Liberty, Equality, IT

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Algorithmic governmentality and spatial justice

"*Solve intelligence. Use it to make the world a better place.*" It is this unabashedly explicit strapline that adorns the homepage of Google DeepMind, a British artificial intelligence company initially based at University College London and taken over in January 2014 by the Internet giant Google for the modest sum of 400 million pounds sterling (Shead 2016).[1] The stated goal is clear: by combining neuroscience and computing capacity, Google DeepMind wants to build general learning machines that will recreate the computing capacities of the human brain).

It is significant that Google is the player here: social network operators are at the heart of the contemporary debate on Big Data, the massive quantities of information generated by our continuous use of social networks and now stored, accessible and exploitable by ever more sophisticated algorithms. The notion of smart systems, whatever the field of application, has now spread to the whole spectrum of human activities: our day-to-day objects (telephones, tablets, etc.) are *smart*, making us more efficient consumers with better identified profiles. Moving up a scale, our cities are also becoming smart, as swarms of sensors capture massive quantities of data that are employed to guide and optimise urban management systems.

However, this idealised picture of data-driven progress would not be complete without the idea of radical change that underlies the debates on Big Data: mass data, processed by algorithms that are not only ever more sophisticated but increasingly independent of human thought, will ultimately make it possible to predict (and therefore to manage) behaviours (Pentland 2014). Indeed, because of the availability of astronomical quantities of data of an increasingly varied nature, and the higher flows and processing speed, Big Data is considered an epistemic revolution, the so-called 3V (volume, velocity, variety) revolution. It is seen as removing the need for any pursuit of

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1 For the Google DeepMind homepage, go to https://deepmind.com/.

causality, by permitting a totally inductive approach involving the detection of correlations between massive quantities of across-the-board data, and therefore avoiding the typically human bias represented by the formulation of working hypotheses. As a result, the understanding of phenomena becomes secondary (or even irrelevant), replaced by predictability.

If we look at the promise of big data from the perspective of justice, the first thing we see is that there is something of a scientific void: while certain texts do ask what the data are and who they are for, we know of none that ask what standards should be advocated for a more just society in a world saturated with algorithms. Yet there are myriads of normative representations of what is just amongst those who see the computer as the technical solution to many social deadlocks. When human beings are caught doing wrong, cannot technology counter their egotistical tendencies? So the opposition to the collection of private data by the giants of the web comes from the activism of total openness, which conceives social justice as emanating from the universal transparency of "open source", cases particularly well illustrated in this collection by the contributions of Eric Arrivé on the Bitcoin protocol or of Pierre Gautreau and Mathieu Noucher on the sharing of environmental data.

More generally, one powerful idea emerges from this issue of *jssj* as a whole: for many operators in the digital world, a just use of data is intrinsically linked to the way those data are prepared and communicated. From this perspective, total transparency is both an end and a means, becoming the standard of justice.

According to the articles collected, in this issue this thesis is highly disputable. The examination of digital procedures as actually implemented shows in certain cases that the opening up of data can result in the reproduction of existing inequalities (and injustices), and in other cases to the production of new forms of injustice. Should transparency therefore be seen as bivalent? Heads, it is equated with truth and emancipation, with each of us potentially able to become agents of our own digital life. Tails, it is about traceability, tracking, bureaucracy.

The bivalent character of information was already pervasive in political discussions in the early 1970s, when centralised IT (symbolised by the giant IBM) still reigned supreme and scientists and activists questioned the role of quantification in the understanding of (and action on) society. A stuttering debate which is worth examining for a moment.

The reign of numbers: ancient history?

In 2011, the Oblomoff group wrote: *"Half a century has passed since the writings of Cornelius Castoriadis or Henri Lefebvre on bureaucracy and technology. Books like* Modern Capitalism and Revolution *or* Position: against the technocrats *began with the postulate of a change in the nature of modern capitalist societies, as they formed during the years that came to be called the "Glorious Thirty" (......) Since then, forty years of "crisis" and neoliberalism have done nothing but confirm this postulate: management, in other words the takeover of our lives by a separate corpus of technocrats is today massively in the ascendancy"* (Oblomoff 2011, p.3).

One reason why we wanted to begin by quoting this volume dedicated to the critique of government by numbers, was because it contains the final text published by Alain Desrosières, shortly before his death. Alain Desrosières who, as administrator of INSEE, had experienced four decades of quantificatory inflation assisted by the digital revolution, and aspired to produce a critical history of the phenomenon.[2] In this final text (in fact the transcription of a lecture and the debate that followed it), he returned to the distinctions he drew between the *Engineering State* which, from Colbert to the Soviet Union, was concerned with counting physical quantities, the *Liberal State* which claimed to do without quantification since all information is contained in market prices, the *Welfare State* which developed quantification for insurance purposes, the *Keynesian State* which was interested in managing aggregate macroeconomic flows for the purposes of national accounting, and finally, the *Neoliberal State*, the most difficult to analyse because the most recent. Desrosières nonetheless agreed with Vincent de Gaulejac in understanding this Neoliberal State as contemporary with the inflation of quantification

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2 Born in 1940 and deceased in 2013, Alain Desrosières was educated at the École polytechnique and the École nationale de la statistique et de l'administration économique, where he was taught by both Pierre Bourdieu and Raymond Barre. An administrator at Insee, he became a practitioner and theoretician of public statistics as a tool of government. With *La politique des grands nombres (The politics of large numbers : a history of statistical reasoning* 1993) and *L'argument statistique I et II* (2008), he became one of the major figures in the sociology of quantification. Very interested in the political dimension of statistical arguments, he made it his goal to open up the black boxes of the "equivalence method" applied to the production of numbers. The text quoted here expresses in particular his attachment to – even his nostalgia for – for the public nature of statistics, something that he saw as necessary though not sufficient to a political discussion of quantification

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procedures inherited from private sector management (Gaulejac 2005). Desrosières stressed the diversity of the relations between political power and management by quantities, as well as the overlaps and hybridisations between these different relations, but he also emphasised the exponential growth in government by numbers. Government both made necessary by the change in the scale of human intervention on the planet, and also made possible by the contemporary revolution in digital tools and by the mass of data they produce, a mass now immediately available for computer processing.

The flood of numbers and data has brought about an upheaval in the academic field of Humanities and Social Sciences. It would be impossible to cite here the different reactions to this new statistical order, even sticking to a single disciplinary tradition. More generally, however, there is no doubt that the scientific debate today focuses on the idea that with the emergence of Big Data[3] and ever-growing capacity to process those data, a new world of science is opening up, which will now be more accurate, more precise, in short more "true", in the attempt to understand the world.
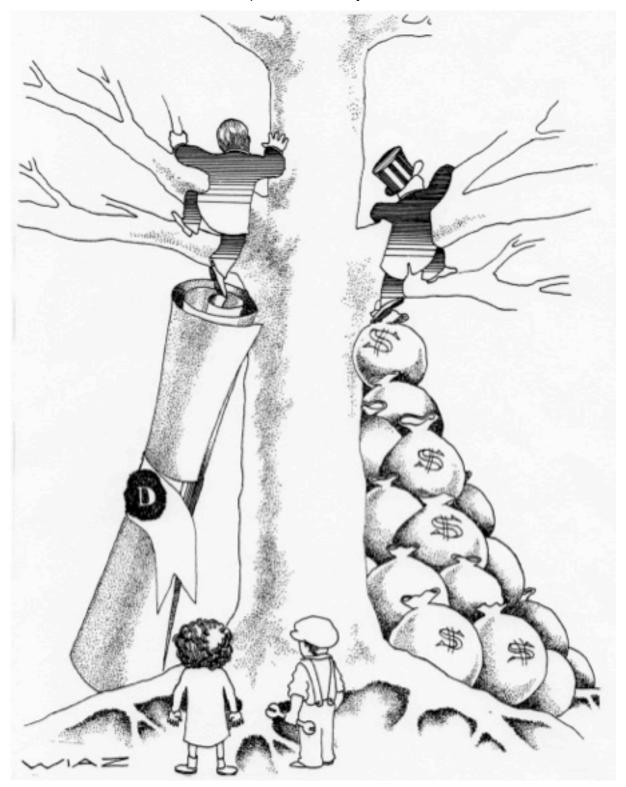
However, this postulate is not self-evident, and is strongly contested by numerous voices within the Humanities and Social Sciences. One example is the Canadian geographer Richard Shearmur, who in 2015 argued the superiority of the population census over *Big Data* as a tool for understanding the social world: "*A brave new world is upon us: more data and more computing capacity are going to reveal all and solve our problems, hubris reminiscent of the post-war cyberneticists (…), data-driven regional scientists of the 1960s and some GIS analysts of the 1990s.*" (Shearmur, 2015 : 965). Here again, it would seem that the history of quantification is repeating itself: Desrosières had similarly widely publicised the methodological choices that in the 1970s led to the French society being represented in terms of groups structured along the main axes of a breakdown into primary components, an approach perceived at the time as revolutionary.

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[3] As the IBM website itself explains very clearly: « Everyday, we generate 2.5 trillion octets of data. So much so that 90% of all data in the world were produced in the past two years only. This data comes from everywhere: from sensors used to collect climate information, from messages posted on social media sites, from digital photography and videos uploaded on the web, from transactional online purchases and from the GPS signals of mobile phones, to name just a few. This data is called Big Data. » (https://www-01.ibm.com/software/fr/data/bigdata/ : accédé le 2 juillet 2016)

Figure 1 : The two dimensions of social space, as seen by Wiaz in 1974

Source : « le prix d'un français », Le Nouvel Observateur, 16 septembre 1974, p.65

This representation of a statistical analysis of correspondences was published in 1975 by the *Nouvel Observateur* magazine using public statistical data. It was an analysis of which Desrosières noted that it was considered at the time as purely descriptive, with no underlying theory, and also that – because it was "multidimensional" – it seemed in the wake of the events of 1968 to be a guarantee of pluralism, opening the door to a more open and freeer representation of society than the simple logic of "class against class" (Desrosières 2008b).

It is analyses and graphic representations of this kind that Pierre Bourdieu used in his major works, such as, *La Distinction* (Bourdieu 1979) to prove the validity of his theories about the social sphere and of *habitus* as a driver of practices... Still according to Desrosières, by manipulating multivariate statistics drawn from INSEE surveys or data, Bourdieu thought that he could avoid being accused of tendentious pre-categorisation... In a way, and despite his long critical analyses of the use of quantities in Social Sciences, he believed or implied that, if properly used, numbers speak for themselves... This is obviously an idea that we are seeing again today, almost unchanged, in many debates on data extracted through the *data mining* or *profiling* methods specific to Big Data. To quote Shearmur again, it is undoubtedly the positivist dream that today underlies all *Big Data's* claims of superiority to more traditional forms of data production: "*The Big Data vision takes us right back to Laplace's positivistic demon, the imaginary—but now, we are told, realisable—entity which, armed with perfect information, will be able to predict the future, taking all humanness, imperfection and doubt out of our lives.*" (Shearmur, 2015 : 965).
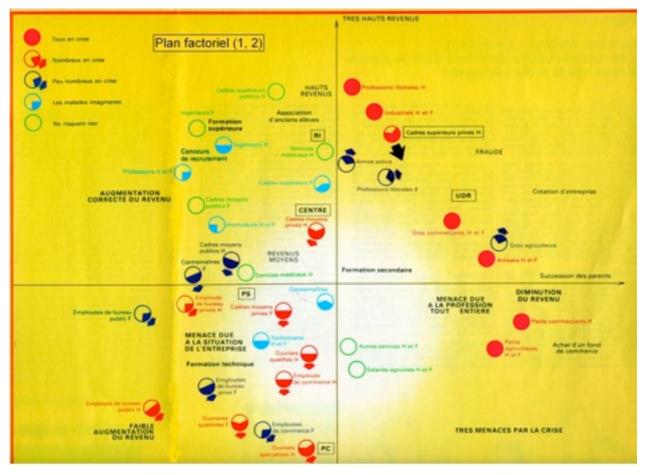
Digital technology key to questions of liberty and equality

Back in the 1970s, Desrosières observed that the graphs illustrating the correspondences used to depict French society gave roughly the same result, whether in the *Nouvel Observateur,* amongst marketing professionals or with Pierre Bourdieu. There was a vertical axis which differentiated the groups essentially on the basis of income... which we could call the axis of equality or inequality. The second – horizontal – axis, based on multivariate statistical analysis, appeared more innovative at the time. It essentially reflected the diversity of working relations, with on one side a largely urban, salaried world, associated with public sector employment, and on the other a more rural world, populated by the liberal professions, the owners of small and large businesses, and farmers. On one side, therefore, those who do get on in the world had to rely on qualifications provided by

the state-managed microstructures of social reproduction (i.e. schools), and on the other those who believed that they could or must count on family economic capital in order to advance.

Figure 2 : Principal components analysis

Source : « le prix d'un français » in Le nouvel observateur du 22 septembre 1975. That is the situation expressed by this drawing by Wiaz published in the *Nouvel Observateur* in 1974…

If the vertical axis represents inequality, then – pushing the analysis only a little further than Desrosières – we will take the risk of positing that the other axis, the horizontal, represents the different possibilities of exercising a form of freedom of movement within society, and therefore of countering the inequality affects that it produces. Here, what is proposed – through numbers – are other readings of society's operating mechanisms, which do indeed connect liberty and equality. There is more: even in the 1970s, the tool that had made it possible to rediscover these two fundamental elements of the claims for justice was already itself caught between these two poles.

Information technology entered very early into the scientific – and then public – debate between the critique of inequalities and the critique of loss of liberty: once again, we can follow Desrosières, on the subject of the "Safari affair", which hit the media and political headlines in 1974 and culminated in France's Data Protection law and the creation of the National Information Technology and Freedom Commission (CNIL) in 1978. At the time, the media and civil society institutions were hot under the collar about the plan for the establishment of a single identifier for every individual, which would cut across the records of the different public administrations, thereby establishing a sort of "file of files". While it ultimately made possible the goal of achieving a better understanding of social mechanisms, it was nevertheless suspected of leading to an intolerable loss of fundamental liberties, since there was a perceived link between all forms of record-keeping and the totalitarian surveillance of individuals.

In fact, Desrosières noted that politicians and the media lashed out at the Ministry of the Interior and the police services, accusing them of laying the foundations for the elimination of basic freedoms… However, as an administrator at INSEE and the man responsible for the technical aspect of the affair, he was well placed to know that the main players here were in fact the Ministry of Finance and the Tax Authority, not the police services. For reasons of fiscal justice, the tax services were trying to prevent the rich from declaring income and assets in a fragmented way with different departments. In other words, certain risks were being taken with liberty for the sake of greater equality… More simply, as Desrosières put it: " *Phew! It was the cops who got it in the neck"* (Desrosières, in Oblomoff 2011)…

So here again, it is old news, which of course raises a problem: what is new about the wave of IT that comes with Big Data? Is it just another stutter in the debate, and if so how can it be explained? Ultimately, what distinguishes a critique of quantification from a critique of computerisation?

That is the question pursued, for example, by Antoinette Rouvroy, with regard to this digital revival of "government by numbers", which she calls, from the perspective of a Foucauldian analysis, "algorithmic governmentality" (Rouvroy, Berns 2013). We will sum up her argument as follows: it is not or it is no longer the individual, the political, legal or philosophical subject, who is the target of modern methods of quantification and notably of data mining. There is no overt and conscious attack on individual liberties. There is no oppressive state, no Orwellian big brother or little sisters

in this *Brave New world*[4]. No one, Rouvroy tells us, is occupied in spying on us personally... Rather, the need is to manage flows, trajectories and performances in a world experienced, perceived and conceived as increasingly fluid and fast moving, in which quantification and performance measurement have become central for the purpose of perpetually optimising systems. In light of this managerial necessity, it is not individuals who are interesting, but their profiles as users who can be constantly reconstructed through the data they produce or that machines (smart phones, etc.) produce by means of various forms of digital capture.

What has happened today to that old desire to compartmentalise files – now called databases – when we constantly leave traces, an incalculable volume of computer data, accessed without the slightest scruple by a myriad of institutions, public and private, domestic and foreign, and at a time when institutions like the data protection authority (CNIL) acknowledge themselves completely overtaken by events? But also when the interoperability of systems and the opening of the "rawest" possible data to the public are becoming values in their own right... on the grounds, for example, of shared and democratic use, or even the empowerment of civil society, which call for those data to be transparent and open.

By her use of the term *governmentality*, Antoinette Rouvroy also prompts us to think about the decentralisation of powers, powers intended not to discipline the masses but to act on their behaviour and on their level of awareness, through modifications to their environment. She tells us that these powers are now assigned to algorithms with varying capacities for "self-teaching" or "self-correcting", which decipher, discretise and correlate these flows and movements, in order subsequently to influence behaviours... of which we usually become aware when we are surfing the web and come across an advertisement for buggies after accessing a website on baby bottles. But these algorithms in fact govern entire sectors of life, like the stock market transactions analysed by Alexandre Laumonnier (Laumonnier 2013), the frequency of subway trains studied by

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4 The expression Little Sisters refers to the surveillance capacity held by the users of the multiple data operators that make up social networks like Google or Facebook. The term was popularised in particular by Jan Chipchase, a consultant specialising in consumer behaviour and new technologies: "*When it comes to surveillance most people think of big brother, but increasingly it's your (early adopting, tech savvy, sensor loaded) little sister.Which makes the whole notion of opting out of technology adoption one of whether to opt out of society.*" FuturePerfect blog, posting of 29 February 2008: http://janchipchase.com/2008/02/big-brother-little-sister/.

Julien Mattern (Mattern 2011), or the stock management on logistics platforms analysed by David Gaborieau (Gaborieau 2012).

Ultimately, we also come back to the old debate on numbers as a tool for the purification of the scientific research process itself. As an advocate of public statistics as a means of stimulating public debate, Desrosières must be turning in his grave. Never have figures been seen as so true, so pure, so devoid of false causalities. They no longer claim to operate otherwise than by correlations and are therefore quite content to do without the theoretical or philosophical aspects that scholars like Pierre Bourdieu cited to justify their use. This is one of the essential elements of the contemporary debate on number, when people like the computer scientist Alex Pentland, founder of MIT's Human Dynamics Lab, promote Big Data as a true Copernican revolution in its capacity to liberate the Human and Social Sciences from the quest for causalities. (Pentland 2014). A stuttering debate, all over again?

Spatial justice, between addiction to figures and critique of quantification

Broadly speaking, by connecting the issue of social justice with the spatial sphere, those calling for greater spatial justice necessarily go through a number of stages:

- revealing socio-spatial inequalities,
- establishing the specific effects of territorial barriers at different scales,
- defining the terms whereby these inequalities and barrier effects can be conceived as just or unjust,
- and defining more just forms of socio-spatial regulation.

At these different stages (and singularly during the first and last), all the calls for greater justice (both spatial and social) rely on quantifiable data that can be used to define and grasp inequalities and, where necessary, to propose corrections. This demands the most refined, reliable and recent indicators, and also the intellectual resources to interpret them. Claims for greater spatial justice are therefore placed "on the same scale" as the data economy and, in many cases, can no longer be legitimised without going through an algorithmic phase in which the indicators are developed, collected and processed by computers. In itself, this raises two major questions:

1/ Should we simply acknowledge this new digital world and join in? In that case, the chances are high that there will be a return to the old debates of the 1970s described above, whether conducted on the grounds of equality or of liberty.

Here again, there is much we can learn from the 1970s. Marion Tillous (Tillous 2009) has shown how the sociologist Jean-François Augoyard was prompted to analyse the day-to-day travel patterns of the inhabitants of the "Arlequin", a large housing estate in Grenoble built for the 1968 Olympic Games to a functionalist urban design inspired by Le Corbusier. An estate that she describes as having been particularly well designed and built, for example in avoiding the trap of monofunctionalism. However, the inhabitants did not seem to move around in the predicted way, despite the number and quality of the preliminary social surveys. On the basis of hundreds of interviews and prolonged immersion in the district, Augoyard reached the following conclusion: a journey cannot be reduced to an origin/destination pairing. In fact, a close analysis shows that, as they move around, the inhabitants devise a silent, poetic language, formed from the rhythmic repetition of stylistic devices such as the ellipse, redundancy... something that strongly recalls the artistic experiments of the situationists in the 1950s, in the practice of urban "*dérive*" (drifting). It is Augoyard's work here that De Certeau reused to define individual "*tactics*" that are irreducible to the "*strategies*" employed by decision-makers, confined as they are to a mapmaker's view that is inevitably top-down and therefore remote(de Certeau 1990). It therefore seemed possible, with Augoyard and De Certeau, to rely on the irreducible autonomy of individuals and their freedom to construct their own spatial narrative... This was the start of the geography of individuals and a different cartography, of emotions, of sensations. But here again, forty years on, how strange it is to see this free spatial narrative captured by the digital traces of our smartphones, by digital advertising screens that observe the direction of our gaze in order to propose the right advertisement in the right place and, increasingly, by an "Internet of things" which is extending the logic of industrial traceability into all spheres of life.

Is what was once opaque condemned to become transparent and, if so, for whom?

In that case, the quest for justice can be content to acknowledge and seek to use this information for the purposes of better description, and even to call for more sensors to that end. To take an example cited by Elisabeth Tovar in her contribution to this feature, the GPS data on smartphones provide an excellent database for the study of daytime urban segregations, and the possibility of significant refinements to our perception of segregation as measured by residential location, i.e. the place where people sleep. Further inspiration can come from the work of Amandine Chapuis (Chapuis 2012), for example, who follows the digital "tracks" of tourists in Amsterdam and explains the urban practices thus revealed by their social and cultural profile. Used in this way, digital data

can be a good tool for enhancing justice through quantification, which can highlight and demonstrate discrimination, just as quantifying a loss is a way to quantify compensation.

It is therefore tempting to see Big Data as a powerful tool for deciphering – and therefore overcoming – inequalities, and this proposal in fact follows the trend expressed more explicitly by certain authors, in particular feminists (Haraway 1991, Braidotti 2013), for whom the post-human cyborg represents the only way to overcome the most deep-seated inequalities, such as those between men and women. What is the view of those who – in advocating open data and open source – still believe in the subversion of domination by the shared use of digital data? What is to be said about policies that are increasingly judged on the basis of complex computation methods, to evaluate the effectiveness of actions – in particular social or medical measures – on pilot territories?[5] And finally, what remains of the attempts to introduce a "bottom-up" justice, largely reliant on the sharing of data, in the face of forms of control that are more about cybernetics than policing, more diffuse, more decentralised, conducted in a fictional real-time, but nevertheless resolutely "top-down", despite being pursued on grounds of reticularity, of linkage, of flow, of the transparency of a universe in which fluidity is perceived as an economic, political and moral value (Boltanski, Chiapello 1999 ; Bonneuil 2015)?

2/ Does the quest for spatial justice instead require us to go beyond this appropriation and to undertake a critical analysis of the production of figures and algorithms? Should we not rather seek to understand the logic of digital inflation? It is the question that arises each time we wonder whether everything is measurable and whether everything should be measured, every time we realise that the quantitative approach to the world always leaves something behind, something forgotten, something condemned to be no more than a statistical phantom, regardless of the constantly growing refinement of the indicators.

We could then wonder what algorithms are doing to our world, carry out the geography of these residues and lacunae that have not been transcribed into binary language. This is probably what was in Nancy Fraser's mind in referring to a principle of justice as "recognition" (Fraser, 2004) : recognising existence. In fact, the logic of figures seeks, by an infinite process of catch-up, to erase

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5 Like the *Randomised Control Trials* (RCT) popularised by Esther Duflo, which have proliferated in the last 10 years or so as a way of assessing public policies (Duflo 2005, Bernajii, Duflo 2009, and for a critical perspective on this RCT procedure : Labrousse 2010).

digital inequalities. To take the French example, it is precisely on this terrain of overcoming inequalities in access to the network that the authorities developed the expression "digital divide": the so-called Attali report of 2008 (Attali, 2008), in reality *Report of the Committee for the Release of French Growth*, nevertheless saw these inequalities of access more as a problem of economic inefficiencies than one of social justice... Of course, today this theme of the digital divide could be applied at different scales (between Norths and Souths, between types of territory within a single national framework, etc.) while each time questioning the motives for exposing it.

Thinking about figures in terms of spatial justice can also mean exploring this territorial aspect, and investigating the way spaces are redefined by digital technology, what Martin Dodge and Rob Kitchin call coded-spaces, space-code and code-space, in order to distinguish between the levels of dependency on digital technology in different places (Dodge et Kitchin 2005, Dodge, Kitchin et Zook 2009, Kichin et Dodge 2011). It can also mean looking to those who call for *locational intimacy*, in other words the right not to be geolocalizable (Desbois 2012), which prompts certain activists to go deliberately off-grid by giving up Internet access, or even to move to a "dead zone" with little or no network coverage...

Finally, what is meant by this obsession with flow, combined with the obsession with tracing and transparency, as if our societies were being shaken by an ever faster Brownian motion, requiring pipes to channel it... In the end, can we demand justice from pipes?

Five original texts exploring these links

Broadly, it is this set of questions that the day seminar on "*Liberty-Equality-IT: algorithmic governmentality and spatial justice",* held in November 2014, sought to explore. That day was also the beginning of a new way of doing things for the journal *justice spatiale/spatial justice*, linking seminars and themed issues of the journal. Two years later, the five texts presented in this number partly originated in that seminar, and partly in an open call for contributions on the subject.

In the first article, Elisabeth Tovar explores the effects of the Big Data revolution on the social sciences and more specifically on how the science of economics handles the question of socio-spatial justice. She contrasts the old, centralised, hierarchical and deductive world of data production (exemplified by the population census) with the new, decentralised and inductive world of Big Data, and assesses them from the perspective of two types of approach to justice: the consequentialist approach and the procedural approach, replaying the widely debated opposition

between the primacy of liberty or of equality. The author considers that Big Data alters and increases our capacity to measure reality through the digital traces of human activities, and therefore to assess what is just. She takes the view that it remains a statistical tool, and therefore a social construct, sweeping aside the critiques directed against its predictive dimension and potential excesses. For her, the challenge is primarily to regulate the production, distribution and use of data, which should be considered as a public good.

In this view, the Big Data "revolution" is only a marginal phenomenon which, in a way, does no more than sharply restate the eternal question of the connection between quantitative and qualitative methods in the social sciences.

After this epistemological perspective, two case studies explore the way in which digital tools contribute to the production and moulding of public policies, revealing – sometimes implicitly – the governmental rationalities at work in different contexts.

Leila Frouillou tackles, through the analysis of the Admission Post-Bac (APB) program, the use of an algorithm as a tool of government. Viewing this system of allocating school populations as a form of predictive management of student behaviour, she explores the way algorithms "contribute to performing the social world". Analysing the real practices of secondary school pupils in the uses of APB, she shows that this program is a powerful tool for the reproduction of socio-spatial inequalities. She also shows very clearly that the use of this algorithm relies on an ethical justification based on the promotion of free school choice, and sees justice as a matter of following the order of priorities, presupposing the existence of "individual, rational, strategic" candidates who have a clearly developed educational plan and are capable of producing a list of hierarchical choices that reflects that plan and their chances of success.

The same normative effects are encountered in Pierre Gautreau and Matthieu Noucher who explore the change in the methods of producing and distributing geographical information in Bolivia, Argentina, Brazil and France since the digital transition of the 1990s. They discuss the different objectives associated with the establishment of these Geographical Data Infrastructures (GDI), which they define as institutions: the question of data sharing and data access rights, spatial coverage, the versatility of the information. This enables them to show that, beyond the rhetoric that promotes these GDI in terms of the right to information, transparency and participation, what we are seeing above all is a takeover of these information systems by the state – as the orchestrator of interoperability – with data filtering, normalisation and formatting effects, as well

as a segmentation of access to information and a clamping down on their use as a decision-making tool in order to "reinforce the legitimacy of the state as the sovereign agent of territorial development". Local authorities and other civil society actors are not forced to communicate their data but do it "freely" in response to the ethical principle of sharing and the right of citizens to information, tending to confirm the thesis, developed in Foucauldian terms in the next article, of the transition from discipline to security, or even to algorithmic governmentality.

Indeed, Nuno Rodrigues discusses the links between forms of governmentality and technology, and the challenge this represents for the production of our societies. Drawing on the example of the development of plans for smart cities, he wonders – in an updating of the Foucauldian approach – whether digital technologies are behind the emergence of a new governmentality that is "algorithmic". He analyses the rationalities inherent in these projects to show the methods of subjection and "behaviour management" that they bring about and their capacity to produce spatial injustices. The relation between technology and society is at the heart of his thesis, since in his view digital techniques cannot be tackled exclusively through an instrumental or substantive approach, since this fails to take account of the active role of technology in fashioning the world.

This question is also central in the thesis developed by Eric Arrivé. He analyses the Bitcoin protocol, one of the best-known crypto-currencies, explaining its operation and principles, in particular the principle of collaborative transparency on which it relies and which, for its users, defines its justice value. He focuses in particular on the notion of "proof of work" which guarantees the authenticity of completed transactions. These proofs of work arise from a process of "mining" that is totally disconnected from the real content of the transactions. It is based on competition between the "miners" seeking to produce these proofs, and results in an exponential and indefinite growth in the total computing power required by the protocol, which has no form of regulation other than the system's own dynamics. Despite the nonphysical nature of the crypto-currency, the computing power on which its existence depends has real-world effects in terms of environmental impact and industrial datacentre infrastructures located near cheap energy sources. For him, the total absence of connection between the mining task and the content of transactions in the Bitcoin protocol is emblematic of the dialectic between concrete and abstract that characterises both the IT tool and commodity production as critiqued by Marx. He questions the very possibility of justice within this framework and calls for a critique of the driving forces and

concrete effects of the development of digital technologies, like that formulated by Marx in the industrial era.

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