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Guest editorial

The place of numbers: histories, geographies, and theories of quantification

Almost thirty years ago David Harvey (1973, page 128) claimed an end to the quantitative revolution in human geography, arguing that it "has run its course, and diminishing marginal returns are setting in ...". So why the special issue, and especially in this journal whose contributors are not usually known either for their interest or for their expertise in things quantitative? Geography has been there, and done that.

But this is not déjà vu all over again. We argue that geographers should take numbers and statistics seriously not because they are "nature's own language', which was their justification in the quantitative revolution, but because they are a crucial component in the construction of social reality, and which ever since postquantitative revolution geographers, including Harvey, have sought to interrogate. Specifically, since the first comprehensive national censuses during the 18th and 19th centuries, and associated institutions for dealing with them (see Desrosières, 1998), the inscription of figures, and later their joining to probability calculations within a burgeoning set of both commercial and statist networks, produced worlds to be organised, controlled, manipulated, studied, and known. Numbers are woven into the very fabric of modernity. By disregarding them, we disregard large chunks of what we try to understand.

This does not mean we need to re-enrol in undergraduate statistics classes, and for those who have them, dust off their Gregory's (1963) (Stan, this is), Blalock's (1960), and Johnston's (1978). Although it might. Some of the best recent critical work on numbers and statistics by writers like Loraine Daston (1988), Alain Desrosières (1998), Ian Hacking (1990), Donald MacKenzie (1981), Ted Porter (1986; 1995), and Stephen Stigler (1986), is compelling because it takes seriously precisely those technical details. The circumstances of the derivation of the regression coefficient really do matter (Porter, 1986). Or the precise experimental designs carried out at the Rothamstead Experimental Station, Hertfordshire, on the basis of which Ronald Fisher made arguments about the analysis of variance, are critically important (Desrosières, 1998).

More generally, what this group of writers bring to the discussion, and it is a sensibility that we think geographers should share, is the recognition of the complicit power of numbers. Numbers create worlds embedded within wider social projects turning on authority and control. The consequences are profound. As Porter (1995, page 45) writes:

> "Grades in schools, scores and standardized examinations, and the bottom line on an accounting sheet, cannot work effectively unless their validity, or at least reasonableness, is accepted by the people whose accomplishments or worth they purport to measure. When it is, the measures succeed by giving direction to the very activities that are being measured. In this way, individuals are made governable. They display what Foucault calls governmentality. Numbers create and can be compared with norms, which are among the gentlest and most pervasive forms of power in modern democracies."

For this reason, statistics are much too important to be left only to the statisticians. How and why they are constructed, by whom and about whom, how they are used and

mobilised, and to what ends and for whose interests, are critical social scientific questions for critical social scientists. Geography's quantitative revolution may be over, but the project of understanding how the quantitative leaves its mark on particular places and spaces is only beginning. The six papers gathered in these theme issues are directed to this end.

It is an end that during the last decade preoccupied a number of geographers as they made an effort to reconceive the place of numbers, and found, for example, in collections in *The Professional Geographer* (1995) and *Environment and Planning A* (Philo, 1998), as well as in Rose (1993) and Pickles (1995). Shifting away from simple rejection of quantitative methods, which characterised the literature of the 1970s and 1980s, this more recent writing aspires to a 'respectful engagement'. That engagement takes several forms.

The first is a historical sensitivity, also characterising much of the work of the nongeographers cited above. This is understandable given the social constructionist position underlying much of this writing. To demonstrate that numbers partly construct reality, rather than only representing it, one must show how the context of their use makes a difference, that is, how context enters into the very pores of numbers and statistical techniques. This is the importance of a historical sensitivity, which is evident in the first three papers of this theme issue (the other three papers, including a commentary by Karen Falconer-Al Hindi, will be published in the following issue).

Stemming partly from earlier discussions about writing the history of statistics in geography (Barnes, 1998; Hepple, 1998), Trevor Barnes's paper offers a strong historical social constructionist position by tracing the development and influence of a key contribution within early quantitative geography, Brian Berry and William Garrison's "The functional bases of the central place hierarchy" first published in *Economic Geography* in 1958. Drawing conceptually upon both actor-network theory and the literature on scientific biography, and substantively on first-hand interviews, Barnes argues that to understand the emergence of geography's quantitative revolution it is necessary to connect the details of individual lives lived with the wider historical context that forms their backdrop. By tacking between the two, Barnes shows that Berry and Garrison's paper was not the distillation of the superordinate rationality of numbers and statistics, but the outcome of a series of local historical encounters and negotiations between two particular lives and their broader social, cultural, and political setting, a 1950s America defined by the Cold War, growing affluence, and a belief in the redemptive powers of technology and rational-managerialism. The broader point is that this 1958 paper that helped usher in a quantitative view of the geographical world derived from a complex series of social relations shot through with issues of power and control. It was not 'nature's own language' speaking in the various numbers and statistical equations found in the paper, but something much more human and ordinary.

Les Hepple's paper also focuses on the history of statistics, in this case, the work of George Udny Yule. Initially an assistant to Karl Pearson, both men worked at the end of the 19th century on the problem of correlation and regression, which Francis Galton had developed in the 1880s within the biometric context of eugenics. The culmination of that work in Yule's case was the development of a multiple regression analysis of pauperism in England. The issue for Hepple is whether the initial biometric context, in which Galton developed regression and correlation, subsequently entered into Yule's own analysis, thereby constraining and compromising it. Using biographical information, Yule's own writings, and technical arguments, Hepple suggests that Yule's development of multiple regression was not inflected by biometric assumptions. As a result, Yule should be seen as a critical figure in quantitative social

science because he provided a general and robust technique—multiple regression—that was able to travel from Pearson's lab at University College London where Yule first developed it, to the Cowles Commission that set the agenda for postwar US econometrics, to 1950s Seattle where people like Berry and Garrison used it. That said, and in line with the earlier argument around historical social constructionism, Hepple recognises that Yule was a child of his intellectual context, and that his method reflected that context. Hepple's paper is about defining which part of Yule's context is most relevant to understanding the development of multiple regression; it is not about the relevancy of context itself.

Historical context also figures large in David Demeritt's paper on forest conservation in Progressive-era United States. He argues that the justification for early scientific forest conservation was through statistical means, in particular, by persuasive diagrams, figures, and maps. In accordance with a social constructionist interpretation, Demeritt argues that such diagrams were not simple representations of what was 'out there', but actively created what was portrayed. The diagrams became the reality of US forests, taking on an almost ontological solidity, and becoming the basis of trust among different interests, and the justification for legislative and on-the-ground practical action. US forests became 'governable' through the very act of measuring, and making them appear in diagrammatic form. For Demeritt this is possible through a manoeuvre he calls enframing, which is to make visible, and thereby graspable, a given object, whether that be colonial Egypt, the economy, or US forests in the latter part of the 19th century. In doing so, one cultivates certainty around the results that are presented—they must be true—and provides the possibility of disciplinary power and regulation by new governmental institutions "that s[eek] to optimize the relationships between the state, society, and nature" (Demeritt this issue, page 445).

Governmental institutions attempting to exercise power are critical to Matt Hannah's paper, which raises the second form of engagement found in this theme issue, turning on how numbers are collected and the kinds of political assumptions deployed in the methods of collection and categorisation. There are no foolproof methods: as Porter (1995, page 41) writes: "official statistical categories occupy contested terrain". The recent debate about the proposed use of sampling methods for collecting information in the 2000 US census forms the central case study of Hannah's paper. As he makes clear, there is a vital politics associated with being counted, a politics that extends even into the seemingly technical details of sampling methods. A heightened awareness of these issues could lead to what he calls 'statistical citizenship', that is, active participation in, and debate about, statistical representation by those who are counted. This will show statistical categories for what they really are: constructed entities. But under statistical citizenship, those entities will not be passively applied by faceless bureaucrats, but are constructed by those whom they represent, permitting the enumerated to take over the management of their own information, and thus carry out a politics of 'statistical activism'. In this way, Hannah extends the scope of participatory engagement with representation opened up by Dianne Rocheleau's (1995) exercise in 'counter mapping', and Danny Dorling's (1998) work with 'human cartography'. The goal of such works is to encourage people being studied or surveyed to participate in and fundamentally shape what is represented, whether in the form of maps or numbers.

In effect, Hannah here raises the possibility of thinking through the progressive political possibilities of using numbers, yet a third form of engagement, and which is the focus of Eric Sheppard's paper. He argues that critical geographers ignore the quantitative at their peril. As he writes, "We live in an increasingly quantitative world; one in which the languages and practices of mathematical reasoning increasingly

penetrate everyday life. ... [As a result,] a critical and dissenting tradition that remains antiquantitative is self-emasculating" (Sheppard, next issue). That the progressive political possibilities of numerical representation and analysis are not usually recognised is because quantitative methods tend to be automatically dismissed by their dissenting critics as positivist. And positivism, as everyone knows, is evil and wrong. Following earlier arguments by Victoria Lawson (1995) challenging the divide between quantitative and qualitative methods, and implicitly the distinction between positivism and post-positivism, Sheppard cites work on fuzzy set theory and complexity theory to argue that mathematicisation is not always bound up with positivism. In making this claim, Sheppard fends off two counterpositions. On the one hand, he rejects the positivist idea that numbers and mathematical models are always innocent and apolitical. On the other hand, he rejects the dissenting position that numbers and mathematical models are always inherently reactionary and politically conservative. Sheppard wants to say a pox on both houses. Mathematics is neither that good nor that bad. It is more complex. As a form of language, mathematics can be used for a variety of purposes, just like words. And like words, what is required is perpetual vigilance in use, rather than reflex approbation or dismissal.

Vigilance about language characterises the last of the essays by Marcus Doel who is the most doubtful of the contributors about the use of quantitative methods. Drawing upon a diverse range of sources from Samuel Beckett to Jean-Paul Sartre to Jacques Derrida, Doel portrays quantification (represented especially by the number '1') as unavoidably haunted by a qualitative 'buzzing' and solicitation that renders the seemingly stable, pinpointed results of counting highly unstable and incomplete: "... what? ... the buzzing? ... yes ... all the time the buzzing ... so-called ..." (Samuel Beckett quoted in Doel, next issue). More generally, for Doel the problem in using numbers is that they essentialise, solidify, and arrest a ceaselessly churning, multiplicitous, and unruly world. They stop the 'buzz', and in so doing they brutalise the world. What was in flux, transition, and movement, is frozen and congealed. By deploying numbers researchers commit an unnatural act, undertake something cruel and fiendish. Rather, the world needs to remain perpetually fuzzy, as it does for the central character in Woody Allen's film, *Deconstructing Harry*, and which Doel uses as an allegory for his antiquantitative philosophical position. Interestingly, though, that notion of fuzziness invites comparison with Sheppard's earlier discussion of fuzzy set theory, and perhaps makes the wider point about the blurred boundary between the quantitative and qualitative (and recognised even in Doel's paper title, "1a. Qualified quantitative geography").

A final form of engagement, not explicitly discussed by any of the papers but implicit, is around audience and reception. Many of the papers collected here make use of, or presume a familiarity with, specific mathematical notation and lexicon (Hepple's paper is the most demanding, but Sheppard, Hannah, and Demerritt all include mathematical formulas and specialised vocabulary). This raises the issue of the general accessibility of such critical commentaries on the place of numbers given that the knowledge and teaching of quantitative methods within the discipline is on the decline. This is problematic because one of the guiding projects of critical science studies, and on which many of our contributors rely, is to break down the barrier between 'the social' and 'science' (Barnes et al, 1996). The assumption is that this obstacle should be removed so that those previously outside science can begin to understand and share responsibility for what goes on inside. In this sense, the project of reassessing quantitative methods intersects directly with the politics of geographical pedagogy.

There is a well-known joke that there are three kinds of geographers: those who can count, and those who cannot. What we are imagining here is a geography from the perspective of that missing third kind of geographer: someone who cuts across the divide between the quantitative and nonquantitative. It is not either/or—the law of the excluded middle—but both/and. The primary purpose of this special issue is to argue that, while numbers always count, it is not always by counting numbers.

Trevor J Barnes, Mathew Hannah

References

Barnes B, Bloor D, Henry J, 1996 *Scientific Knowledge: A Sociological Analysis* (University of Chicago Press, Chicago, IL)

Barnes T, 1998, "A history of regression: actors, networks, machines, and numbers" *Environment and Planning A* **30** 203 – 223

Berry B J L, Garrison W L, 1958, "The functional bases of the central place hierarchy" *Economic Geography* **34** 145 – 154

Blalock H M, 1960 *Social Statistics* (McGraw-Hill, New York)

Daston L J, 1988 *Classical Probability and the Enlightenment* (Princeton University Press, Princeton, NJ)

Desrosières A, 1998 *The Politics of Large Numbers: A History of Statistical Reasoning* originally published in French in 1993; translated by C Nash (Harvard University Press, Cambridge, MA)

Dorling D, 1998, "Human cartography: when it is good to map" *Environment and Planning A* **30** 277 – 288

Gregory S, 1963 *Statistical Methods and the Geographer* (Longman, Harlow, Essex)

Hacking I, 1990 *The Taming of Chance* (Cambridge University Press, Cambridge)

Harvey D, 1973 *Social Justice and the City* (Edward Arnold, London)

Hepple L, 1998, "Context, social construction, and statistics: regression, social science, and human geography" *Environment and Planning A* **30** 225 – 234

Johnston R J, 1978 *Multivariate Statistical Analysis and Geography: A Primer on the General Linear Model* (Longman, New York)

Lawson V, 1995, "The politics of difference: examining the quantitative/qualitative dualism in post-structuralist feminist research" *The Professional Geographer* **47** 449 – 457

MacKenzie D A, 1981 *Statistics in Britain 1865 – 1930: The Social Construction of Scientific Knowledge* (Edinburgh University Press, Edinburgh)

Philo C (Ed.), 1998, "Reconsidering quantitative geography" *Environment and Planning A* theme issue **30** 191 – 201

Pickles J (Ed.), 1995 *Ground Truth: The Social Implications of Geographic Information Systems* (Guilford, New York)

Porter T M, 1986 *The Rise of Statistical Thinking* (Princeton University Press, Princeton, NJ)

Porter T M, 1995 *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton University Press, Princeton NJ)

Rocheleau D, 1995, "Maps, numbers, text, and context: mixing methods in feminist political ecology" *The Professional Geographer* **47** 458 – 466

Rose G, 1993 *Feminism and Geography: The Limits of Geographical Knowledge* (University of Minnesota Press, Minneapolis, MN)

Stigler S M, 1986 *The History of Statistics: The Measurement of Uncertainty before 1900* (Belknap, Cambridge, MA)

The Professional Geographer 1995, "Focus: Should women count? The role of quantitative methodology in feminist geographic research" **47** 426 – 466