



Sounds of the City: Project Summary 2011

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Introduction

All speech sounds are variable; somehow this fine-grained phonetic variation can result in sound change. But despite being able to trace the outcome in the historical written record, and being able to observe it in great detail at particular points in time, a fundamental aspect of language change remains mysterious: how do patterns of fine phonetic variation over time contribute to sound change? Advances in analytical method and technology have brought us much closer to understanding fine phonetic variation, but there still is a great deal that we do not know about how fine phonetic variation relates to sound change over time. There have been rather few studies able to chart changes in fine phonetic variation in a community over multiple time points. Some fundamental questions about sound change remain:

- Do sounds which are changing show more and/or different variation from those which appear to be stable over time?
- In sounds which are thought to be changing gradually over time, do the patterns of variation also shift in a gradient fashion within and across speakers from decade to decade?
- If sounds appear to have entered a variety rather abruptly at a particular time, does this actually entail discrete shifts in fine phonetic variation, or are gradient shifts also discernible at the finest level beforehand?
- Are particular prosodic/syntactic locations, e.g. utterance-final preboundary position, particularly conducive to sound change?
- To what extent do patterns of fine phonetic variation over time relate to the
 - o kind of sound involved (e.g. vowels, liquids, plosives)?
 - o words and phrases that sounds appear in?
 - o changing social characteristics of a community?
 - o individual speakers themselves?

Empirical evidence is needed in order to answer these questions.

Background

Observing sound change In the variationist paradigm (e.g. Labov 1994/2001/2010), variation is the instantiation of categories. Change in the variation reflects shifts in that category; or the category itself may be shifted through abrupt substitution of variants from another category. For practical and theoretical reasons, variationists have developed a special notion of time which links variation to change: 'apparent-time' studies allow the inference of change by comparing patterns of variation in generations of speakers recorded at the same time point (Labov e.g. 1994). The substantial cohort of apparent-time evidence largely underpins variationist theories of sound change. But understanding the mechanisms of change crucially needs 'real-time' study which tracks change by comparing variation at different time points, by returning at a later date either to the same individuals, or to the same community (e.g. Sankoff 2006). Recent real-time research on Canadian French offers support for the apparent-time construct, but shows that actual change over time may show more complex, and sometimes different, trajectories at the level of individual speakers for particular changes in progress (Sankoff and Blondeau 2007; Gregersen, Maegaard and Pharaoh 2009). Much more real-time evidence is needed from communities in order to understand how fine phonetic variation actually relates to processes of change (Gregersen 2009).

The lexicon and sound change Usage-based accounts of sound change assume that heard instances of words or phrases, 'exemplars', are stored and form a continual basis over which categories are abstracted: variation is continually updated in real time, so categories also shift (e.g. Bybee 2001). Change can be gradual, e.g. reflecting shifts in articulatory gestures leading to lenition, or change can be more abrupt if there is discontinuity across stored exemplars, e.g. through misperception or substitution as a result of dialect contact, or analogy. The assumption that lexical items are the

anchors for exemplar storage has led to strong predictions about the role that the usage of such items is likely to have on sound change (cf also Pierrehumbert 2006). But while this theory predicts patterns of fine phonetic variation in conjunction with lexical frequency over time, it is almost exclusively supported by historical evidence or phonetic data from a single point in time (Gordon et al 2004; though see Pharao 2010). And while the theory places language use at its centre, the predictions relate to a specific aspect of use, lexical items, which begs questions about the intersection of other key aspects of language use, such as those captured by social factors (Foulkes 2010). Recent research shows that social factors can outweigh frequency effects (Clark and Trousdale 2009), or no frequency effects are apparent at all (Labov 2006; Pharao 2010; Nielsen 2010). Real-time evidence is essential for testing and refining exemplar theory.

'Viewing' sound change Fine phonetic variation can be defined at different levels of granularity and abstraction (cf Kerswill and Wright 1990). The descriptive and theoretical validity of quantified auditory analysis (Gordon et al 2004) is clearly demonstrated in the consistent finding of statistical relationships between such units and linguistic and social factors. Acoustic phonetic analysis permits closer resolution and continuous measures. It is usual for vowel analysis (cf Langstrof 2006), but less so for consonants (Docherty and Foulkes 1999). However, to date there are no studies that track phonetic detail in vowels and consonants, when both are together characterized by continuous acoustic measures, in speakers of different generations for a community over multiple time points. We need to increase the resolution with which we view stability and change, and particularly to use continuous measures to evaluate usage-based theories, whose claims relate directly to the processing of continuous speech input.

Linguistic context The vernacular dialect of Glasgow over the past forty years presents an ideal resource for such evidence (Macaulay 1977; Macafee 1994; Stuart-Smith 2003). The comparison of recent sociolinguistic studies with earlier descriptions suggests that alongside apparent stability in many features (e.g. local vowel realizations), a number of changes are taking place, some apparently continuing gradual ongoing change in the vernacular (e.g. derhoticization of postvocalic /r/; Stuart-Smith 2007), others appearing to have entered the system more abruptly (e.g. vocalization of syllable-final /l/; Stuart-Smith et al 2006). Glaswegian has a distinctive local phonological system, so particularly interesting patterns of variation emerge as new variants become integrated. Glasgow's post-war urban regeneration led to social upheaval, which may also have created disturbances in linguistic patterning (Stuart-Smith et al 2007). The recent social history of the city together with its distinctive dialect lexicon make Glaswegian particularly suitable for investigating the interrelationships between fine phonetic variation and language use, lexical and social.

Hypotheses

This project takes advantage of recent technological advances in the storage, searching, and analysis of spoken language, and theoretical progress in statistics, to analyze acoustically aspects of a real-time spoken corpus of Glaswegian vernacular constructed from existing recordings made over the last forty years. Using this corpus we can tackle the more general questions about fine phonetic variation and sound change by testing a series of hypotheses relating to this context:

- apparently gradual changes will also be phonetically gradual at the level of continuous fine phonetic detail
- innovative consonant changes will show abrupt shifts in fine phonetic variation (and associated patterns of lexical frequency and social patterning)
- the Glaswegian vowel system will show stable patterns of continuous fine phonetic variation over time
- stable sounds will show different patterns of fine phonetic variation to changing sounds
- patterns of fine phonetic variation consistent with change over time will also occur at specific prosodic/syntactic locations
- different kinds of sounds (vowels, liquids, plosives) will show differing patterns of fine phonetic variation
- lexical frequency effects will be mediated by social and individual speaker factors, and the change itself
- the social-spatial reorganization of the city will be reflected in shifts in fine phonetic variation over time
- for any cohort of the sample, some individual speakers are likely to show more innovative patterns of variation than others

Objectives

Methodological:

- to develop a corpus of Glaswegian vernacular stratified for speaker age and decade/date of recording using a high-speed searchable database
- using advanced statistical methods to design a sampling strategy for speakers within and across the four decades
- to adapt a discourse analytical technique for the Glasgow corpus in order to facilitate comparability in data sampling across recordings in the corpus
- to develop appropriate acoustic measures for analyzing fine phonetic variation in coda /r/ and /l/
- to develop context-specific stochastic models and techniques for fitting and assessing goodness of fit

Descriptive:

- to provide and compare real- and apparent-time accounts of variation and change across speakers of different ages from four decades of an urban dialect using continuous acoustic phonetic measures for both vowels and consonants
- to investigate the role of the lexicon, in conjunction with other factors, linguistic and extralinguistic, in the patterning of fine phonetic variation

Theoretical

- to develop more informed modeling of the role of fine phonetic variation in sound change
- to gain an empirically-based appreciation of the notion of 'stable' sounds
- more generally to contribute to
 - o theories of sound change, and language change more generally
 - o the theoretical development of cognitive representations of speech over time

Method

Corpus – sample This project will build and analyze a real- and apparent-time spoken corpus of Glaswegian vernacular. Initial searches of existing archives (BBC Scotland, British Library, local oral history projects, School of Scottish Studies, and existing sociolinguistic surveys by Macaulay and Macafee) have unearthed over 200 hours of recordings to act as a resource for the corpus. The earliest substantial recordings date back to the early 1970s (a few very short recordings exist from the 1960s and 1950s). The structure of the corpus will allow an investigation of fine phonetic variation for sounds, stable and undergoing change, over four time points in real-time, and across three generations in apparent-time, which together will effectively cover a century of language use in Glasgow (see Table 1). For purposes of display, we show the speakers grouped according to age group and decade of birth; analysis of both of these factors could also be based on continuous variables.

Decade of Birth Speaker age	1900s	1910s	1920s	1930s	1940s	1950s	1960s	1970s	1980s	1990s
Older 70+	['70s] <10	['80s] >20	['90s] >20	['00s] <10						
Middle 40+				['70s] <10	['80s] <5	['90s] <10	['00s] >10			
Younger 10+							['70s] >40	['80s] <5	['90s] <20	['00s] >40

Table 1. Summary of extant recordings located to date, giving estimated numbers of speakers with decade of recording in square brackets above, grouped by age and decade of birth. The shaded columns indicate the period of urban regeneration experienced by Glasgow.

Glasgow's urban regeneration, and the accompanying population movement about the city, means that we might expect stratification in fine phonetic variation according to whether speakers acquired their speech before, during or after the main period of social-spatial instability. Assuming that speakers will show some stability in their linguistic system since acquisition (Sankoff 2006), we predict that the Older sample are likely to show a continuous range of fine phonetic variation indicative of the system of Glaswegian vernacular before the changes, and the Younger speakers something rather different after the changes (though also perhaps fairly consistent given that social networks in working-class communities reformed very quickly after the disruption); the later sample of Middle-aged speakers would be expected to show some discontinuity.

Corpus – construction The corpus will be constructed using the dedicated database and search engine software, ONZEMiner, which has been specifically designed for the storage and high-speed searching of time-aligned orthographic and spoken data, alongside speakers' metadata, lexical frequency data generated from the corpus (or its components), and any other linked annotation layers. ONZEMiner is particularly suitable for this work because it permits the storage of subsets of texts/speech with the possibility to conduct sophisticated searching across texts/speech at any level. This free software was developed by Robert Fromont and Jen Hay for the Origins of New Zealand English project (Fromont and Hay 2008; Gordon et al 2004). ONZEMiner works in conjunction with online English dictionaries to facilitate the automatic phonemic transcription of orthographic texts, which whilst not intended for Scottish English, nevertheless provides a good instant transcription of consonants and most vowels (the relationships between Scottish and English English vowels are fairly constant). It also has a direct interface with Praat, enabling direct acoustic observation of any portion of the corpus. In order to allow fast searching and extraction of search output for Glaswegian, we will upload and create a main corpus of time-aligned orthographically-transcribed recordings on ONZEMiner. One third of the recordings are already transcribed; constructing the corpus will entail orthographic transcription of the remaining recordings. ONZEMiner is flexible, allowing for the continual addition and updating of the overall corpus through the addition of new sub-corpora. The transcription will take place during the first nine months of the project, but transcribed data can be uploaded and accessible for preliminary analysis as the work progresses.

Linguistic variables We will investigate fine phonetic variation for a range of consonantal and vocalic features which have been established through previous sociolinguistic research to differ according to their social evaluation (above or below the level of community awareness), and their status with respect to change:

- apparently stable, but 'above': monophthongs /ɪ ʊ ə/ (cf Macaulay 1977)
- apparently stable, but 'below': aspiration of /p t k/ (Wells 1982); Scottish Vowel Length Rule (Scobbie et al 1999); and monophthongs /i e ɛ ʌ ɔ o/ (Johnston 1997)
- assumed gradual change, 'below': derhoticization of postvocalic /r/ (Stuart-Smith 2003)
- assumed abrupt change, 'below' (shifting to 'above'): innovative l-vocalization (Stuart-Smith et al 2006)

Acoustic analysis Analysis will be carried out using the most appropriate speech processing software, Praat, and/or if sound quality permits, EMU (Harrington 2010). Search output will be acoustically labelled and measures of duration and resonance will be taken; vowel measures will be normalized (cf Langstrof 2006). Whilst many aspects of acoustic analysis can be automated, including some labeling routines (and possibly more by 2011-12 than now, as there are continual advances) hand segmentation of the waveform is required for consonantal analysis. Our analysis of /r/ and /l/ will also require the development of suitable measures for this purpose. We have already carried out some preliminary work in this direction (Lawson et al 2010), and are in good contact with phoneticians currently working towards the same goals (Heselwood 2009).

Ethics The corpus must remain a private resource for bona fide scholars because while the recordings have permission for sociolinguistic analysis, most are not for open access. We have already ascertained that all the recordings identified may be used for the research, though formal permission will be sought at the outset of the project.

Methodological challenges While building an electronic diachronic corpus is not a trivial task (cf Beal et al 2007), undertaking real-time comparison of fine phonetic variation also presents a number of challenges. Fine phonetic variation is sensitive to many factors which relate not only to those which we intend to examine (e.g. linguistic and social factors, including age and time), but also to methods of data collection. The design of our study anticipates several methodological issues:

1. sampling and analysis: Selection of samples of speakers from the corpus, and then samples of speech for analysis of features (some much more frequent than others), requires sophisticated formal planning. At the same time, a balance must be found between suitable numbers of tokens to permit valid statistical analyses, and feasibility of analysts' time. Again, sophisticated and effective analysis of linguistic, social and other factors which are likely to influence the patterning of fine phonetic variation, requires advanced statistical techniques. This is an interdisciplinary project between sociophonetics and statistics, requiring the

implementation of statistical theory and method at several levels, with the likelihood that the problems presented by these data will lead to developments within statistics itself.

2. comparability: our recordings, whilst all from working-class speakers from the Glaswegian conurbation, are from different numbers of speakers, made for different purposes by different fieldworkers, ranging from individual sociolinguistic interviews to group discussions to oral history narratives; variation could reflect stylistic differences as well as differences relating to real and/or apparent time (cf Tillery and Bailey 2003). We will adapt the innovative analytical strategy offered by the LANCHART real-time project (Gregersen, Nielsen and Thogersen 2009), Discourse Context Analysis, by which recordings are analysed and annotated for discourse contexts at differing levels, allowing the identification of similar speech events, which then serve as frames for phonetic analysis within and across recordings.
3. recordings: we anticipate that some of the earlier recordings may present challenges in terms of recording quality, and hence for obtaining measures via acoustic analysis. We ran a small-scale pilot of formant frequency analysis from a sample of recordings made in 1972 and no problems were encountered. However, in the case of difficulties, we will seek advice from the experienced sound technicians at Glasgow University, and from the forensic phoneticians at Peter French Associates, who are used to working with very difficult data. As a methodological precaution, we anticipate only taking acoustic measures of resonance and duration (the feasibility of noise-based measures will be piloted during the project). We also note that different recording equipment and techniques may have an effect on acoustic measures derived from them (Hansen and Pharao 2006; cf De Decker and Nycz 2010). If it appears to be necessary, we will also investigate acoustic and statistical methods for normalizing for recordings, as well as for speakers, in conjunction with experienced specialists amongst our Advisory Board (Foulkes, French, Harrington, Hay, Watt).

A real-time study can never provide the basis for comparisons for which 'all things are equal'. We must therefore proceed alert to the difficulties, and using advanced statistical methods including mixed effects modeling of phonetic variation to correct for a range of factors, linguistic, lexical, contextual and social: these include grouping factors, such as date of birth, age-group, gender, and random factors, such as speaker and word; there is likely to be a mixture of crossing and nested relationships between these. In the end we must always make our comparisons with caution. The fact remains that our understanding of sound change is mainly based on either comparisons drawn from the historical record which specifically does not allow fine-grained inspection of phonetic detail, or from synchronic data which do, but not over real time. If the field is to progress, the challenges must be faced and real time study must be carried out.

Dissemination

The project findings will be of immediate interest to the academic community, and they will be published in descriptive and theoretical articles submitted to peer-reviewed journals such as *Language Variation and Change*, *Diachronica*, *Language and Speech*, *Laboratory Phonology*, *Royal Statistical Society (Series A, and/or Series C)*, *Statistical Modelling*, *Journal of the American Statistical Association*. A by-product of the project will be a fully-searchable private electronic corpus of texts and speech suitable for the further investigation of additional features by other scholars. The project will have a dedicated website in order to: (a) facilitate the discovery of any further recordings held by the public or in other holdings; (b) advertise and disseminate the research to the academic community; (c) provide generally accessible summaries of the research and findings for the media and general public.

A current topic for primary school children in Scotland is recent local history, and appropriately presented information about language change would be ideal material for this. Our experience from previous projects is that issues to do with language change are of very great interest to the general public. We will work in conjunction with the University Press Office to raise awareness of the project and its findings. This project will also be particularly salient for the local community in Glasgow, and University outreach opportunities, such as close links with Glasgow Museums, the Glasgow Science Festival, and Continuing Professional Development courses for teachers will be used to disseminate findings and increase opportunities for dialogue within, and feedback from, the community.

Significance

This project will be the first to investigate the patterning of continuous fine phonetic variation for aspects of the sound system of a community represented by speakers of different ages over a period

of four decades. It will also be the first to provide a description of sound change (and stability) for an urban dialect of English over an effective time-frame of a century. As a real-time study, we are aware that the research will be challenging, but it will provide a form of evidence which is not currently available – a picture of fine phonetic variation for a community over time – which is essential for developing our understanding of the processes of sound change, and for language and cognition in general.

References

- Beal, J.C., Corrigan, K.P. and Moisl, H.L. (eds.) (2007) *Creating and Digitising Language Corpora, Vol. 2: Diachronic Databases*, Basingstoke: Palgrave Macmillan
- Bybee, J. (2001), *Phonology and Language Use*, Cambridge: CUP
- Bybee, J. (2010), *Language Usage and Cognition*, Cambridge: CUP
- Clark, L. and Trousdale, G. (2009), 'Exploring the role of token frequency in phonological change: evidence from TH-fronting in East-Central Scotland', *English Language and Linguistics*, 13, 33-55
- De Decker, P. and Nycz, J. (2010), 'For the record: which digital media are good enough for sociophonetics?', Poster presented at NWA 39, University of Texas-San Antonio, November 4-6, 2010
- Docherty, G. and Foulkes, P. (1999). 'Derby & Newcastle: instrumental phonetics and variationist studies', In P. Foulkes and G. Docherty (eds), *Urban Voices*, London: Arnold, 47-71
- Foulkes, P. and Docherty, G. (2006), 'The social life of phonetics and phonology', *Journal of Phonetics*, 34, 409-38
- Fromont, R. and Hay, J. (2008), 'ONZEMiner: The Development of a browser-based research tool', *Corpora*, 3: 173-193
- Gordon, E., Campbell, L., Hay, J., Maclagan, M., Sudbury, A., and Trudgill, P. (2004), *New Zealand English: Its origins and evolution*, Cambridge: CUP
- Gregersen, F. (2009), 'The data and design of the LANCHART study', *Acta Linguistica Hafniensia*, 41, 3-29
- Gregersen, F., Nielsen, S.B., and Thogersen, J. (2009), 'Stepping into the same river twice: on the discoursecontext analysis in the LANCHART project', *Acta Linguistica Hafniensia*, 41, 30-63
- Gregersen, F., Maegaard, M. and Pharaoh, N. (2009), 'The long and short of (ae)-variation in Danish – a panel study of short (ae)-variants in Danish in real time', *Acta Linguistica Hafniensia*, 41, 64-82
- Hansen, G. and Pharaoh, N. (2006), 'Microphones and Measurements', In Ambrazaitis et al (eds) *Proceedings of FONETIK 2006, Department of Linguistics Working Papers 52*, University of Lund: Sweden, 49–52
- Harrington, J. (2010), *The Phonetic Analysis of Speech Corpora*, Oxford: Blackwell
- Johnston, P. (1997), 'Regional Variation', In C. Jones (ed.), *The Edinburgh History of Scots*, Edinburgh: EUP, 433-513
- Heselwood, B. (2009), Unpublished Report on R-Meeting, Dept of Linguistics and Phonetics, University of Leeds, 19 June 2009
- Labov, W. (1994/2001/2010), *Principles of Linguistic Change: Volumes 1, 2, 3*, Oxford: Blackwell
- Labov, W. (2006), 'A sociolinguistic perspective on sociophonetic research', *Journal of Phonetics*, 34, 500-15

- Langstrof, C. (2006), *Vowel change in New Zealand English*, Unpublished PhD Dissertation, University of Canterbury
- Lawson, E., Stuart-Smith, J., Scobbie, J., Yaeger-Dror, M. and Maclagan, M. (2010), 'Liquids', in M. Yaeger-Dror and M. de Paolo (eds), *Sociophonetics: A Student's Guide*, London: Routledge, 72-86
- Kerswill, P. and Wright, S. (1990), 'On the limits of auditory transcription: A sociophonetic perspective', *Language Variation and Change* 2: 255–275
- Macafee, C. (1994), *Traditional dialect in the modern world: A Glasgow case study*. Frankfurt: Peter Lang
- Macaulay, R. (1977), *Language, Social Class and Education: A Glasgow Study*. Edinburgh: EUP
- Nielsen J. (2010), *Lexical frequency effects in the spread of TH-fronting in Glaswegian*, Unpublished MSc Dissertation, University of Edinburgh
- Pharao, N. (2010), *Consonant Reduction in Copenhagen Danish: A study of linguistic and extra-linguistic factors in phonetic variation and change*, Unpublished PhD Dissertation, University of Copenhagen
- Pierrehumbert, J. (2006), 'The next toolkit', *Journal of Phonetics*, 34, 516-30
- Sankoff, G. (2006), 'Age: Apparent time and real time', *Elsevier Encyclopedia of Language and Linguistics*, 2nd edition, Article no: LALI:01479
- Sankoff, G. and Blondeau, H. (2007). "Language change across the lifespan: /r/ in Montreal French." *Language*, 83, 560-88
- Scobbie, J., Hewlett, N., and Turk, A. (1999), 'Standard English in Edinburgh and Glasgow: The Scottish Vowel Length Rule revealed', In P. Foulkes and G. Docherty (eds), *Urban Voices*, London: Arnold, 230-245
- Stuart-Smith, J. (2003), 'The phonology of Modern Urban Scots' In J. Corbett et al (eds), *The Edinburgh Companion to Scots*. Edinburgh: EUP, 110-37
- Stuart-Smith, J. (2007), 'A sociophonetic investigation of postvocalic /r/ in Glaswegian adolescents', *Proceedings XVIth International Congress of Phonetic Sciences*, Saarbrücken, 1307-10
- Stuart-Smith, J. and Timmins, C. (2007), "'Tell her to shut her moof": The role of the lexicon in TH-fronting in Glaswegian', in G. Caie et al (eds), *The Power of Words*. Rodopi
- Stuart-Smith, J., Timmins, C. and Tweedie, F. (2006), 'Conservation and innovation in a traditional dialect: L-vocalization in Glaswegian', *English World Wide*, 27:1, 71-87
- Stuart-Smith, J., Timmins, C. and Tweedie, F., (2007), 'Talkin' Jockney: Accent change in Glaswegian', *Journal of Sociolinguistics*, 11, 221-61
- Tillery, J. and Bailey, G. (2003), 'Approaches to real time in dialectology and sociolinguistics', *World Englishes*, 22, 351-65
- Wells, J. (1982), *Accents of English*, Cambridge: CUP