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## TPM Special Issue on Contemporary Philosophy

### James Ladyman 'The Philosophy of Big Data'

The physicist Philip Anderson famously claimed that 'more is different'. He was talking about emergence in many-body systems in physical science. 'Big data' means of the order of  $10^{15}$  bytes of information. With data more is different for several reasons. First, automated systems collectively generate big data sets every day, and the results are impossible for human beings to survey. Secondly, pattern recognition software and machine learning algorithms can use big data to make predictions. For example, social media systems can predict sexuality, political affiliation and even when relationships are about to form or break up. Online browsing activity has been used to predict pregnancy. The way this is done is also impossible for a human being to survey, and it does not depend on any theories nor does it give us any explanations. Thirdly, big data systems are converging to form a single network on which almost every aspect of life will depend. Finally, we are moving into an age where every click we make on social media and the web is recorded and may be used for purposes as yet unknown.

While philosophers such as Nick Bostrom and Huw Price are investigating the implications of artificial intelligence, the latter remains science fiction. There is no immediate prospect of a machine with its own motives and desires intervening in our lives any time soon, and if one were to emerge we would have the ability to turn it off. On the other hand we will soon be so dependent on the big data infrastructure that turning it off will not be an option. Every aspect of life from the delivery of food to the production in factories is being connected. Soon a vast proportion of human communication and interaction will be mediated by a single data infrastructure. The Chinese government is already using a social index for every individual derived from data automatically gathered about their behaviour to determine, for example, who is eligible to apply for what jobs and what deposit each individual needs to make to hire a car.

The philosophical implications of big data are largely epistemological and political, though there are also questions in the philosophy of mind. The ownership of data is an obvious issue that is much discussed. More important is the way that decision-making in education, law enforcement, finance and other areas is being transformed. As things stand, if a child is told he or she cannot sit a certain examination, or a prisoner is denied parole, some individual or individuals can in principle be asked to explain that decision and held to account for their judgment. However, already big data is being gathered about children's performance and pattern recognition can then be used to predict their grades in subsequent tests. It will not be long before these systems are touted as being better able to determine who takes what subjects than teachers. Meanwhile, decisions about insurance, loans and financial trading are increasingly automated. The integration of the systems involved and the recording of every click on a website means that one could find oneself turned down for health insurance while no reason can be given even in principle for why other than that the system says so. Big data threatens to bring about the end of accountability and scrutiny of decision-making by large organisations and governments because automated systems will make their decisions for them. Meanwhile, big data is also set to transform

science as pattern recognition is used to make predictions about complex systems without scientists understanding how.

The effects of big data on our personal and social lives is hard to predict but we have already witnessed the rise of the filter bubble where automated systems preselect content they predict will make you click more so that you are less likely to be exposed to ideas, news and values, and less likely to interact with others, that are outside of your comfort zone. This has arguably already had a terrible effect on public political discourse and the quality of reporting and comment in the media. Furthermore, while so far big data is largely being used to predict our behaviour, there are many people working hard to use it to control it. For example, the aforementioned social index is computed from various parameters. The government controls how those parameters are weighted so by adjusting the weighting they may seek to influence how people behave. Increasingly, our pasts are stored electronically and so cannot be forgotten, and our personalities are manifest through electronically mediated social interactions. There are likely to be radical changes in our ideas of agency and selfhood as a result of the big data revolution that is already well underway. All this cries out for urgent attention from philosophers.