Myrmecology is a branch of Entomology and concerns the scientific study of ants.

paradigm as an alternative to the substantialist paradigm that had thus far dominated sociology. Substantilism, he argued, could be found in both actor-oriented as well as in structure-oriented sociologies, because both start from the premise that either actors or structures are fixed entities that pre-exist the relationships they enter into.

Emirbayer argues that if one focuses on relations instead of entities, one is able to develop a more dynamic and process-oriented account of the social and from this new research questions can emerge. Emirbayer's claim to a paradigm shift has found resonance in the works of, for example, Crossly (2010), Donati (2010) and Häußling (2010) and has been refined over the years to become methodologically more adept. The use of digital graphic interfaces to map social networks has provided further impetus and there is now a broad international base for the methodology of "Network Analysis". Network Analysis became a crucial methodology, not only in studies of new media and the Internet, but also in the fields of political economy, anthropology, empirical political science, management and organization studies and science studies (for an early example, see Whitley 1984).

It should thus come as no surprise that other groupings, which also refer to networks as part of identifying their paradigmatic allegiance, were quickly being associated with "relational sociology". For example, the little branch of Science and Technology Studies that had called itself Actor-Network Theory in the 1980s, was soon thereafter being associated with those massive "social" phenomena such as globalization and the Internet, even if those operating under the label of Actor-Network Theory were neither researching globalization nor Internet *as such*. In *Reassembling the Social*, Bruno Latour painstakingly describes a (fictional) dialogue with a student (in true Platonic style) in which the subject of network is being raised. (P. is Latour and S. is the Student.)

> S: But my agents, I mean the people I am studying at the company, they form a lot of networks. They are connected to a lot of other things, they are all over the place.
>
> P: But see, that's the problem! You don't need Actor-Network to say that. Any available social theory would do. It's a waste of time for you to pick such an outlandish argument simply to show that your informants are 'forming a network',
>
> S: But they are! They form a network. Look, I have been tracing their connections: computer chips, standards, schooling, money, rewards, countries, cultures, corporate boardrooms, everything. Haven't I described a network in your sense?
>
> P: Not necessarily. I agree this is terribly confusing, and it's largely our fault – the word we invented is a pretty horrible one. But you should not confuse the network that is drawn by the description and the network that is used to make the description.
>
> (Latour 2005, p. 142)

Hence, for Latour network is not what needs to be described, it is that which needs to be deployed as a tool of generating descriptions. He thus asserts that network-as-object is

different from network-as-tool. In his earlier work on Heidegger, Graham Harman (2010) posits the radical thesis that for Heidegger, *'Zuhandensein'* or 'readiness-to-hand' implies that all objects are tools. To put it differently, objectification is the work of tools. In a later passage, Latour (2005, p. 143) formulates a similar position as follows:

> Being connected, being interconnected, or being heterogeneous is not enough. It all depends on the sort of action that is flowing from one to the other, hence the words 'net' and 'work'. Really, we should say 'work-net' instead of 'network'. It's the work, and the movement, and the flow, and the changes that should be stressed. But now we are stuck with 'network' and everyone thinks we mean the World Wide Web or something like that.

Latour (2005) furthermore seems to concur with Harman's Heidegger when he states that "tools are never 'mere' tools ready to be applied [Heidegger called this *'Vorhandensein'* or 'present-at-hand' – JVL & LU]: they always modify the goals you had in mind". However, he thereby cannot answer to Harman's point, that an object can only be an object, i.e. act as an object by objecting and objectifying, unless it already is a tool.

In his latest work *An Inquiry into Modes of Existence* Latour (2013, p. 31) has rephrased the distinction between "network-as-object" and "network-as-tool" as a between "networks-as-result" and "network-as-process". Presuming he uses this distinction in a pedagogical fashion to warn his readers not to forget the process by solely focusing on the result, we are still left to wonder whether this pedagogical heuristic might backfire into an opposition between results and processes, which is a false dichotomy since a result is nothing but the smallest possible interval within the unfolding of a process. To summarize: whereas Latour has rightly problematized the notion of association as merely given, by shifting attention to network-as-process (or Method), the opposition thus invoked between result and process is not necessary and even counterproductive. Indeed, the example of a distinction between the matter of a pipeline and the matter of what flows through a pipeline might help Latour to make the point that these are different matters of concern, it cannot tell us which of these matters matters most.

This may seem a trivial point, but in the face of the polemical efforts to drive a wedge between Network Analysis and Actor-Network Theory, it may still be significant. To suggest "vulgar" Network Analysis is merely describing a network without taking into account how the network has been assembled is a gross overstatement that only serves the polemical purpose of self-purification. Whereas it may be true that a focus on mere associations as simply "there" is to ignore the work of the network, the tracing of associations is itself also work and that has to take into account the scars that have been left behind by the impact of affect. These scars can be mapped and made to perform graphs. These graphs tell us something about the construction of networks, even if they focus on the pipelines rather than

the content of the flows. A sociology that takes intensity seriously also needs to take into account the frequency of pulsation. If one wants to quantify associations by means of impact (or the severity of scars), one is necessarily forced to be somewhat more limited in terms of the variety (not amount) of information one is able to *take into account*.

In a much older work, *Science in Action*, Latour (1987) himself reminded us to distinguish between ready-made-science and science-in-the-making but not to simply discard the first and put all our eggs into the basket of the second. Ready-made science still matters as it helps to construct a specific kind of public-ness of scientific work. It allows scientific work to be represented in non-scientific fora and thus enables the translations of science into, for example, political processes.

In this contribution, we will be focusing on very minimal work: the work of Facebook. Facebook allows for a very limited set of associations: users, friends, memberships of groups, fan pages, posts, comments and likes. Most of these involve mere clicks on virtual buttons, which is not much work indeed. Still, the sheer amount of clicks does add up to a high volume of work in terms of time and energy. Moreover, the writing of comments involves more than a few clicks and often means that some care has been invested into making a specific association. As comments are often performative rather than informative, we would also need to take into account what is being performed.

Here, we are merely focusing on mapping two activities: liking and commenting (and both in relation to posts on a particular Fan Page). These two mark different degrees of intensity of work and should thus enable us to test Latour's thesis that the work of networking matters. Our second aim is to highlight, that graphic models of simple networking activities (which are not the same as "ready-made-networks") can still tell us something about "networks-in-the-making". Through the applications of data-mining and pattern-matching, profiles are being created that can serve many purposes: above all those of "enhancing national security" (military objectives) and "targeted niche-marketing" (commercial objectives).[4] By developing a few simple graphic models of working the net of Facebook, we will show how such graphs could be deployed to profile particular entities that for example enable administration and marketing to become more independent of personal interpretation and thus bypass subjectification. This bypassing of subjectification could also have significant political implications (e.g. Deleuze, 1992). However, rather than getting into a critique of the erosion of subjectivity, our main focus shall be on how these graphs can be deployed to develop more thorough analyses of networking activities through so called "social media".

[4] For a thorough analysis of the workings of profiling machines, see the work of Greg Elmer (2005).

3 Network Analysis with Facebook – A short Introduction

It is perhaps somewhat ridiculous to refer to "clicking on a hyperlink" as work. Indeed, if one takes the anthropocentric point of view that the work consists only of the individual who clicks, it is hardly work at all. Yet, the click is a mere trigger that sets off a series of intermediate steps, that one could refer to as "a setting into work" of an association. On Facebook, friendship is only a click away and one may seriously question what that means for the kind of friendships that are thus supported (or even created). However, this is not a question we wish to pursue here. Instead, we want to focus on the work that is required to prepare networks for analysis. This is primarily a question of tracing links and activities and making them visible in graphic form.

Indeed, the rise of the so-called "social network medium" Facebook not only increased the possibility of limitless networking and communication but also for an enhanced gathering and treatment of more or less deliberately generated "Big Data" (Hogan, 2010: 167). Through Network Analysis, these data can in turn be and made visible as graphics.[5] This process of translation can also be understood with the old-fashioned term representation. The becoming-visible through representation by means of the deployment of a software-based social science research method does not imply that we need to assume that they are the same (that would be re-presentation), but instead that the representation is the consequence of many translations of the available data by the particular software (like NodeXL or Pajek) and that these data in turn are the consequence of translations of particular actions (that constitute entities, see below) by the medium of Facebook.[6]

The question that can thus be raised is: which new phenomena, questions and aspects of the so-called "social" can be described and explained through the deployment of these relatively new and still by and large unchartered data flows in what has been generally referred to as "Network Analysis"?

Central to the network concepts are three aspects:[7] links, nodes and mesh (Van Loon 2006; Rogers 2013). Links are components of networks (Hansen et al. 2010, p. 34); they are the associations that have taken place. Strictly speaking they are traces of *actions*. As we will see below, once made these associations are only retrieved as such by means of technological devices; they are not permanent in their actuality. Monadology posits that actor

[5] Access to such data takes places via freeware programs such as NodeXL (http://nodexl.codeplex.com/) (for more information on NodeXL see also Hansen et al. 2010) that has a plug-in for Excel. Through elaborated formatting, these data can be visualized furthermore by means of additional programs such as Pajek (http://vlado.fmf.uni-lj.si/pub/networks/pajek/) (for more information on Pajek, see also de Nooy et al. 2006) and the networks that are thereby produced as graphics can thus be used for classical network analyses.

[6] An analytically more precise term would be prehension that has been derived from the work of Alfred North Whitehead (1978). It will be further elaborated later in this chapter. For a more detailed account of its applicability to processes of mediation, see Van Loon (2014). For a more elaborate account of representation and re-presentation, see Latour (2005).

[7] Network Analysis is based on a branch of mathematics called *graph theory*. In relation to this theory the actual representation of a network is also called *graph*. On this view links are named *lines* and nodes *vertices* (de Nooy et al. 2006, p. 6); mesh refers to the graph as a whole.

and action are the same and are constituted by what Whitehead (1978) called "actual occasions". This means that there are no nodes without links and vice versa. Nodes thus emerge with associations and *take place* when they have been bound by specific associations. They thereby become "actual occurrence" or entities that can take many different forms. For example on Facebook, they can be individual human beings, machines, collectives, fictitious characters, organizations, nations, and concepts and many more (Hansen et al. 2010, p. 34). Our example concerns a specific kind of deployment of Facebook-based data for Network Analysis. These data have been generated through the specific entities of "users" and "published posts".

Mesh is the third and most abstract concept that can be deployed in network analyses and refers to the specific graphical forms in which networks can be displayed. Mesh is related to values such as centrality, density and distance (de Nooy et al. 2006, pp. 125-127) and essential when one deals with aggregates of links and nodes (e.g. User Profiles which are made up of wall-posts, photo albums, likes, friends-links, comments). These profiles can be used to identify particular users, for example for the purpose of niche-marketing or identifying alleged risks to national security (which is said to be the core business of the NSA). For our analysis, we will only focus on one type of aggregate: the Fan Page.[8]

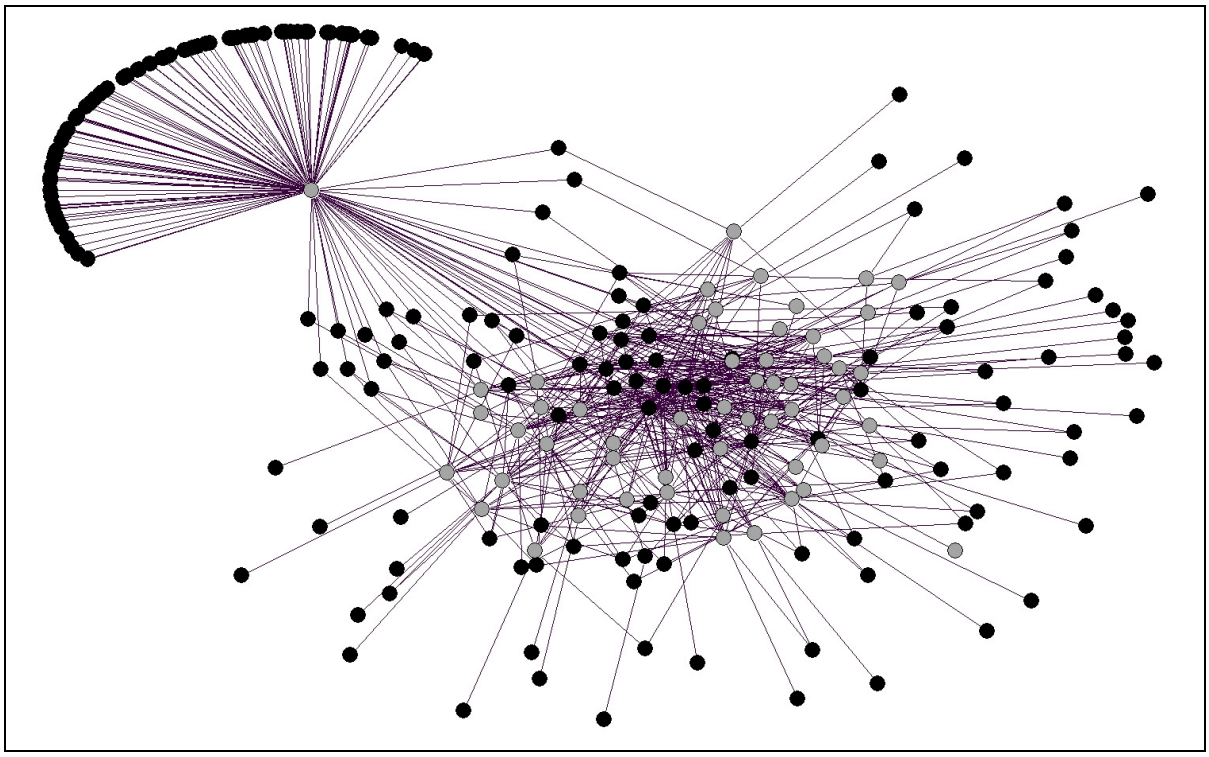
The data that emerge from the actions of Facebook-users and are made available to the analysis by means of software applications can be rather different in nature. For example, one could focus on the friends-network of a particular user, which refers to every user with which this user has a "friends-link" regardless of whether this link has been actively maintained (Hogan 2010). A graph then displays all the users (nodes) that emerge on the friends list as well as the friends-links that exist between them.[9] Whereas such a network represents a so-called one-mode network (Hansen et al. 2010, p. 36), in this chapter we will engage ourselves instead with two-mode networks (de Nooy et al. 2006, p. 103). An example of such a two-mode network - that has also been referred to as a bi-party-graph - has been given in Figure 1.[10]

[8] A Fan Page is a Facebook site dedicated to a particular interest or activity. Through the actions of liking such a site, every piece of information associated with the site will be displayed as "notifications" on the News Feed (Hogan 2010, p. 165) of all users that have once liked this Fan Page.

[9] With such a so-called "egocentric network" (Hogan 2010, p. 167), it will become clear that the user itself is not made visible as part of the network, because he or she is logically connected to all those that are displayed as part of his or her network. This particular piece of information thus becomes redundant and would disrupt the visual clarity of the graphic display (Hogan 2010, p. 170). It also shows something that Actor-Network Theory has been insisting on for decades: each actor, or better actant, is itself a collective or an actor-network. Furthermore, it is a perfect example of what in poststructuralist theory was falsely named "the death of the subject" and should have been called "the subject as displaced" (Descombes 1980; Haraway 1990).

[10] The examples of networks we have used in this chapter to describe the methodology of Network Analysis have been anonymized and thus displayed in a more abstract fashion. The data we have used as visualized examples are derived from the Fan Page of a student-political collective at the University of Duisburg-Essen (https://www.facebook.com/pages/RCDS-Duisburg-Essen/239006386158763?fref=ts) and have been downloaded on the 14th of June 2013. We have not provided any form of content-analysis of this Fan Page as that would require a rather different kind of question that is not of our concern here.

Figure 1: Two-mode-network of a Fan Page (based on co-likes, Layout: Fruchterman-Reingold; Source: www.facebook.com, created on 14. Juni 2013 © Laura Unsöld)



Central to two-mode-networks is the involvement of two different kinds of entities: in the case of Facebook, these are called posts and users (Hansen et al. 2010, p. 36). Two-mode-network analyses are particularly effective when analyzing aggregates such as Fan Pages because unlike friends-links, posts and users can become associated by means of two different kinds of actions: liking and commenting (on posts). Posts and users are then the entities (nodes/vertices) that emerge from these actions and are made visible in the graph. Figure 1 provides an illustration of this. By using colors or shades of grey, we can visually distinguish between these two types of entities (de Nooy et al. 2006, pp. 34-35).[11] In this graph, all vertices are of the same size (because we did not include centrality measures). It is also important to note that the length of the lines or edges does not indicate distance and have solely been established for graphical purposes.

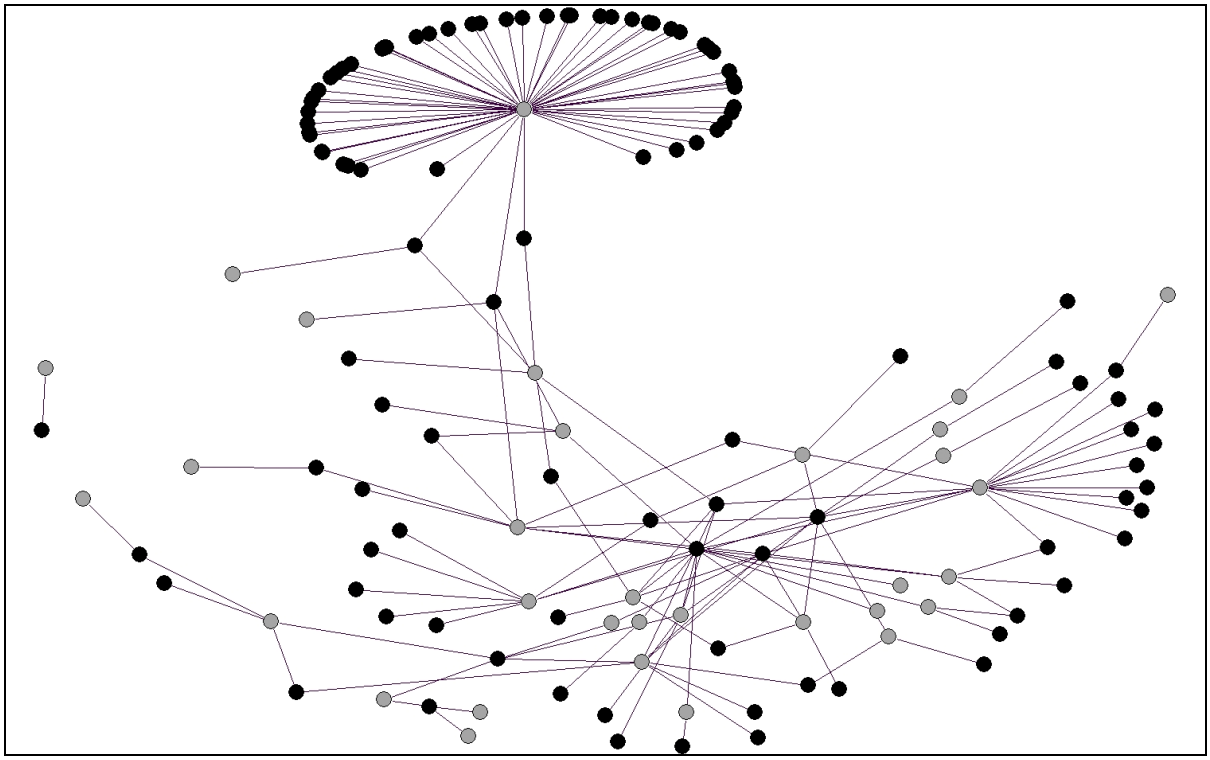
4 Liking and Commenting as Affective Modalities of Facebook

As we have already seen, the creation of this graphical display of the network of the Fan Page takes place through likes (also referred to as *co-likes*) and/or comments (or *co-comments*) and these establish specific associations between posts and users. The choice of type of association then determines the kind of visual display (mesh) that represents the Fan Page. For example, whereas Figure 1 displayed a mesh based on co-likes, Figure 2 is based

[11] Whereas the entity "user" is being displayed as black vertices, the entity "post" is represented by grey vertices.

on co-comments. The activity of liking is nothing more than the pressing of the virtual button "like" below a particular post that has emerged on the Fan Page. In this way, an association is created between the entity "user" and the entity "post" that can thus be given the attribution "co-like". By contrast, when the generation of a graphic display of a Fan Page network takes place on the basis of co-comments (as in Figure 2), then it becomes clear that we are here dealing with a rather different mesh.[12]

Figure 2: Two-mode-network of a Fan Page (based on co-comments, Layout: Fruchterman-Reingold; Source: www.facebook.com, created on 14. Juni 2013 © Laura Unsöld)



The greater visibility of edges within Facebook Fan Pages as two-mode-networks based on co-comments is no coincidence. This is because comments are inaugural actions by users in relation to existing posts. Unlike co-likes, co-comments require a bit more work and thus commitment and are therefore less frequent. For Facebook Fan Pages, liking is a primary modality of association (as that constitutes the notion of "being a fan"), whereas for Facebook Groups, the higher investment of time and effort (i.e. writing comments) may express a notion of being a good member. Edges in networks are to be understood as inaugurations that link the world of the Facebook site to the world beyond the Facebook site (even though this world is never made visible by the graph). They point towards the limits of Network Analysis because an edge is simply an emergence of associations but what

[12] This is related to the fact that this Facebook site is a Fan Page. That is, the form, content and type of Facebook aggregate are determined by the kinds of activities that take place. Whereas co-likes are a more prominent feature of Fan Pages; certain Facebook Groups may rely much more strongly on co-comments, for example if the Group in question is based on the sharing of tips.

motivated the emergence cannot be made visible with this method. The historicity of such inaugural actions is not traceable because it lies beyond Facebook.

This is also important in relation to the distinction between network-as-result and network-as-process (or work-net) which is central to ANT. If we treat the graph as a network-as-result, we are immediately confronted with problem of the boundary. It is as if there, the world simply has come to an end. If we consider network-as-process, it is clear that the Fan Page is a construction based on specific actions that – in the graph – are nothing but traces of that which can be retrieved because these deployed the particular medium of Facebook. If we wanted to know more about the Fan Page and about those involved in, for example, student politics at the University of Duisburg-Essen, we would need to not just focus on the content of the comments and the relations between them, but also try and trace the associations beyond the Fan Page itself.

With the description and analysis of networks of a Facebook Fan Page, the modality of the association between the specific entities "users" and "posts" has to be clearly identified. On the basis of the different possibilities of creating visual representations of a network based on co-likes and co-comments respectively, it can be made clear what kind of significance characterizes each particular modality of associations in terms of the meshes they have generated. The fact that these networks have different visual representations merely shows that the difference in modality of association is a difference that matters.

As we have already pointed out in a previous section, sociology tends to use the term "relation" (as synonymous with "the social") in a rather unspecific and undifferentiated manner. There is of course an understanding of the variable strength of relations, i.e. a notion of quantitative difference, as well as specific modalities of association, i.e. a notion of qualitative difference, but these differences are mostly seen as derivative of the overarching concept of "the social". We, however, would like to mention an old and now almost forgotten treatise on sociology by Albion Woodbury Small (1905) where he deploys the term "interests" to highlight that no association is simply an association; it is always motivated. It is this notion of motivation that needs to be taken into account when considering different modalities/intensities of association. The problem is that when association and interest are disconnect from each other, it suggests that there is such a thing as an "association-as-such", that is, independently from interests and motivations. This is the mistake that is implicit in the notion of network-as-result; concepts such as motivation and interest always point towards something that entail processes of associating that are temporal and only actual within a very short time-frame. When one maintains that an association is lasting, there is a risk that one forgets that every association needs to be established anew over and over again. The continuity of associations does not stem from their actual occasions, but from their virtual prehensions (see Footnote 5) which can be traced in terms of interests or motivations.

Our analysis of the two different modalities of association inaugurating different networks also shows that neither every user who liked this particular Fan Page nor every post that has appeared on the same Fan Page, will automatically become part of the graphically visualized network. In becoming part of the network, the modality of association, i.e. co-liking or co-commenting, is of fundamental importance. Indeed, the single user cannot be automatically prehended if he or she remains passive; there is no such thing as a user-as-such. Only through active engagement in the form of liking or commenting a user can be traced as part of the network of a Fan Page. For example, when considering Figure 2, we can see that there is a single line connecting two vertices, which means that one post has been commented upon by one user and no one else. This user has not commented on anything else, as that would have resulted in a link between the user and the rest of the network. However, it is possible that this user has liked several other posts. In that case, the vertices in the graph based on co-likes (Figure 1) would be connected to the rest.

For an association to become prehended by software based data processing of a Facebook Fan Page an action must have taken place; only then we can speak of an entity as an actual occasion. In the same vein, a post has to be noticed (through an act of liking or commenting) by a user; that is, it has to be deemed significant enough to warrant such an action, it has to be deemed of significant interest to be liked or commented upon, for it to be prehendible by the specific software. Finally, it has also become clear that on one and the same Fan Page, those networks that are based on co-liking and those that are based on co-commenting contain significant differences in terms of the represented users and posts and their mesh. It is indeed possible, that particular entities of a network can be made visible as part of one but not of the other type of network.

5 Time and Limits: An Analysis of Events

Alongside the need to identify the modality (and thus the interest and/or motivation) of an association within a network and the “belonging to” this network that emerges from that, the aspect of temporality in this case concretely manifest as the point in time at which the data had been prehended also plays an important role. Even if the question of the limits or boundaries of a network is often seen as of secondary importance within the domain of Network Analysis (Häußling 2009; Laumann et al. 1989, p. 63), the temporal framing of the processed data is highly significant for the visual formation (or “determination”) of a particular network. Association is an event. Indeed, the work-net-as-process is nothing but a collection of events. This collecting, i.e. building of a collective, is the emergence of a network that appears as if it is nothing but an image (a visual representation) of a structure that always-already exists. Fact is, however, that with every additional like or comment, the mesh of the network already changes.

As both in terms of its mesh as well as its entities (nodes) and actions (links), social networks such as Facebook Fan Pages are always in flux, it is essential that the time frame of the data-gathering and processing is taken into account. The informational architecture of a Facebook site is such, that it is capable of storing all actions that have taken place until the moment of data-gathering. In terms of its visualization, it does not then differentiate in terms of the actual taking place of each link. It thereby constructs the impression of a permanent network-structure (referred to elsewhere in this paper as "network-as-result"). Of course, each subsequent analysis is capable of making visible any slight change in terms of links, nodes and meshes and enables one to engage with the phenomenon of "network-as-process". However, the software also allows one to visualize networks within specified time-frames thus making temporality visible as a succession of cumulative associations that together build a network-in-development. Additionally, a focus on the temporality of networks-in-development (Scott 2013, pp. 139-145) facilitates a differentiation between more and less significant events.

The temporal aspect of Network Analysis still points out that there remain completely arbitrary aspects in terms of establishing what a network contains. These arbitrary aspects relate first and foremost to the methodology with which the networking activities are being traced. A network-as-process is never completed or finished; motivations and interests always point towards something beyond immediate presence. In Network Analysis, one always has to assume to position of *in medias res*; the starting point is never *ab ovo*. The danger with software-based network analyses is that these conflate the limits of technologies of tracing associations and processing data with the limits of actual and virtual associations. It is for this reason that one of the founding principles of Network Analysis has been that one should not try and determine the boundaries of a network and instead stress the importance of trying to represents the dynamics of such social phenomena.

6 Centrality

As a final aspect of the Network Analysis of a Facebook Fan Page, we would like to invoke the measurement of centrality (Scott 2013, pp. 83-98). Together with time (and density - Scott 2013, p. 69), centrality is one of the main visual aspects of the mesh of a network. Centrality is also one of the possible formatting devices one can deploy in software-based Facebook research (de Nooy et al. 2006, pp. 123-137; Hogan 2010, pp. 174-176).[13] Most often, network analyses deploy the following measurements to establish the mesh of a network: degree, closeness and betweenness (Scott 2013, pp. 84-87). The various types of

[13] One could also include under such formatting procedures the selection of specific parts of a network, because often the analysis of major components (key players) (Scott 2013, pp. 100-107) is of greatest concern. Besides, one could also choose one specific energy-based ordering (a so-called layout, here referred to as mesh) (de Nooy 2006, pp. 16-17) to trace specific nodes and edges of a network.

centrality are usually graphically represented through the visualization of the size of different vertices: the larger the size of the vertices the more central the entities to the network, but only in terms of the selected measure of centrality. Examples of degree centrality and betweenness centrality of the same Fan Page as before have been displayed in Figures 3 and 4.

Figure 3: Degree centrality in a two-mode-network of a Fan Page (based on co-comments, Layout: Fruchterman-Reingold; Source: www.facebook.com, created on 14. Juni 2013 © Laura Unsöld)

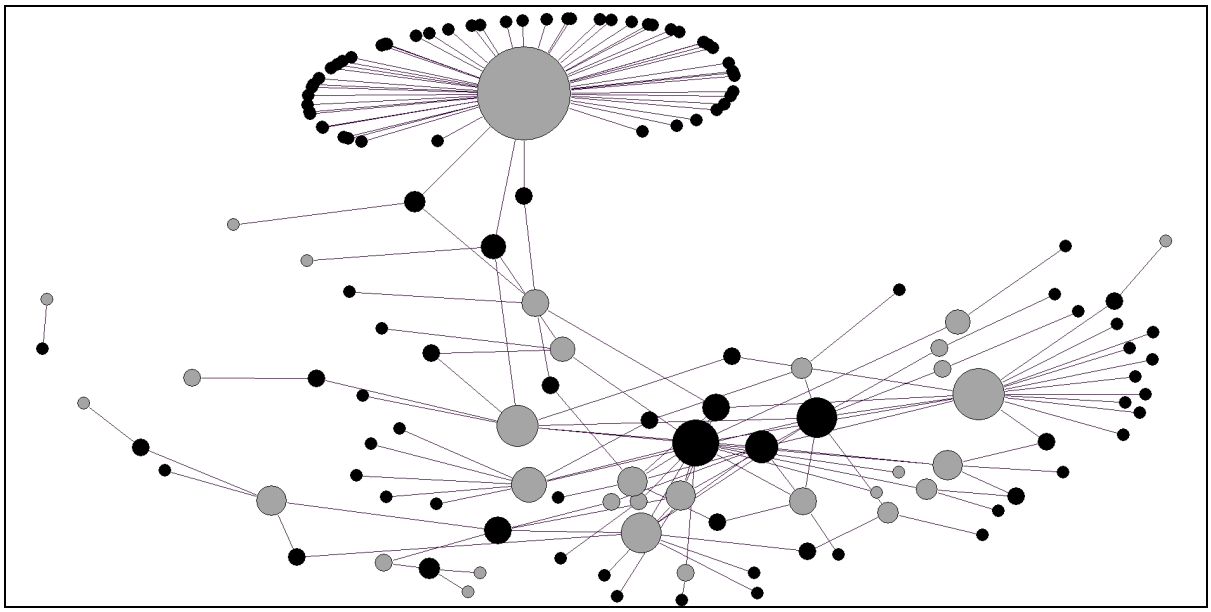


Figure 4: Betweenness centrality in a two-mode-network of a Fan Page (based on co-comments, Layout: Fruchterman-Reingold; Source: www.facebook.com, created on 14. Juni 2013 © Laura Unsöld)

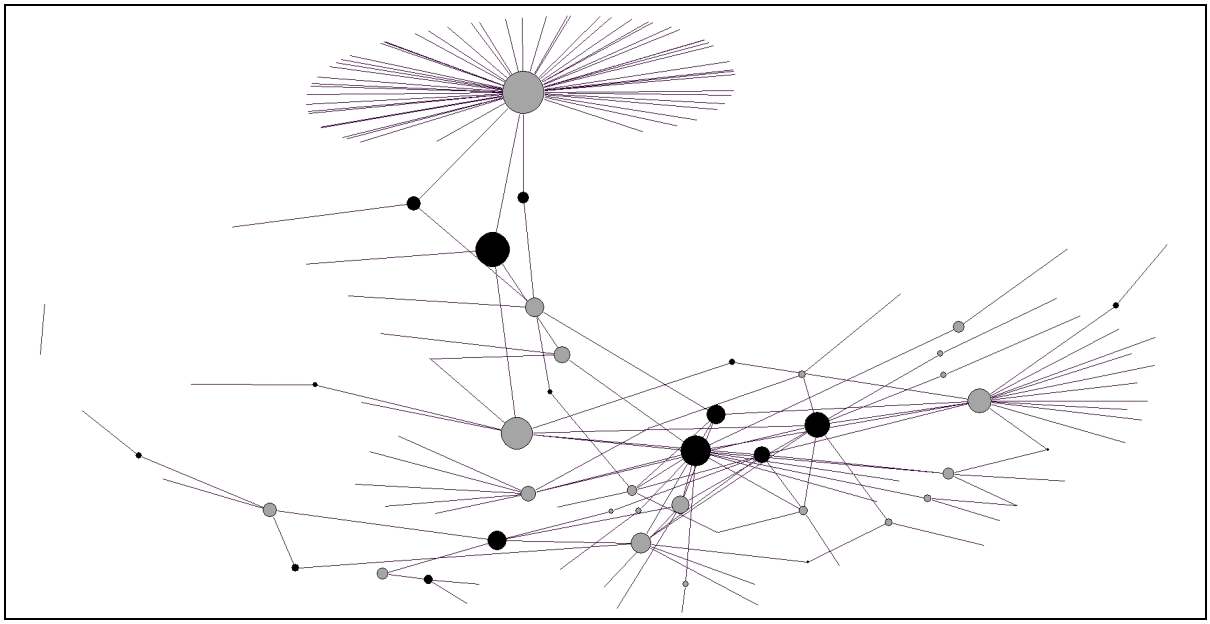


Figure 3 displays the differential values of degree centrality of each of the vertices that constitute the Fan Page. It is based on the total sum of *direct* associations with other nodes of the same network: the more direct associations are connected to a particular node, the higher its degree centrality (de Nooy et al. 2006, p. 126; Hogan 2010, p. 174). As it is related to the immediate associations of an entity, degree centrality is also referred to as a local centrality measure (Scott 2013, p. 84).

By contrast, the betweenness of entities is referred to as a global measure of centrality (Scott 2013, p. 83), because here not only the direct associations are taken into account but the indirect associations as well. These indirect associations are mediated by mediators which connect two or more entities of a network (de Nooy et al. 2006, p. 131; Scott 2013, p. 87) and so become somewhat akin to what in classical ANT is usually referred to as obligatory passage points (Callon 1986).

Betweenness centrality refers to indirect or mediated associations and the betweenness value of an entity (node) in a network is therefore an expression of the significance of this particular node for the cohesiveness of this network. The value that is thereby measured is based on the degree in which and frequency with which the node establishes the shortest possible distance (in terms of number of nodes) between two other entities (geodesics) (de Nooy et al. 2006, p. 127). Nodes which enable more and faster short cuts possess a higher betweenness centrality compared to others and are conversely visually represented as vertices that have a larger size. The vertices on the outside of Figure 3 (in particular the pair of vertices on the left which indicate that a single user has commented on a single post, but not on any others, nor has the post been commented on by anyone else) are no longer visible in Figure 4 because here only betweenness centrality is being displayed. These two vertices do not perform any mediation that is required to obtain a measure of betweenness centrality and thereby disappear. Moreover, one can only compare the vertices in terms of their measure of degree and betweenness centrality within one and the same graph and not between graphs as the measure in case is only derived from its relationship to this particular network and no other. Comparing between graphs requires different measurement devices, such as the centralization measure.

Betweenness also reflects what Bruno Latour (2005) referred to as the difference between mediators and intermediaries. Whereas we might be inclined to see entities with a high measure of betweenness to be intermediaries, they are in fact mediators, as the shortening of distances entails a transformation of the association. This has been shown as being of pivotal importance in applying Callon's (1986) concept of obligatory passage point. Mediators perform a central role in the configuration of networks because they facilitate a transformation of associations between otherwise disparate entities; they can thereby strengthen networks because they can enforce more direct and uniform communications, but

they can by the same token also weaken networks because they can inhibit heterogeneity and become “an Achilles heel”. The vertices that appeared as isolated entities in Figure 3 and disappeared in Figure 4 because they had no measure of betweenness could thus be seen as intermediaries, as they do not perform a transformative role to the network as a whole. Had the user commented on any other post of the Fan Page, or had the post been commented upon by any other user, the pair would have been brought into the network. In the first case, the user would have shown up as having a small measure of betweenness centrality in terms of an association between two posts, in the second case, the post would have been the mediator between two users.

7 Beyond the Polemic

Research Methods provide more or less useful tools for differentiating between matters of concern. The graphic displays of Facebook-based social network analyses may at a first glance represent the epitome of what is wrong with Network Analysis in that they are only able to describe the tool of research – in fact this can be said of all writings on methods – however, they also do something more: they enable us to differentiate between various kinds of associations (comments vs likes), more and less significant events (the development of networks over time) and the relative degree of involvement of different entities (degree centrality vs betweenness centrality).

For any sociologist interested in associations, the quantification of affect in terms of frequency and intensity should be of major concern. It is only in terms of quantification that we can begin to qualify the work of networking. Only in terms of quantification can we differentiate between more and less impact, between matters of more and matters of less concern and between mediators and intermediaries. The fact that such quantifications can be displayed graphically has certain advantages. Although these graphs as such do not give us actual measurements of strengths and weaknesses in numerical terms (such as correlations, for example), they are themselves of course still based on quantitative data that enable the exact calculation of such quantities.[14] These quantification measurements have to be understood as what Latour (1988) referred to as “trials of strength” of associations and are based on measurements of intensity that can be objectified. They objectify associations and thus make them measurable so that they can be tested in terms of the differences they make.

These graphic objectifications are not mere representations of a reality that is given: they are realizations or re-assemblings of the social. For example, on 26 December 2013, Adam Clark Estes reported in the digital lifestyle magazine Gizmodo, that:

[14] For example, while centrality is a measure that can displayed in terms of the variable size of the vertices, centralization is a measure that can be calculated for entire graph, which enables comparisons between graphs.

> As record shops shut their doors around the world, the popular metal band turned to analytics to plan its next move. Using the British data-mining company Musicmetric, Iron Maiden monitored its growth in popularity on social media sites and spotted a spike in Latin America. But, funnily enough, Latin America was also the region where a large amount of Iron Maiden's music was being pirated. Rather than turn their backs on the pirates or even take them to court, Iron Maiden recognized that a fan is a fan—and went straight to their front door. The band now regularly targets Latin America on tours and does so with tremendous results. One single show in São Paulo recently brought in over $2.5 million. These data-driven tours have also helped to bring in even more social media fans, and Iron Maiden has thus gained some five million new followers between 2012 and 2013 (Clark Estes 2013).

Data-mining is a quantification of association-events. It does not require a stable, a priori definition of the social, it does not require social indicators or social categories, social groupings or social media. However, it creates new associations.

Albion Woodbury Small's (1905) concept of interests is directly applicable to the world of Facebook. It also functions without having to specify beforehand where the social resides or what the social is made up of. Interests are a mere pragmatic device to help us differentiate between modalities (as attributions of intensity) of association or, as Latour (2013) calls them, modes of existence. Unlike Weber's *Verstehende Soziologie*, it does not require us to decide beforehand what is intentional and what is accidental; it does not restrict sense-making to cognitive operations and perceptions; and it does not force us to draw a sharp divide between human and nonhuman objects of action (Callon 1986; Latour 1987; 2005).

The fact that it is forced to talk about entities without being able to define a priori what constitutes an entity, makes this kind of analysis far more radically empirical. Only that which emerges and can be experienced as en event of emergence and can thus be taken into account; nothing more and nothing less. Users and posts can be distinguished as different entities, because they appear within the space of a specific Facebook site as such. Comments and Likes are different modalities of association, even if sometimes they express similar content. Associations through comments and likes evolve over time as digital network analyses enable the inscription of time as traces and display them graphically with variable degrees of density. Centrality is also variable; and the fine-tuning of digital network mapping is capable of distinguishing between different kinds of nodes: nodes that are bundles of links and nodes that link different sections of networks. The latter have a greater capacity to function as mediators because they are critical points of passage between otherwise dissociated entities.

It is the mediator with a high degree of betweenness centrality that one might target in campaigns of viral marketing, propaganda, security-checks or disruption. These kinds of applications also show that even if networks cannot in themselves express value, they constitute what Carl Schmitt (2003) called "the *Nomos of the Earth*" (in this case a rather virtual planet). This means that in order to analyze networks in terms of power, one must be extremely careful not to conflate force (*puissance*) and value. Being associated is not in itself valuable. One needs additional modes of existence, i.e. different modalities of intensity, to evaluate power-at-work.

8 Making the Social Visible: the Work of Optical Mediation

When we consider empirically what is at stake in transforming activities of "online social networking" with their graphical representations in Network Analysis, it becomes clear that it involves making associations ("the social") visible. This social is not some sort of given substance, but instead nothing but interactions, or better prehensions, between human beings, keyboards, interfaces, data-processing devices, display screens, wireless and cabled telecommunications, service platforms and so on and so forth. This is what has enabled the Sociology of Associations to become so convincing: we can now see relations as they emerge. It is nothing more than that but also nothing less. Like the electron microscope enabling the molecular biological turn, the measurement of activities of digital social networking media and their transformation into graphic displays enable an associative turn in the social sciences. But this associative turn is not yet completed without a thorough account of the technological infrastructure that made it possible.

It was Friedrich Kittler (2010) who deployed the term "optical media" to describe how our world has radically changed. For him it is the introduction of the lens that has made the greatest difference, because it enabled human beings to manipulate perception in relation to size (e.g. the microscope) and to distance (the telescope). However alongside the lens, *light* played a major part in establishing an optical universe of perception as well. Finally, the introduction of electricity connected optical media with something that would be able to replicate the human nervous system. Electricity is both pulsation and touch and it is thus able to set something "into-motion".

Optical media such as computers - that drive social networking platforms such as Facebook - are thus far from representational devices that somehow magically depict an image of a parallel universe called "the real social world". Instead, they set this world into motion. They provide the mysterious "social fabric" which however remains – by virtue of its optical nature – exclusively performative. Optical media also enable a much more precise counting of pulsations and prehensions. They do not require surveys with their problems of

operationalization, interpretation, non-response rates etc. Instead they record automatically every pulsation that has made the tiniest of difference.

The technologies that allow us to trace the minutiae of liking and commenting as modalities of associating tell us a few other things as well: (1) what makes the social possible is itself not social; (2) the social is that which is initiated by acts of association (prehensions), nothing more and nothing less; (3) the social does not exist beyond these acts, i.e. what the graphic displays show us is a collection of social events that have already passed; and (4) those figurations that are assemblies of traces of previous instantiations of the social are less complex than one single association that has helped it come into being. Network analyses reveal to us what the social has been from the outset: a virtuality.

We hope to have shown, therefore, that insights developed by means of social network analyses are not exclusively concerned with "networks-as-results" as has been polemically claimed by Latour in defense of ANT. What they require, however, is a radically empirical account. We need to treat them as optical mediations and not as representations. They do not depict a social that is substantially fixed and real, but instead they record prehensions as acts of association that have come to pass.

The reason why we have insisted on quantification is not because we believe that an analysis of content is obsolete. Quite the contrary, the Fan Page of a political party at the University of Duisburg-Essen should be further analyzed in terms of specific comments, for example if one is interested in the social embedding of student politics in Germany. However, against the quantitative-qualitative divide, we propose a Sociology of Associations that is capable of taking into account the intensity of affect *first*. Our interest concerns first of all the pulsations that instantiate "social events". This, we believe, should be at the heart of relational sociology, rather than, for example, network-structures.

With this, we are thus faithful to what Latour (1988) in now ancient and almost forgotten text referred to as "the principle of Irreduction": Nothing is derived from anything else and can be reduced to anything else. The network-as-process is an unfolding of many prehensions between entities that can be measured as pulsations and can then be displayed graphically as assembly of traces (vertices and lines), of that which has come to pass. These may sound like the old chronicles of paper and ink – and the analogy is in many aspects more than justified – except here the story-teller is entangled with optical mediation rather than with storytelling (e.g. witness accounts, lore, legends, myths and imaginations).

By introducing optical mediation into the methodology of Network Analysis, we hope to convince readers that ANT is more than a method or a theory; it is a radically different way of doing sociology. Without ANT, Network Analysis or Relational Sociology would be nothing but a few footnotes within the sociology of the social; they will not be able to do more than, for example, Bourdieu's concept of habitus or Giddens' notion of structuration, namely to

describe an imaginary “intermediate level” between individual actors and invisible social structures, this time using fancy computerized technology.

At the same time, ANT should not be throwing out the baby with the bathwater and recognize that optical mediation is more than a toolkit that reveals “networks-as-result”. A key problem for ANT has been quantification and this has led a lot of ANT-based research to end up with statements such as “everything is heterogeneous”, which is in effect a tautology because that is itself a consequence of the principle of irreduction. What matters is not identify difference, but instead to identify differences that matter.

Indeed, only by shifting the focus to the work of optical mediation as a specific attribution of prehension we are able to come to terms with the virtual nature of the social. Only then will we be able to stop opposing entities and relations as two different kinds of substance. Prehension is the instantiation of actual occasions and entities can only be understood as actual occasions. The assemblies that are formed by tracing prehensions and taking them “into account” can be understood as networks, but that is only the beginning of social research.

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