Geography’s changing lexicon: measuring disciplinary change in Anglophone human geography through journal content analysis

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A Jackson, R Harris, L W Hepple, A G Hoare, R J Johnston, K Jones and P Plummer
School of Geographical Sciences, University of Bristol, Bristol BS8 1SS, UK

Abstract

Much writing on changing trends in geographical practices is based on subjective interpretations of the discipline’s scholarly output. This paper introduces a data source which provides quantitative information on the discipline’s lexicon through full-text searching of the contents of five of the discipline’s major Anglophone journals. Analysis of the large data set identifies two main trends in geography’s language and practices during the period 1950-1998: one group of terms associated with quantitative work became prominent in the 1970s but declined in relative importance thereafter – though by no means disappearing from the lexicon; the other, comprising a range of terms generally associated with cultural and social geography, increased in prominence from the 1980s on.

Many discussions about changing practices over recent decades have made claims regarding the relative strength of various approaches within Anglophone human geography, suggesting, for example, that different styles of working have dominated at different times. Few (apart from Wheeler, 2002a, 2002b) have attempted to quantify the extent of such claimed domination but instead have relied on assertion based on subjective judgements. Some of those assertions have been rather extreme, claiming, for example, that quantitative work is no longer undertaken within human geography (Hamnett, 2003: for a response, see Johnston et al, 2003).

How has the relative importance of different practices within human geography varied over recent decades? If quantitative answers to that question can be obtained, they would provide disciplinary historians with valuable comparative material to inform assessments of trends within the discipline and complement textbooks which offer students overviews of their authors’ conceptions of the structure of the contemporary
discipline (one which see Johnston, forthcoming). In this brief paper we introduce a source from which some such evidence can be derived, and use the data obtained to identify trends in geography’s lexicon during the second half of the twentieth century. Such material can only be complementary to other analyses, based on such material as memberships of learned society specialist groups: it provides additional insights into the relative importance of different geographical practices.

### Lexical analysis through keyword counts

This paper introduces and illustrates the potential use of a widely-available data source – searchable, electronically-accessible journals – to address the general question set out in the previous paragraph. Our data are derived from keyword counts undertaken on five internationally-recognised, Anglophone geography journals – Annals of the Association of American Geographers (AAAG), Economic Geography (EG), Geographical Journal (GJ), Geographical Review (GR), and Transactions of the Institute of British Geographers (TIBG). These were included in the JSTOR project which provides searchable electronic versions of back-sets of journals for scholarly use. (For full details of the project, see Schonfeld, 2003.) Together, they published on average 150 papers annually during the period studied here (1950-1998), although with slightly more in the middle years than either the beginning or the end (Figure 1). These five journals provide us with broad coverage of Anglophone human geography during that period, and is the focus of concern here. The possibility of analysing variations between countries and between journals within countries is left for further analyses: our concern here is to display the broad pattern within which local details might be later explored.

The JSTOR project covers the full history of those journals, so that we have information for the nineteenth century for the GJ and its predecessor (the Journal of the Royal Geographical Society), and for most of the twentieth century for AAAG (founded 1911), EG (founded 1925) and GR (founded 1916). We have limited the time span for this study to the period since 1950, however, and the end-date for our study is 1998: the JSTOR project does not include the most recent five years and our data acquisition was undertaken in summer 2003. Before 1950 TIBG did not publish a substantial number of refereed papers each year, and so any analysis of the first half of the twentieth century would be dominated by US periodicals.

It cannot be claimed that these journals are entirely representative of Anglo-American geography as a whole, particularly from the 1980s on when a large number of specialist journals was launched. Until the 1970s, however, they predominated over geographical publishing in the English language: only one other journal – Geography (not included in the JSTOR project) – was widely used for the publication of geographical research then and such was the pressure on the small number of journals that a privately-produced journal – Geographical Studies – was launched by a number of British geographers in 1954 (see Steel, 1983, Johnston, 2003a: it only lasted for 6

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1 Lexicon is defined in the OED as ‘The vocabulary proper to some department of knowledge or sphere of activity’.
2 Geografiska Annaler is also included in the JSTOR project but we excluded it for a variety of reasons; it split into two journals (Series A, Physical Geography; Series B, Human Geography), in 1945, for example.
years, with 9 issues appearing). By its title, *EG* appears to be more specialised than the other journals, but for much of the period it has carried a relatively wide range of material typical of geography then. There are undoubtedly differences between journals in the frequency with which terms are used and particular geographical practices reported (a topic that we have left for further research), but these five offer a valuable overview for the period. A wider spectrum would be desirable for the last decades of the twentieth century, but no others are included in the JSTOR project at present and full-text searching of other journals is currently not feasible.

Three of the five journals were in the top seven for impact factor in the ISI’s citation analyses for 2003 (*TIBG* was ranked second, *AAAG* fifth and *EG* seventh), and two (*AAAG* and *TIBG*) were in the top six for total number of citations (*GJ* and *GR* are ranked much higher on this criterion than the first). Additionally four – the exception was *GR* – were in the 20 journals most cited by UK geographers in their returns to the 2001 RAE (Johnston, 2003b). Given this overall standing, it can be assumed that the contents of these journals reflect the range of work conducted by geographers, both historically and currently. (It has to be noted, of course, that some journals’ editors have been resistant to certain types of papers, especially those representing new departures, as with early work using quantitative analysis: see Berry, 1993. Foundation of the IBG and its journal was in part a reaction to perceived restrictions on publishing human geography research papers in *GJ* in the 1920s-1930s.)

Four of the five are ‘general’ geography journals, attracting contributions from both physical and human geographers (the exception is *EG*). For much of the period studied here (1950-1998), however, most of the journals’ editors indicated that they were having trouble getting high-quality submissions from physical geographers (see Lee, 1998; Martin, 1998; Agnew and Spencer 1999), so that the analyses here are dominated by the lexicon of late twentieth century human geography. Nevertheless, it may be the case that, given the plethora of (mainly specialist) journals launched within human geography over the last two decades, certain types of work are less likely than others to be published in the general journals available for the current study. Only further research exploring a wider range of sources can test that assertion: at present, we are constrained by data availability which requires us to assume that the five journals analysed are broadly representative of the range of practices deployed within human geography over the last 50 years.

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3 There was some publication in English-language journals produced in continental Europe (notably *Geografiska Annaler* and *Tijdschrift voor Economische en Sociale Geografie*) but these carried a small minority of papers only. Similarly, some geographers published in journals associated with other disciplines, though again not to any great extent, and in regional journals such as the *Scottish Geographical Magazine* and the *East Midlands Geographer*.

4 The word ‘marxist’ appeared as many times in *EG* in 1983 as in *AAAG*, for example, and more often than in *TIBG*: over the full period it appeared there on 57 occasions compared to 124 in *AAAG* and 99 in *TIBG*: the numbers for *GJ* and *GR* were 20 and 21 respectively. Similarly the term ‘post-colonial’ appeared on 11 separate occasions in *EG*, compared to 10 in each of *GJ* and *GR* and 26 and 23 in *TIBG* and *AAAG* respectively. In the same decade, ‘post-modernism’ was not mentioned once in *GJ*, but ten times in *EG*, whereas ‘deconstruction’ appeared on 5 occasions in *EG* and only once in *GJ* and 4 times in *GR*.

5 It is almost certainly the case, for example, that much work in Geographical Information Science is published in specialised journals. Unfortunately, *Progress in Human Geography* cannot be searched for keywords over its full 30 years of publication, as its series of annual progress reports is designed to ensure broad coverage of the evolving discipline.
Using a specially-written software routine, we were able to identify all of the papers in each volume of those journals whose full text included either a defined keyword or two or more keywords in combination. (We excluded book reviews and all other items that appear in some of these journals – such as obituaries and society news: the lists of references in papers were also excluded.) Expressing the number of papers in each volume in which the keyword appeared as a percentage of the total number of papers published then gives a clear quantitative expression of the relative importance of the type of work represented by that keyword at the time. Using a number of keywords reflecting various geographical paradigms (the types of work conducted by communities of scholars: ‘accepted examples of scientific practice … [that] provide models from which spring particular coherent traditions of scientific research’ – Kuhn, 1962, it should then be possible to identify major trends – if there are any – in the language of geography over a given period, and from that draw strong inferences regarding the types of geographical practices at different times.

A total of 127 keywords was chosen – mainly from those included in the fourth edition of the Dictionary of Human Geography (Johnston et al, 2000) – in an attempt to ensure wide coverage of all types of work represented in the discipline’s literature over that period. Many occurred only rarely, and the analyses here focus on those which appeared most frequently. In addition, we also looked at the number of times 28 different subdisciplinary names – such as urban geography, climatology, GIS and quantitative geography – were mentioned in the text of individual papers, as a measure of author identification with separate areas of the discipline.

**Changing sub-discipline patterns**

As a first exploration of changes during the period, we looked at the percentage of papers annually in which the 28 different subdiscipline ‘titles’ appeared. Of those, only six appeared in at least ten per cent of the papers published in any one year – ‘cartography’, ‘cultural geography’, ‘economic geography’, ‘historical geography’, ‘political geography’ and ‘urban geography’.

Plotting the percentage of papers in which each of those ‘top six’ subdisciplines was mentioned annually identifies two main groups. The first includes two human geography subdisciplines generally associated with the introduction of quantitative methodologies in the 1950s-1960s – ‘economic geography’ and ‘urban geography’ – together with ‘cartography’ (Figure 2a): all have received a relatively consistent percentage of mentions, certainly since the 1960s. (This does not imply, of course, that the approaches used within those subdisciplines has remained constant over the period.) Among the three, ‘economic geography’ stands out, averaging a mention in 19 per cent of all papers (with a maximum of 35 at the end of the period); 8

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6 We are very grateful to Duncan Baldwin of the School of Geographical Sciences at the University of Bristol for his very considerable assistance with this.

7 They were: agricultural geography; applied geography; behavioural geography; biogeography; cartography; climatology; cultural geography; economic geography; electoral geography; feminist geography; geography of gender; geomorphology; GIS; glaciology; historical geography; humanistic geography; hydrology; industrial geography; political geography; population geography; quantitative geography; regional geography; rural geography; social geography; soils geography; theoretical geography; urban geography; women and geography.

8 The high frequency of appearance of ‘economic geography’ is in part unsurprising, give the title of *EG*, which published 16 per cent of all of the papers in the five journals over the study period.
‘cartography’ and ‘urban geography’ are used in under 10 per cent of papers in most years.

The second group – ‘cultural geography’, ‘historical geography’ and ‘political geography’ – involves subdisciplines for which the number of mentions increased substantially, from averages of 5 per cent or less at the start of the period to 10 or more at the end (Figure 2b). ‘Cultural geography’ and ‘political geography’ were used on fewer occasions than ‘historical geography’ for much of the period. Their appearance grew rapidly from c.1980 on, and ‘historical geography’ increased in usage in the 1990s – though this varied considerably within the decade.

In a search for general trends in the pattern of mentions for the subdisciplines, we factor analysed the percentage data, to identify groups of subdisciplines with similar trajectories in the frequency with which they were mentioned over the time period: the subdisciplines formed the variables and the years were the observations. Several small factors with eigenvalues exceeding 1.0 were extracted but two dominated, accounting for 29 and 13 per cent of the total variation across all 28 terms respectively before rotation; Varimax rotation was then undertaken to obtain the clarity provided by simple structure. The Varimax-rotated scores on the two dimensions, showing the average trends for each group of terms identified by the various factors, are in Figure 3. The first factor – which had high positive loadings (0.7<) for ‘cartography’, ‘cultural geography’, ‘feminist geography’, ‘geography and gender’, ‘GIS’, ‘political geography’, and ‘women and geography’ – indicates those disciplinary subdivisions which gained increased percentages of mentions over the period, especially since the late 1970s. The second factor – with high positive loadings for ‘geomorphology’ and ‘quantitative geography’ only (and smaller ones for ‘applied geography’, ‘hydrology’, ‘social geography’ and ‘theoretical geography’) – identifies segments of the discipline (including both ‘quantitative geography’ and ‘theoretical geography’) which were most frequently referred to in the 1960s-1980s. (‘Economic geography’ loads on a separate factor which shows no temporal trend, as suggested in Figure 2a.)

This first analysis has identified three clear patterns in the number of mentions of different sub-disciplines, therefore. The first involves those which were prominent within geography between the mid-1960s and mid-1980s, and declined in their relative importance over the last fifteen years: these are largely sub-disciplines strongly associated with quantitative practices. The second involves a range of

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9 Factor analysis seeks common patterns among groups of highly-related variables and has been used widely in human geography and other social sciences for more than forty years (the first paper usage is believed to be Berry, 1960: for general introductions see Johnston, 1978, and Robinson, 1998). Acting on a matrix of correlations, it identifies groups of variables which are highly correlated – they have loadings (the equivalent of correlations) on the same factor. The relative importance of each group of variables with similar patterns across the observations is indicated by its eigenvalue: standard practice involves focusing on those with eigenvalues exceeding 1.0. Varimax rotation is used to clarify the patterns, separating out groups of variables with similar relative values for each observation. In these analyses, the individual terms in the lexicon form the variables and years are the observations. The loadings for each factor identify groups of terms with similar trends over the fifty years, which are shown by the factor scores for those years – standardised average values for the highly-loaded terms for each year. Thus, these factor analyses identify groups of terms with similar trends in their frequency of occurrence over the 49 years.

10 Smaller positive loadings (0.5-0.7) were recorded for biogeography, historical geography, humanistic geography, industrial geography, rural geography, social geography and urban geography.
specialisms within the discipline which grew in relative importance throughout the period, but with a substantial increase after c.1980. Finally, one sub-discipline (‘economic geography’) maintained its relative performance throughout the period. The early 1980s thus appear to be a watershed in the relative importance of different areas within human geography.

Individual terms in the lexicon

Whereas identifying the trends in references to separate geographical subdisciplines gives some insights to changes within the discipline, examination of individual keywords offers considerably more. Out of the large number of words used in our searches, we concentrate here on those which appeared in at least 10 per cent of the papers in at least one of the years being studied. There were 51, although we omitted two – class and ecological – because each has at least two very different meanings.

A number of the terms retained in the list refer either directly or indirectly to quantitative-theoretical work. Some are technical, such as ‘correlation’ and ‘regression’, for which trends in the percentage of mentions are shown in Figure 4. Both show peaks in the percentage of papers in which they are mentioned in the 1970s-early 1980s, at over 30 per cent in the case of ‘correlation’ and nearly 25 per cent for ‘regression’. Neither had disappeared by the end of the period: each is mentioned in around 10 per cent of papers in the last year for which data were available (1998).

Other terms refer more directly to the theoretical side of geography’s ‘quantitative revolution’ and trends for four of them – ‘hypothesis’, ‘law’, ‘explanation’ and ‘prediction’ – are shown in Figure 5. (None is exclusive to ‘quantitative geography’, of course.) Both ‘hypothesis’ and ‘prediction’ display trends comparable to those for ‘correlation’ and ‘regression’, with their highest recorded percentages in the 1970s and 1980s: references to ‘law’ increase throughout the period (suggesting almost certainly that it has been used in somewhat different contexts at different times). Those for ‘explanation’ increased rapidly in the first half of the period (from c.20 per cent in 1950 to c.40 per cent 25 years later) suggesting growing use of the term during what is generally taken to be quantification’s heyday – and then remained fairly high for the rest of the period.

By way of contrast, Figure 6 shows the trends for four terms which were only rarely deployed in geography’s lexicon before the second half of the period studied here. From a baseline of virtually no usage prior to 1970, ‘ideology’ appeared in as many as one-quarter of all papers 25 years later, with ‘imperialism’ in about 15 per cent. ‘Marxism’ reached a peak of c.20 per cent of all papers containing the term in the early 1980s, but then subsequently declined somewhat. ‘Modernism’ only entered the lexicon in the early 1990s, but within a decade was a term being used in about one-tenth of all papers.

11 A technical constraint further limited the size of the matrix to be studied: for factor analyses the number of variables – in this case terms – cannot exceed the number of observations – years here.
12 The small number of mentions of ‘marxism’ in the 1950s was in papers on the geography of the USSR and Eastern Europe which used it as a descriptive term for the political system there.
These three graphs suggest two major trends in geography’s lexicon, as also indicated by the use of keywords in five of the discipline’s major journals. The first, associated with quantification, is characterised by higher levels of use in the middle of the period than in the end-years; the other displays more-or-less continuous growth in usage over the fifty years, though with many of the terms appearing very infrequently until the last two decades. To test the validity of these generalisations, the percentages for the 49 selected terms were subjected to a principal components factor analysis, again seeking groups of terms with similar trajectories in their frequency of use over time. The analysis produced five interpretable dimensions with eigenvalues exceeding 1.0: the first of these accounted for 59 per cent of variation in the correlation matrix, the second for 15 per cent, and the other three for only 5, 3 and 2 per cent respectively. There was one dominant trend, a second substantial one, and three others involving only a small number of keywords.

The five factors were subjected to a Varimax rotation. Table 1 lists the keywords with substantial loadings on each of the rotated factors. When graphed, the scores on those factors display the average secular trends in use of the keywords loading heavily on the various factors.

Figure 7 shows the trend lines for the scores on the first two factors. The first involves a large number of terms (Table 1) whose average use has increased very substantially over time, from a negative score of -1.0 in 1950 to positive scores above +1.5 in the 1990s: ‘imperialism’ and ‘ideology’ (Figure 6) both had loadings of 0.90< on this factor and are typical of this trend.13 (In addition three keywords – ‘boundary’, ‘expedition’, and ‘map’ – have negative loadings, indicating that their usage declined as that of those with positive loadings increased.)

The second factor shows the inverted-U form already associated with keywords strongly linked to the ‘quantitative revolution’, with a peak positive score in 1976. The nine with large positive loadings on this factor (listed in Table 1) are all clearly associated with the lexicon of quantitative work, as are several of those with smaller loadings: with a loading of 0.92 ‘regression’ (Figure 4) is typical of this group of keywords. Again, the four negative loadings are for words which fell out of common usage during the period associated with the ‘quantitative revolution’.

Those last four keywords – border, boundary, fieldwork and frontier – reappear as the only ones with loadings over 0.5 on the third factor: Figure 8 shows that they were most in use (i.e. had high positive loadings) in the 1960s, with a brief return to popularity in 1990. The final two factors are, to all intents and purposes, single-term dimensions. Factor 4 is strongly associated only with ‘place’ – and then relatively weakly: its usage declined in the 1970s and 1980s, but then increased very rapidly through the 1990s. Finally, ‘region’ – the only keyword with a large loading on the fifth factor – shows no clear trend in use, though it appeared more frequently in papers published in the 1990s than in the 1970s.

Conclusions

13 Factor scores have zero mean and unit variance, so a negative score does not indicate non-appearance of the term, but rather a number of mentions below the overall average for the variables loading heavily on that factor: positive scores indicate above average numbers of mentions.
Much has been written in recent years suggesting that different types of work have dominated geographical practices at different periods, but little has been done to evaluate those claims in any formal way. Assertion and anecdote have prevailed. One way of evaluating such claims is to analyse the disciplinary lexicon. Variations in the relative importance of different words reflect variations in the practices that they represent, so identifying trends in the usage of various keywords deployed by Anglophone human geographers provides important insights to their approaches to and methods of knowledge-creation.

In an attempt to develop a methodology for undertaking more formal evaluations of such assertions we have illustrated here how the vast store of data now held in electronic libraries can be used to chart changes in geographical practices. Using the powerful search engine associated with the JSTOR project, we have identified the number of times different keywords in geography’s lexicon have been deployed in five leading journals during the last five decades of the twentieth century. These data have been subject to statistical analysis in the search for general trends in the discipline’s language.

Two clear conclusions – associated with the two main factors extracted during those analyses – can be drawn from this initial, very much exploratory, study. The first is that different sets of terms entered geography’s lexicon at different stages during the period. The second is that one of those sets involves keywords associated with quantitative work, whose usage peaked in the 1970s and early 1980s, especially in subdisciplines such as urban geography. A new lexicon came into prominence thereafter, implying that new practices, deploying different languages, were introduced to the discipline through such increasingly popular subdisciplines as cultural and political geography. But – contra Hamnett (2003) – the language associated with quantitative work (and thus, we assume, quantitative work itself) has not disappeared from the five leading journals analysed. Such work may no longer appear in as large a percentage of papers published in the discipline’s leading journals as previously, but it has certainly not been abandoned and apparently continues to occupy a secure place within geography’s division of labour.

That conclusion – although very unlikely to be refuted by further analyses – is necessarily subject to caveats. The JSTOR project covers only five leading Anglophone geography journals, two of which – Geographical Journal and Geographical Review – were considered somewhat marginal to major shifts within the discipline during at least part of the period studied. The ability to incorporate further journals into such analyses, at least for the last 25 years or so, would enable the breadth of geographical publishing to be encapsulated, which reliance on JSTOR alone precludes. Further, all but one of the journals whose contents were investigated contain at least a small proportion of work in physical geography (although over the full period only the GJ carried relatively large numbers of physical geography papers). It may be, therefore, that some of the papers using quantitative terminology

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14 Urban geography remains a substantial subdiscipline, but with a change in emphasis in its practices and methods (see Berry and Wheeler, 2005).

15 At the beginning of the twenty-first century, and following the merger of the IBG with the RGS, GJ was given a specialised ‘mission’ among the merged society’s journals: TIBG and Area are general journals aiming to cover the discipline’s full breadth: GJ concentrates almost exclusively on society-nature interactions.
were in physical rather than human geography, especially in the later years of the study, thereby somewhat blunting one of our conclusions. This could be investigated further, though we have yet to devise a methodology for automating it. Finally, a very large number of the terms studied have more than one meaning – think of the various usages of ‘environment’, ‘place’, ‘region’ and ‘space’ – which will clearly have an impact, though this should not influence the general trends unless the nature and frequency of those usages varies over time. Furthermore, the use of factor analysis to identify trends in groups of terms smooths out many of the particularities of usage of any one term in a specific context by identifying the general underlying patterns across all terms.

Despite these caveats, the results presented here – particularly with regard to the first two factors identified in the analyses of keywords – are considered robust enough to enable us to identify at least two major features of geography’s lexicon over the last fifty years. Much more could be done by, for example, comparing trends in language use as displayed by UK and US journals, and indeed by comparing journals published within as well as between individual countries. This paper has served its major purpose, however, by introducing means of assessing disciplinary trends in a rigorous quantitative way, within – as always – the constraints of the available data.

Acknowledgements

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References


Johnston, R. J. forthcoming: Re-texting human geography’s agenda: textbooks and the politics of representing increasing diversity.


Table 1. Keywords that loaded highly on the five, Varimax-rotated, factors displayed in Figures 7-8.

**Factor 1**

<table>
<thead>
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<th>Loadings 0.7&lt;</th>
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<td></td>
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Loadings 0.5-0.7

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<th>map</th>
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Loadings 0.5-0.7

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**Factor 3**

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**Factor 4**

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**Factor 5**

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Terms shown in italics had negative loadings on the factor