Phonetic Aspects of CBC Radio Newsreading 1937–1987

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Bachelor of Arts, Victoria, 1986

A THESIS SUBMITTED IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in the Department

of

Linguistics

We accept this thesis as conforming
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ABSTRACT

This paper is a phonetic investigation of radio newsreading on the Canadian Broadcasting Corporation (CBC) from 1937 to 1987. Recorded newscasts from the first, third, and fifth decades of CBC history are examined. Brief histories of CBC Radio news and of the Office of Broadcast Language are included, and the bibliography brings together much scattered reference material on CBC language. Traditional auditory evaluations of selected aspects of voice quality settings, vowel quality, and voice dynamics are supplemented by instrumental measurements.

The descriptive terminology of Laver (1980) is applied to identify the voice quality settings. The majority of newsreaders examined display the vocal settings of lowered larynx, open jaw, and the use of creaky phonation. This configuration enhances vocal resonance and is shown to be an established newsreading model, perceived as suitable to the authoritative presentation of information. The patterns of vocal settings identified for three test decades (1937–47, 1957–67, 1977–87) are supported by the results of acoustic analyses.

Individual, group, and across-group statistical tests were executed on the results of acoustical waveform analyses of the peripheral vowels /æ ɒ u/ produced by each newsreader. To test vowel quality as a sociolinguistic variable, the CBC formant data were compared with compatible /æ ɒ u/ data from informants of the Survey of Vancouver English (Gregg, 1984). The results show that the speech of

CBC Radio newsreaders cannot be associated with any particular SES class of the Vancouver Survey. As a result of the extensive variation in production found for both informant groups, the high back vowel phoneme /u/ remains ill-defined for Canadian English.

The voice dynamic component in CBC Radio newscasts has changed over the years. Measurements of speech rate show that the duration of pauses post-1966 are dramatically shorter than those pre-1966. Sentence length is shown not to have changed considerably, but phrases have been lengthened and pauses shortened. A marked reduction in the percentage of silent time within the newscast has been the result. It is suggested that pitch fluctuations are now used more extensively than pausing to structure the text orally. Despite the changes in continuity, the articulation rate of the newsreaders, measured in syllables per second, has remained constant. These results indicate that the newsreaders are exceptionally skilled speakers.

The prevalent voice settings and the averaged acoustic measurements for CBC vowels are presented as representative of a readily identifiable and publicly recognized standard of formal spoken Canadian English.

Examiners:

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ACKNOWLEDGEMENTS

I must first thank all the members of my family for their encouragement and their patience during the long years leading up to this writing. Especially I want to thank Mona and Meriah for their forbearance; and for her forebearance, my mother, Sarah Rosetta.

My supervisory committee has been most inspirational and helpful. For the introduction to theoretical facets of voice and for much timely advice, I thank my supervisor, Dr. John H. Esling. For her patient instruction and practical demonstrations of voice qualities, I would like to thank Professor Linda Hardy of the Theatre Department, UVic. To our departmental "Gradma," Dr. Barbara P. Harris, I extend my grateful thanks for her gentle insistence that I produce some written proof that I have in fact been studying linguistics all these years.

I wish to acknowledge the influence of my professors and my cronies in the Grad Room, and to thank them for their friendship and support. I would like particularly to acknowledge Laura Proctor for her generous assistance with things computorial, and Gaelan de Wolf for supplying me with background data from her monumental work on the Vancouver and Ottawa surveys. I am especially indebted and grateful to the erudite Ms. Andrea Giles, without whose copious help this manuscript would never have seen the light of day. And I extend my thanks to the current Chairman of the Department, Dr. Joseph F. Kess, for his memorable counsel, and also to our efficient Secretary, Mrs. Darlene Wallace, whose subtle humour makes time in the department seem to pass so quickly.

I would like to thank the people at the Centre for Speech Technology Research, located in the Linguistics Department, UVic: to Jocelyn Clayards, Allan Wynrib, Parm Ollek, and Jim Woolsey, for their ever-cheerful advice on the use of the MSL programs and equipment; and to Craig Dickson, Director, and Dr. Stephen Eady for enlightenment on points of acoustic phonetics and formant structure.

For his extensive help in designing and suggestions for deciphering the results of the SAS programs used in this study, I wish to thank Patrick Konkin, Statistical Consultant in Psychology, Cornett Building, UVic.

All the broadcasting people I met were extremely helpful and encouraging. It is a great pleasure to thank them all for their time, their interest in my project, and for so much paralinguistic information that I'll have to write a book to use it all. The most difficult task here is to express my appreciation to them all without the page turning into a jumble. If some I fail to mention, I ask them to forgive me.

For supplying me with materials and encouragement I want especially to thank the following people: Les Jackson, historian at CBC Vancouver, who was on the newsroom staff in Winnipeg when the NNS began in 1941; Dr. Kenneth Bambrick, School of Journalism, UWO; Maurice Jones, Editorial Resources, CBC Toronto; and of course, Ken Haslam, CBC Broadcast Language Counsellor.

At CBC Vancouver I owe a debt of gratitude to Elizabeth Wilson, Radio Variety; Stan Peters, Bruno Cimilai, and Robin Piercey of Radio News; Greg Barnes, Director of Radio Services; and to Telford Oliver, a "CBC Voice" I've finally put a face to after so many years. And at CBC Victoria, I'd like to thank Barry Bell, who is CBC Victoria. I also thank Tom Walters of CKVU 13, Vancouver, for a fascinating inside view of the TV newsroom in action. And in Toronto I was delighted to meet the grand old man of CBC's World Report, Rex Loring.

My thanks go to Dido Mendl of the CBC Program Archives, and to Ken Puley for his help with the card catalogues and for the use of his stopwatch. To Leone Earls of the CBC Reference Library, for her permission to rummage through all those wonderful reference files, and to her efficient staff, I send my thanks And I would also like to thank all the helpful people at the National Archives in Ottawa: Rosemary Bergeron and Kathleen Owens, for their interest and their prompt response to my request for recorded materials; Ernie Dick, Richard Lougheed, and Andrea Cross for their efforts in producing the "Beyond the Printed Word" Symposium, which provided me with the first opportunity to speak about my work; and especially I must thank Robert Albota, erstwhile student and now NFTSA staff, who provided me with many archival documents and leads, and whose subsequent M.A. Thesis on Dan McArthur I found most interesting.

My ability to engage in this project was greatly enhanced by the friends in Toronto and Ottawa who provided me with accommodation and entertainment during my research jaunts in their cities. And I must express my deeply-felt thanks to my chiropractor, Bruce Russel, who set me back on my feet after a car accident, and to the friends who kept me arrect during the writing process. And for supplying hints and opening doors along the way I thank (in no particular order): Robert Brodie; Morris Wolfe; John Twomey, Ryerson, Toronto; Ross Eamann, Carleton University; Brian Antonson, BCIT, Burnaby; Gordon Mesley; Steven Thorne; Kim Whale; and the people in the CBC departments of Records Management, Human Resources, and Network Promotions.

DEDICATION

To my children. For my daughter Alison Meriah – in the fond hope that she might read it some day. And for her big sister Cosmea Jain – with the hope that she might read the National someday.

Chapter I

INTRODUCTION

1.1 Introduction.

The purpose of this thesis is to identify some of the phonetic characteristics of the speech of radio newsreaders in the first fifty years of the Canadian Broadcasting Corporation (CBC). Selected aspects of vowel quality, voice quality settings, and voice dynamics are used to demonstrate changes over time. The description of "CBC English" is presented as a model of an implied standard for formal spoken Canadian English. A brief history of CBC Radio news is included. This study also contains the first history of the CBC Office of Broadcast Language.

Academic interest in Canadian broadcasting has grown greatly in recent years, particularly in the area of broadcast news. Studies have been done from a number of viewpoints, such as cultural, historical, political, technological, and editorial (see, for example, *Papers from the "Beyond the Printed Word" Symposium*, forthcoming). Interest in news language has generally focused on the language content of television news, and the relationship of visual image to word choice, sentence structure, and length of utterance. Comments on broadcaster *style* have been made in passing, but there have been no long-term studies from a linguistic perspective. This paper draws together sociolinguistic information pertinent to the CBC and Canadian English, yet it remains centrally a diachronic phonetic investigation of *radio newsreading* Documentaries and news commentaries are

not included, nor are announcers from affiliated stations. Brief reference only is made to program hosts and news reporters. The focus is the voice of the male CBC studio newsreader.

Newsreading is a specialized, formal function within CBC Radio. In the earliest decades, women tended to be excluded from newsreading because the CBC model called for "clear Canadian voices with a distinctly masculine quality" (*CBC Annual Report*, 1943, p. 7). Women now regularly read local and national newscasts but, because of the historically low ratio of men to women in the CBC News Service, few recorded samples are available for study.

Throughout this paper, *CBC Radio* refers to any of the CBC radio systems. The *Trans-Canada Network* began in 1936, and in 1944 the *Dominion Network* was added. In 1962, the two merged to become the *CBC Radio Network*. Newscasts are currently broadcast on CBC Stereo (FM) and CBC Radio (AM) simultaneously.

1.2 Voice and accent.

Radio is the medium of the spoken word. For both listeners and speakers, removal of all visual clues increases sensitivity to the phonetic features of voice. (The term *voice* here includes both the vibrations of the vocal cords, i.e., the narrow definition, and the supralaryngeal features.) *Voice dynamics* and *voice quality* are interwoven with the articulation of the phonetic *segments* -- vowels, consonants, and diphthongs. Voice dynamics refer to the fluctuations in pitch, tempo, rhythm, and loudness that signal variations in word and sentence meanings. Voice quality is the long-term auditory effect resulting from a speaker's habitual

way of holding the larynx and the muscles of the vocal tract. Short-term changes in the quality and dynamics of a voice can create paralinguistic *registers* of mood or emotion. Individually, each of the three *phonetic strands* of speech -- voice dynamics, voice quality, and segments -- can differ greatly from speaker to speaker. The voice carries inherent and acquired *indices* that can identify the speaker individually, and which also combine to identify the speaker as a member of a group. The basic dimensions and shape of a speaker's anatomy and vocal apparatus produce *idiosyncratic indices*. Extralinguistic information such as the age, size, and sex of the speaker are inferred from anatomically-based clues. The *affective indices* are the results of changes to the physical or mental state of a speaker (e.g., illness, grief, intoxication). The *regional index* within a language is heard as broad, systematic similarities in pronunciation among groups of speakers. The use of particular forms within the regional varieties is often, and certainly in English, recognized as an index of *status*. Taken together, the regional and social status indices comprise a technical definition of a speaker's *accent* (Abercrombie, 1967, p. 8).

1.3 General Canadian and the CBC.

Canadian English is recognized as the widest-spread regional dialect of World English (Priestley, 1951; Woods, 1979). Canadian English (CE) has been described as a

> hybrid which resembles American English in some respects and British English in others while exhibiting much that is singularly Canadian. It is, in fact, the composite of these characteristics which gives Canadian English its unique identity (Avis, 1973, p. 43).

The evaluation of a standard within Canadian English is still a matter of linguistic discussion (v. Lougheed, 1986), but the aspects of CE which resemble British English are generally regarded as the prestige forms (Warkentyne, 1986, p. 171). Previous research in status cues in speech (Harms, 1961, p. 168) has shown that listeners "find high status speakers to be the most credible and low status speakers to be the least credible." Several features mark the speech of CBC newsreaders as a prestige-status form of Canadian English. One of the more apparent is the use of the palatalized form (*y* sound) of words like *Tuesday*, *duty*, and *news* [u -> ju / {t d n}]; another is the invariable use of the velar [ŋ] variant of the *-ing* particle.

A survey of broadcast language studies throughout the world (Bell, 1983, p. 37) states that "informants have cited broadcast speech as a standard" and that "broadcast news style is evaluated as the most prestigious." In Britain, *BBC English* is synonymous with Received Pronunciation (RP), the prestige accent of administration and education. In the United States, there exists a *Network English* described as that spoken by "network newscasters and news commentators who have trained themselves to speak an English devoid of any regionalisms" (Hackenberg, 1972, p. 3). *Network English* has been ranked highest among six American social dialects (Tucker & Lambert, 1969). In Canada, the regional and urban variations of CE that have been studied (e.g., de Wolf, 1988; Gregg, 1984; Nylvek, 1984; Scargill & Warkentyne, 1972; Woods, 1979) are recognized to occur within the pattern of a *General Canadian* that has been described as

> the type of English used in the conduct of educational, cultural, governmental, and commercial affairs by leaders of the English-speaking community. It is moreover, the type of English used in national radio and television broadcasting and, for the most part, by local stations as well. Furthermore, it is the type of English

> aspired to by those who wish to take part in the country's affairs above the local level. And, perhaps, most significantly, it is the type that, with minor variations, marks the educated, non-regionalized Canadian (Avis, 1986, pp. 215-216).

Canadian language attitudes toward broadcast speech are similar to those found in other countries. Eighty-three percent of respondents polled in Ottawa consider the CBC news language to be the best (Questionnaire item #661 -- Woods, 1979). The statement, "The language of CBC announcers should be the standard for spoken English," met with disagreement from only one quarter of the informants in the Survey of Vancouver English (Questionnaire item #1050 -- Gregg, Murdoch, Hasebe-Ludt, & de Wolf, 1984). French-speaking Quebec represents a special case within the country, but even there the speech of *Radio-Canada*, the Francophone affiliate of CBC, has been identified as the prestige standard by its listeners (d'Anglejan & Tucker, 1973, p. 12).

Chapter II

REVIEW OF THE CBC LITERATURE

2.1 A thumbnail history of CBC Radio news.

The organization of the Canadian broadcasting industry is a blend of the British and American structures. In 1929, the first Royal Commission on Radio Broadcasting in Canada, now known as the Aird Commission, recommended the formation of a national monopoly similar to that of the British Broadcasting Corporation (BBC), in preference to a commercial complex like that of the United States. The revenues derived from commercial stations were later found necessary to support the national system, so a compromise was the result.

The Canadian Radio Broadcasting Corporation (CRBC) was set up in 1932, but was plagued with political and internal problems (v. Allard, 1979), and so it was terminated in 1936. When the CBC took over on April 1, 1936, it inherited the CRBC's five stations and most of the staff of 37 – including 18 announcers.

When the CBC began radio broadcasting on November 2, 1936, news bulletins were supplied free of charge by Canadian Press (CP), just as they had been to the CRBC. The reports read on the air were the same as those prepared for the newspapers, however, and CP maintained strict control of wording and content. In 1938, the CBC General Manager, Bill Gladstone Murray, suggested to CP that their

> sentence structure, impeccable for publication, is sometimes not appropriate for reading [aloud]. It is chiefly a matter of shortening the sentences, eliminating dependent clauses, and wherever possible using short Anglo-Saxon synonyms (PAC-MG 30, E333, 2).

CBC and CP worked together that year to produce an outline for rewriting print news for radio use. During 1939 and 1940, CBC paid a small fee for the news services and cooperated in preparing the bulletins, but CP still retained control over content. In 1940, the CBC National News Service (NNS) was organized and other news-gathering agencies were added. On January 1st, 1941, the CBC took over full responsibility for the selection and preparation of news items.

Dan MacArthur, the influential first Chief Editor, set the editorial style in 1940 and maintained it for thirteen years. His early efforts prevented the NNS from becoming merely a mouthpiece of successive governments (v. Albota, 1988). McArthur established the integrity of the CBC news bulletins by using only information that was "authentic and authoritative, avoiding rumour, false emphasis, and sensationalism" (Canada, 1940, p. 13). The news reporting remained strictly impartial, yet McArthur was aware of his audience. In 1941, he wrote:

> It is hoped to achieve a desirable medium between the complete impersonality of BBC news announcing, and the extremely personal -- and too often sensational -- style affected by popular news announcers in the United States. It is kept in mind, that if the style of CBC news bulletins is too impersonal, too matter-of-fact, many listeners will turn to United States and Canadian newscasters who present the news in a lively personal style which enjoys a wide acceptance on this continent (DCM-PAC).

Radio was the only form of public broadcasting when the NNS was established. When television began, Canadian audiences were introduced, largely through U.S. television, to investigative and "eyewitness" news reporting. But the CBC continued to take its news reports only from secondary sources, and the role of editors was restricted essentially to text preparation. Bill Hogg, Chief Editor of Radio News from 1953 to 1966, adhered to the original "bare facts" ideal. Even during the 1950s, Hogg discouraged use of the new, portable tape-recorders so as

to preserve "objectivity" (v. Eamann, 1985). The CBC was the leading disseminator of factual information, but at the expense of becoming known as "the good, gray CBC." In 1957, Toronto's *Sunday Telegram* called CBC newswriters "faceless, nameless robots stripped of all personality and opinion" (Robert Fulford, May 19, 1957). *Time* magazine said much the same thing: "the personality of CBC News is not that of a newsman, but of the announcer who simply reads it" (July 19, 1963).

During the 1960s, there was a revolution within the CBC News Service itself. The Association of CBC News Supervisors was formed, and they wrote to the administration:

> We are living in an era of violent change in which the upheaval of ideas has breached tradition and shattered prejudices. This is an age when people need to be informed responsibly, intelligently -- and fully. We must meet the challenge of that need.... We can no longer be satisfied with disseminating the bare facts of the news gathered by others. (letter, K. Brown to VP of Administration, November 14, 1966).

The National News Service was reorganized to make better use of the combined resources of both radio and television. Greater use was made of recorded news reports, and a new, two-host format for the major evening newscast (*The World at Six*) was instituted. Professional media watchers liked the new "sound." The Toronto *Telegram* wrote, "It is crisply written, brightly read and it has a keen sense of swift movement" (Sid Adelman, April 12, 1967). Changes continued to be made. By 1968, the major morning newscast (originally *The World at Eight*, now called *World Report*) had also switched to two newsreaders. In 1968 also, the daily BBC newscast, which had been heard over the CBC since the beginning, was discontinued. The BBC model was no longer "inside" the Corporation; American models were exerting a greater influence. The most subjectively apparent change

in newsreading that occurred with the changes in format was a great increase in the rate of speech. That impression is tested in this study.

With the regular inclusion of "voice clip" reports in the newscasts, anchor newsreaders lost some of the authoritative status derived from being the sole imparter of information. The listener was presented with an immediate and obvious contrast between the read-aloud style of the impartial report and the more spontaneous, personally-involved speech of "eyewitness" news reporting. This linguistic contrast is the source of a continuing "authority versus credibility" division within the Canadian news industry (Tom Walters, CKVU Television, Vancouver, personal communication).

The re-evaluation of policies in the late 1960s brought about a restructuring of all CBC program formats. For the first thirty years of CBC Radio, virtually every word heard over the networks had been scripted and all programs handled by full-time staff announcers. Since the publication of the 'Meggs-Ward Report' in 1970, the hosts for many programs have been selected for their expertise in a particular subject and not necessarily for their well-modulated "plummy tones." These program hosts hired on a contractual basis have increasingly replaced the all-round, career announcer. Program hosts and newsreaders are subject to different linguistic expectations, and for that reason one can often hear sentences such as, "We'll hear more about that right after the news [nuz]," followed immediately by "Here is the CBC news [njuz]." The [+jod] variant after t, d, and n is the form traditionally recommended for use by CBC announcers (CBC, 1946, p. 11; cf. also, Orkin, 1970, p. 124, and Duffy, 1983, p. 55). The English heard on the CBC Radio network exemplifies the divided usage typical of Canadian English, and CBC

newsreaders follow the more conservative (British) example. On the BBC, Received Pronunciation is still the "voice of authority" for news and official announcements (O'Donnell & Todd, 1980, p. 91; Gough, 1982; Leitner, 1980, 1983).

2.2 CBC Broadcast Language.

The literature about CBC language written during the course of CBC's fifty-year history shows two main patterns. The first is that the great bulk of it was written in the first thirty years. The second is that the works are dominated by the first Supervisor of Broadcast Language, W.H. "Steve" Brodie. Technical aspects aside, radio speech involves two areas: the voice, and preparing text for the voice. Brodie wrote much of the material about CBC voices and language himself, and his direction is obvious in many documents where the author is not stated. Brodie was prominent in preparing both of the first announcing and newswriting styleguides, and in revising the later editions. In addition, a review of archival materials reveals that many directives issued by others were copied verbatim from Brodie's memos (see, for example, PAC-RG 41, vol. 174). W.H. Brodie embodied the corporate CBC language attitude.

Modern CBC Radio audiences consider "a good clear speaking voice" and "proper use of the language" to be the first and second most important qualities in a good radio announcer (*A CBC Research report: 1988 Qualitative radio study*). An expectation of high standards in broadcast language was expressed in the official literature from the very outset. The *Announcers* section of the Aird Commission's report reads:

> It has been stressed to us and we strongly recommend the importance of having competent and cultured announcers (French and English) and the desirability of having special training and tests of capability for such persons (Canada, 1929, p. 11).

The Annual Reports of the CRBC (1934, 1935, 1936) do not comment on speech standards, nor on any training given to announcers. However, the first Annual Report of the CBC (1937) expressed the official attitude of linguistic responsibility. The section titled *Announcing* reads:

> The Corporation has adopted as its ideal for announcing the criterion that announcers should reflect the clearest and most cultivated speech of the region rather than that of seeking an impersonal uniformity. In accordance with this policy, the Corporation has attempted to improve the standard of announcing both on its own network and over private stations. For this purpose, a coach has been retained whose services are available to private stations (Canada, 1936–37, p. 14).

The CBC has always selected its announcers from among those who "naturally or through training" speak well (Brodie, CBCPA Recording 621011–5). Applicants are expected to hold a university degree or "the equivalent" (*CBC Job Specifications Manual*). The audition criteria have not changed noticeably between 1939 and 1988 (cf. Halhed, 1981, pp. 1, 21; and the following):

> Audition: a short newscast; two or three introductions from existing network programmes; promotional material; word list, grammatical sentences, a short (max. 2 minutes) ad lib biography.
>
> Comments: voice quality, breathing, enunciation and diction, pronunciation, grammatical correctness, and reading ability (CBC Broadcast Language Office, *Audition and evaluation forms,* 1988).

When the National News Service began, preparation and delivery of news bulletins became of the first importance. McArthur and Brodie selected and trained the original Senior Editors for the five Regional Newsrooms, and they kept a careful watch on the announcers:

> Along with the writing of the news, which has always been done for a listening rather than a reading audience, the manner in which the news is read by the announcer is regarded as of prime importance. Anything in the nature of the exciting or emotional is avoided. Men possessed of clear Canadian voices with a distinctly masculine quality are selected, who, in their diction, are calculated to command the attention and interest of the average listener (Canada, 1943, p. 7).

The CBC Annual Reports continued to report on the progress of the "Coach to Announcers" and of speech standards throughout the corporation until 1949. They recorded that many directives regarding broadcast language were sent out, and that lists of words indicating correct pronunciation were issued from time to time. Publication of the first *CBC Announcers* [sic] *Handbook* was noted in 1938, and of its revised edition, *Handbook for Announcers*, in 1946. Yearly progress reports on the NNS and the Broadcast Language department were continued until 1949. By that time, the working arrangements were well established and language bulletins were being published regularly by Brodie. The separate entries in the Annual Reports were discontinued.

2.3 Broadcast Language Supervisors.

William H. Brodie joined the CBC in 1936, and was first attached to the Programme Division. The Broadcast Language Department was formed in 1940, with "Steve" Brodie as Supervisor of Broadcast Language, the title which he retained until his first retirement in February, 1962. On January 20, 1966, Brodie returned, at age 74, to help train the new announcers needed for coverage of Expo '67. He was retained in an advisory capacity until shortly before his death in 1976.

Brodie was succeeded by Eldon Wilcox, the newly-appointed Chief Announcer (English), on February 26, 1962. Wilcox was selected to

> provide specialist advice and instruction in matters relating to announcer's [sic] functions in the English language (Toronto newsletter (memo), A.K. Morrow, February 28, 1962).

John Rae took over as Chief Announcer in October, 1965, when Wilcox was moved to Ottawa. On June 5, 1974, Rae was appointed Supervisor of Broadcast Language

for both Radio and Television in the English Services Division. His duties and his title were changed to Manager of Broadcast Language and Announce [sic] Services on February 3, 1975, and Lamont Tilden then worked with him in the role of Broadcast Language (BL) Counsellor. Tilden had postponed his retirement for two years to take the position. When Tilden did retire in December, 1976, John Rae continued alone for a year until George Rich took over as BL Counsellor in December, 1977. John Rae retired on July 1, 1979. Rich carried on as Counsellor until May, 1983, when he was nudged into early retirement at the age of sixty. The Office of Broadcast Language then lay empty until the fall of 1983 when Ken Haslam urged that the position be revived. Ken Haslam is the present (1989) Broadcast Language Counsellor. Haslam was given the title and responsibilities in addition to his full-time duties of Senior Announcer. Unfortunately, because of severe cut-backs in funding for the CBC, the Office of Broadcast Language no longer has an operating budget.

2.3.1 CBC language bulletins.

Brodie's column *Please Don't Tread on the Flowers* appeared almost continuously for twenty-eight years in the CBC in-house publications, running from January, 1947, until July, 1975. The succession of magazines in which *Flowers* appears is: *Radio 1*(3), which became *Radio-TV 13*(7), on September 1, 1957, which then became *Closed Circuit 1*(1), on September 14, 1965. The last installment of Brodie's column appeared in *Closed Circuit 10*(10), on July 10, 1975. A compilation of Brodie's *Flowers* is in preparation for publication by Dr. Kenneth Bambrick of the University of Western Ontario (personal communication, January 30, 1988).

In February, 1975, Lamont Tilden and John Rae started a monthly BL bulletin titled *You Don't Say*. The bulletin was distributed throughout the CBC, and was also made available to interested organizations and individuals outside the corporation. When Tilden retired, Rae continued *You Don't Say* until George Rich took it up in December, 1977. Over one hundred editions, in six volumes, were published before the bulletins were discontinued in July, 1983. Dr. Grace Jolly of the University of Saskatchewan has compiled a computerized database of the contents of the first four volumes of *You Don't Say* (personal communication, February 24, 1988).

Ken Haslam began his weekly in-house column of advice in February, 1984. This is currently in distribution within the CBC, and is called *Generally Speaking*. Haslam also regularly writes a column titled *Words: Use and abuse* that appears in *Content* magazine, a trade publication for Canadian journalists.

Chapter III

VOICE SETTINGS, DYNAMICS, AND VOWEL FORMANTS

The study of voice quality settings merges segmental phonology, dialectology, and sociolinguistics. Fluent articulation of the segmental inventory of a particular language or dialect is dependent on maintaining the characteristic vocal configuration or *articulatory setting* of that language (Honikman, 1964). In Russian, for example, the lips are held in a habitually spread position, but for French and German the lips are habitually rounded. The jaw position also varies typically, from a closely-held position in Russian to loosely open in many Indian languages. National dialects, such as the accents of British and American English, can be distinguished by their voice quality settings (Esling & Wong, 1983; Honikman, 1964). Likewise, sociolinguistic studies such as those done in Norwich by Trudgill (1974) and in Edinburgh by Esling (1978a) have established that the use of particular articulatory settings can differentiate social classes within regional dialects.

This study views CBC Radio newsreaders as members of one speech group by virtue of their profession. This view is based on the assumptions that they have been judged competent for the task by other broadcasting professionals, that the criteria used in their selection have been consistent, and that they have been selected from among a number of skilled candidates.

3.1 A terminology for voice settings.

John Laver (1980) has drawn together anatomical and acoustic evidence to produce an articulatory-phonetic system for describing voice and voice quality. Laver's descriptions are based on a 'neutral' setting, against which modifications throughout the vocal tract are measured. This reference standard for vocal setting fits the traditional phonetic description of place and manner for articulation of the non-tense, central vowel *schwa* [ə]. Supralaryngeal settings are contrasted through the application of a three-degree scale (*slight*, *moderate*, and *extreme*). Phonatory settings are described in the manner of Catford (1964), and overall muscular tension of the vocal tract is judged as *tense*, *neutral*, or *lax*. Laver uses instrumental verification to correlate auditory components with the articulatory, physiological, and acoustic levels of analysis. Some of the correlations remain to be tested further, but his method has gone far to replace the many, and sometimes conflicting, impressionistic labels previously used to describe voice and voice quality. The term 'articulatory settings' coined by Beatrice Honikman (1964) was chosen from among a number of others (e.g., Sweet's [1877] 'organic basis') because it best describes the relationships between the long-term "posture of the vocal organs" in articulation and the resultant effect on the voice quality "which is continually present instead of being confined to the duration of a segment or two" (Abercrombie, 1967, p. 93). References throughout this paper to the voice settings for General American English follow Esling & Wong (1983, p. 91), shown here:

(1) spread lips
(2) open jaw
(3) palatalized tongue body position
(4) retroflex articulation
(5) nasal voice
(6) lowered larynx
(7) creaky voice

References to British English (i.e., Received Pronunciation) are, unless otherwise stated, those given by Honikman (1964, p. 81). These are (verbatim):

Jaws	Loosely closed (not clenched)
Lips	Neutral; moderately active
State of oral cavity	Relaxed
Main consonant articulation	Tip – alveolar
Tongue:	
Anchorage	To roof laterally
Tip	Tapered
Body	Slightly concave to roof
Underside	Concave to roof

Honikman describes the visible and auditorily verifiable features of the lips, jaw, and tongue in a terminology that antedates that of Laver. Commonly-occurring features of RP that can be added to Honikman's description are nasality and the use of creaky voice (Laver, 1980).

It can be expected that an examination of the voices of thirty newsreaders taken from three periods of CBC history will reveal a pattern of voice quality settings that differ in at least some respects from both those described for British English (Honikman, 1964) and American English (Esling & Wong, 1983). The articulatory settings found can be taken as representative of at least one significant and visible variety of the formal public speech of Canadian English.

3.1.1 The CBC prescription.

The *Handbook for announcers* (CBC, 1946) and the language bulletins contain comments from which the CBC prescription regarding vocal settings can be inferred. They might be considered largely phonological (and somewhat obscure), but they do contain hints about preferred vocal settings. The overall clarity of the advice suffers from the use of impressionistic labels rather than a notational standard. For example, *Generally speaking 1*(36) observes that

> The word J.U.S.T. through laziness is frequently sounded 'JIST' or 'JEST'.....make sure that the 'U' receives full value, JUST as in MUST, TRUST or BUST.

Most interesting, perhaps, is that many of the recommendations are repeated often through the years. (The entries are presented together in Appendix C.) Most frequently, the pattern of advice over the years suggests that the CBC counsellors have been advising against what Peterson & Barney (1952, p. 178) call

> the prevailing vowel shifts observable over long periods of time in most languages. The common tendency is continually to shift toward higher vowels in speech, which correspond to smaller mouth openings.

In 1941, Dan McArthur, the first Chief Editor, declared that "We have certain definite ideas as to how news should be announced" (Powley, 1974, file 18-38-1), and that the newsreader should

> sound authoritative... it is urged that every effort should be made to keep news announcing in the hands of those announcers who have the desired qualities of voice, pace, emphasis and personality for this very specialized responsibility (ibid. file 23-2-1).

Authority in broadcasting is a complex social concept (see, for example, Hoggart & Morgan, 1982, especially pp. 25-32). Authority, both in the sense of being 'in authority' and of being 'an authority,' is generally ascribed to those associated with prestigious organizations. At the phonetic level, it has been suggested (Laver & Trudgill, 1979, p. 28) that authority might be attributed by virtue of "the fact that a given speaker has a long vocal tract, and that he speaks with a prestige accent." The long vocal tract would be the natural property of a large person, who would also have generally greater mass and dimensions of the articulators. Listener judgements about a speaker's physique, and sex, are usually quite accurate (ibid., 1979, p. 8), but the speech organs can be brought under conscious control with

practice, and the effects of variation in physical size can be minimized. The recent *CBC Radio news style guide* stated that "there's a distinctive news "sound" that's quite different from anything else on the radio" and observed, "We each have our own voice, no two voices are identical.... we must ask why so many of us in news sound so much alike" (CBC, 1987, pp. 63-64). This "sound" is viewed here as the result of a striving to follow a uniform authoritative voice model among male CBC newsreaders. W.H. Brodie wrote (*Reading the news*, 1946) that the personality of the newsreader "must be consciously moulded to and subordinated to the material it works in." The role of the newsreader has been solely that of disseminator of important or useful information.

The voice of the newsreader must not detract from the message and, therefore, the expectation is that individual differences in vocal settings within sample groups will not be extreme. The implication is that newsreaders tend to adopt settings that approximate a perceived authoritative phonetic model, and that other successful, experienced newsreaders are chosen as the models. The exact model might be different for each era.

3.2 A brief description of voice settings.

The greater the length of the vocal tract, the greater the resonance. Protrusion of the lips "lengthens the mouth channel by adding a resonance-chamber beyond the teeth" (Sweet, 1877, p. 13), while lowering the larynx also gives a deeper or hollower sound to the voice. Esling & Wong (1983, p. 92) state that the lowered larynx (along with a low pitch range) often characterizes newsreaders and other public speakers throughout North America.

They point out that the lowered larynx setting would, however, be unusual in a British public speaker. This observation by Esling & Wong is compatible with Laver & Trudgill's (1979, p. 28) statement about authority and the long vocal tract. Both the protruded lips and the lowered larynx settings would be highly suitable for a newsreader wishing to produce the resonance of a "deep, authoritative voice." Shortening the vocal tract is accomplished either by holding the larynx in a continuously raised position or, in some cases, it is the result of physiological anomalies such as "overbite" (i.e., the extreme labiodentalization caused by retracting and raising the lower lip). The first of these produces a higher-pitched voice, and the second noticeably increases sibilance; both are considered undesirable traits for formal microphone speech.

Protrusion of the lips is normally accompanied by *lip-rounding*. Degrees of rounding can be differentiated as *open* and *close rounding*. Close rounding corresponds to the extreme protrusion of the vowel [u]. In this paper, both *protrusion* and *rounding* refer to open rounding. The label *lip-spreading* describes horizontal expansion of the lips, where this is assumed to co-occur normally with non-protrusion.

The tongue is the most active and important articulator. The movements of the tongue body, root, and tip or blade are largely interdependent and are often difficult to separate at the auditory and acoustical levels. For the purposes of this study, therefore, it was decided to follow Laver's (1980, p. 46) advice that

> it may be more practical for most purposes to subdivide less finely, and distinguish only between settings with a fronting component, in *tongue-fronted voice*, and those with a retracting component, in *tongue-retracted voice*.

As in both British English and American English, articulation is made with the tip of the tongue slightly retroflexed. The position of the jaw is termed simply *close* and *open*. The jaw is considered largely an enabling feature; for example, a close-set jaw increases the tendency toward the use of a spread, rather than a rounded, setting of the lips.

W.H. Brodie said that "although quality of voice was important it was one of the least important qualifications as long as it wasn't objectionable" (McNeil & Wolfe, 1982, p. 275). A discussion of velopharyngeal settings involves the effects of faucal and lingual settings as well as those of the velum and pharynx. The faucal pillars are two opposing sets of muscular arches straddling the back of the mouth that serve to pull the velum downward during speech, and to raise the tongue and larynx. Approximation of the sides of the faucal arches constricts the top of the pharynx, and the effect of extreme *faucal constriction* can often be heard in the untrained speech of deaf people. This sound was described by Alexander Graham Bell (1908, p. 19) as "resembling somewhat the cry of peacock." For average speakers though, Laver (1980, p. 58) points out that

> the most frequent involvement of the faucal muscles is ... in *nasal voice*, ... where they contribute to the complex acoustic characteristics of nasality.

Adjustments to the pharynx are made both by the action of the tongue and by the pharyngeal muscles. Similar to that of faucal constriction, the auditory effect of muscular tension within the pharynx itself has been described as giving a 'metallic, strident quality' to the voice. These "unpleasant" voice qualities would be undesirable for newsreading.

The perception of nasal and denasal qualities is affected by degrees of overall tension; denasality is the result of the same sound source resonating in a relaxed musculature. Nasality has often been thought of as the direct result of the volume of air passing through the nasal cavity. Resonance of the nasal cavity does occur in the production of nasal segments, but long-term nasality can also result from vibration within any 'cul-de-sac' chamber attached to, and smaller than, the main vocal tract. The degree of nasality is determined by the size of the opening into this chamber, with a smaller opening being associated with a slighter quality of nasality. Resonant side chambers can be produced by the habitual position of the articulators. The fronting or backing of the tongue expands or constricts the upper part of the pharynx, or nasopharynx. Hixon (1949) has pointed out that "nasal speakers seem to retract and raise their tongues more than normal non-nasal speakers." This configuration is seen as contributing to side-chamber resonance within the vocal cavity.

Modal voice and creaky voice are the phonatory types one expects to hear on a newscast. Modal voice is the neutral setting on a breathy -- whispery -- modal -- harsh -- ventricular scale. A breathy voice results from the vocal folds being held at their most open during vibration, and a ventricular voice while at their most constricted. A number of these possible phonation types are highly unsuitable for authoritative newsreading. Whispering normally indicates confidentiality. The use of breathy voice in English usually signals intimacy, and it has been suggested that a breathy voice (presumably to a marked degree) "may be indicative of introversion, neurotic tendency and anxiety" (Scherer, 1979, p. 158). Toward the other end of the scale, Laver and Trudgill (1979, p. 17) point out that "a

harsh phonatory setting conventionally signals anger in the paralinguistic code of English." Vibration of the ventricular folds in conjunction with the true vocal folds results in a very harsh, constricted sound. Ventricular voice is best imagined as speech while attempting to retain a lungful of smoke. Gillian Brown (1977) has described a number of these voice features within a framework of their paralinguistic and social functions. In her description, creak and "unmarked" are both suitable features for *important* and *responsible* voices (1977, p. 149).

Modal voice is also the neutral setting on a falsetto -- modal -- creaky scale. Creaky voice results from the slow vibration of the anterior portion of the vocal folds only. Creak is commonly associated with the naturally slower vibration of the thick vocal folds of a large, authoritative person. This low pitch range has been observed as a noticeable feature in the voices of public speakers throughout North America "where the degree of prestige can be assumed to be high" (Esling & Wong, 1983, p. 92). Falsetto voice is the rapid vibration of vocal folds stretched from front to back.

3.3 A brief description of vowel formants.

Peterson & Barney (1952) established the benchmark formant values for American vowels, and J.C. Wells (1962) did the same for the vowels of British English (Received Pronunciation). This study makes acoustic measurements of three vowels /æ ɒ u/ taken from recorded CBC newscasts and compares them with compatible data from Vancouver speakers. The averaged acoustic measurements of CBC vowels will be seen as representative of the formal public speech of Canadian English.

The first two *formants*, the energy peaks of soundwaves, carry most of the information used in our auditory perception and evaluation of speech sounds. The lower frequency of the first formant is determined primarily by the greater length of the vertical section of the vocal tract, and that of the second formant by the size of the horizontal section. The relative dimensions of these two sections change during articulation, principally due to the movement of the tongue. As one section shortens the other lengthens, and the frequencies of the dependent formants rise and lower accordingly. Despite variations in size between individual vocal tracts, the relationship of the resonant frequencies to one another remain constant and it is this characteristic *formant structure* that distinguishes one sound from another.

The selection of /æ ɒ u/ follows Laver's concept of susceptibility that suggests "the effect of a setting on a segment will be proportional to the distance between the articulatory locations and the setting" (1980, p. 20). Therefore, the low front vowel /æ/ should be particularly susceptible to the effects of tongue backing and raising (velarization), the low back vowel /ɒ/ to tongue fronting and raising (palatalization), and the high back vowel /u/ to tongue lowering (pharyngealization). All three vowels should be susceptible to changes in characteristic vocal tract tension, or to changes in configurations of the lips. The high front vowel is not included because previous research suggests that /i/ is a sort of "pivotal vowel" which exhibits little change relative to vocal setting (Esling, 1986, p. 15).

Certain co-occurrences of settings have a more marked acoustic effect than do certain others. Laver (1980, p. 18) points out, for example, that

> the effect of rounding the lips will be different, in absolute terms, when the back of the tongue is simultaneously raised in velarization than when the front is raised in palatalization.

Comparative instrumental measurement of the effects of vocal settings on segments were made by Esling and Dickson (1985). The method used Long Term Analysis of Spectra (LTAS) of natural speech as well as formant frequency measurements. Their findings show that

> superimposing palatalized and velarized settings on otherwise identical texts results in a systematic shift in mean spectral peaks, with widely-spread peaks for palatalization as for an [i]-quality vowel, and approximation of the two peaks for velarization as for a [u]-quality vowel (1985, p. 157).

A number of studies on the influence of voice settings on formant values are summarized in Laver (1980). The references presented below use Laver's page numbers. A raised larynx raises both F1 and F2 in open vowels, but only F2 in close front vowels (p. 27). A lowered larynx produces a drop in both formant values, but more for F1 (p. 29). Lip protrusion also produces a drop in both formant values, but more in F2 -- especially for back vowels (p. 31). Spread lips alone raise both the formant values (p. 41), but the close jaw setting which so often accompanies spread lips causes a drop in F1 (p. 67). Palatalized tongue articulation produces a "maximally high" F2, with movement either forward to dentalization or backward to velarization causing a progressive lowering of the F2 value (p. 55). With tongue backing, the F1 is heightened as the F2 is lowered. Velopharyngeal (nasalized) settings also show the raised F1 and lowered F2 pattern (p. 56-58). All of these effects must be considered when comparing auditory evaluations to acoustic data.

A *mel* scale is used to represent the auditory perception of formant values (Minifie, Hixon & Williams, 1973). Formant values (in Hertz) below 1,000 are presented linearly and those above are calculated logarithmically. A variation of

approximately 30–50 Hz in the first formant value produces a significant change in perception of the sound, while for the second formant a variation of approximately 100–150 Hz is required to produce a perceptible difference (C. Dickson, personal communication).

3.4 Voice dynamics in newsreading.

Brodie emphasized that listeners were already interested in hearing the news, so feigned enthusiasm was quite unnecessary. As Dan McArthur put it,

> We don't want our news to sound like a man who buttonholes you on the street and starts shouting a lot of odds and ends in your ear (DCM–PAC).

At the same time, it was stressed that the newsreader should not kill the listener's interest through a dull, monotonous delivery style (Brodie, *Broadcast News Language*). Voice dynamics were expected to follow naturally from the newsreader's confidence, interest, and knowledge of the subject. He wrote that,

> Degrees of complexity and degrees of importance, the difference between the essence of a story and its background material, between news of disaster and news of cheer -- all these should influence pace and tempo.... A pause can be used for emphasis; it can be used to let the listener marshall in his mind the few words that have gone before and to focus properly on what follows (Brodie, 1946, p. 2).

Brodie advised announcers to model their newsreading style on the natural rhythms of telling an interesting story to a friend. The newsreaders were repeatedly reminded that radio listeners were not truly a mass audience, but usually one or two people sitting at home. Brodie's advice that the story be told to just one person at a time has often been judged by CBC announcers as his single most important teaching point (Rex Loring, personal communication, June 14, 1988).

Chapter IV

METHOD

4.1 Sampling.

The data for phonetic analysis come from recordings of thirty CBC newscasts spanning the years 1937 to 1987, ten samples from each of the first, third, and fifth decades of CBC history. The three sets of newscasts comprise Group A (1937–1947), Group B (1957–1967), and Group C (1977–1987). The availability of recorded newscasts influenced selection to some degree. Recording #1 is the earliest extant example of a CBC newscast. It comes from the Jack Cullen Collection in the Sound and Moving Image Division of the Provincial Archives of B.C. (SMID–PABC), Victoria. Recording #6 comes from the CBR [i.e., pre–1952 CBC Vancouver] Collection of the National Film, Television, and Sound Archives (NFTSA) in Ottawa. Recordings #28, #29, and #30 were captured as off–the–air recordings by the author. The other twenty–five newscast samples are from the CBC Radio Program Archives in Toronto.

There is a scarcity of recordings of early newscasts. Recordings #2 – #12, with the exception of #6, are the only entries cross–referenced under "News," "Radio News," and "National News" in the Radio Program Archives. All other holdings are filed by date (year, month, day) with the extension "–00" signifying "Radio News" (e.g., 410617–00). Each group spans eleven years so as to utilize all the available catalogued early materials. A search of the "–00" entries matched

Group B and Group C to Group A by month and day of transmission, as nearly as possible, at twenty-year intervals. Story content has been the major consideration in newscast preservation at the Program Archives. As a result, all their recordings after 1982 are of *The World at Six* newscasts. Samples #28 - #30 were therefore taken from private sources to provide a wider representation. The newscasts were professionally copied onto cassettes at the three archives. The sound quality of the recordings is superior to most field data and therefore satisfactory for acoustic analysis. The voices are those of professional speakers reading from prepared scripts. Sound levels are controlled by professional technicians, and room acoustics can be considered ideal.

A one-hour tape cassette holds the thirty newscast samples, assembled chronologically. Each sample represents the first two minutes, approximately, of a newscast. They are timed from the end of the station announcement to the completion of a news item at about the two-minute mark. Some recordings contain short "voice clip" reports within the targeted time. Voice clips and "actualities" (action sounds) have been deleted. Newscasts in which an insert runs well over the allotted time are terminated at the beginning of the clip. As a result of these "out-takes," the duration of the recordings vary from fifty-five seconds to two minutes and twenty-five seconds. Five of the thirty newscasts are of the two-host format, yielding a total of thirty-five newsreaders. (Appendix A supplies the dates of transmission, and the number (e.g., 901, 902) assigned to each newsreader.)

The thirty newscast recordings were transcribed using standard orthography. These transcriptions were then used in conjunction with the recordings to locate

speech data prior to instrumental evaluation and to assist in the auditory evaluation phase.

4.2 Data gathering.

In addition to the thirty newscast recordings, information for this project has been drawn from personal interviews, CBC publications, broadcasting histories and biographies, articles in popular and academic periodicals, archival materials, and audio recordings of interviews and program broadcasts.

An important source of information was an unfinished manuscript (undated) written by Dan McArthur, the first Chief Editor. It is a history of the National News Service, titled *The CBC News Service—The Formative Years*, and is contained in Volume Two of the Albert Edgar Powley Collection (PAC MG30, E333, vol.2) in the National (Public) Archives of Canada, Ottawa. McArthur assembled the information with the collaboration of A.E. Powley, the first Senior Editor of the Central Newsroom in Toronto. Volume Two contains materials dated from 1933 to 1974 brought together from many sources - original CBC files and private correspondence. The items have not been assigned specific file numbers within the collection; therefore, all information drawn from this volume will be given the same reference "DCM-PAC" (i.e., Dan C. McArthur - Public Archives of Canada), and dated wherever possible.

4.3 Instrumental measurements.

Initial machine measurement of the data used Micro Speech Lab (MSL) and a number of of MSL programs developed at the Centre for Speech Technology Research at the University of Victoria for use on the IBM-PC microcomputer. The MSL program is used to encode digitized speech at the rate of 10,000 samples per second. MSLEDIT provides a visual display of the sound waveform and audio playback of data up to twenty-two seconds in length. Through the manipulation of cursors, segments of the waveform can be marked and verified auditorily, and the segments can then be stored on floppy diskettes. Subsequent statistical processing used the Statistical Analysis System (SAS) package on the university's IBM 3090 mainframe computer.

4.3.1 Acoustical measurements.

Three tokens of each vowel /æ ɒ u/ from each newsreader were sought. A search of the transcriptions identified the contexts for each vowel, and the optimal examples were located auditorily. (Appendix B lists the environments from which the vocalic nuclei were extracted. Clear examples of all three vowels are not available for all newsreaders but the numerical order of the entries is maintained for the sake of clarity.) Selected portions of the thirty newscast tape-recordings were loaded into MSLEDIT, and the vocalic nuclei previously identified were isolated. Each of the one hundred and five tokens of each vowel (three times thirty-five newsreaders) was saved to an individual data file. The MSLSORT program was used to assemble and save, with a 20 msec. gap between each, vowel tokens for each speaker. The process was repeated to assemble those of the speakers from each of the three time periods represented by Groups A, B, and

C. Finally, all tokens of each vowel were gathered into one file for each of the vowels /æ/ /ɒ/ and /u/.

The three digitized vowel files were then run through the Linear Predictive Coding (LPC) analysis within the [MSL] FORMANTS program. LPC uses reflection and filter coefficients representative of the vocal tract and its articulators to extract up to five spectral peaks for each frame of times-series data. The 105 tokens of the three vowel files were analyzed in 20 msec. frames with 10 msec. intersample gaps, resulting in 478, 502, and 287 frames for /æ/ /ɒ/ and /u/ respectively. The FORMANTS program obtained a minimum of four spectral (i.e., formant) values for every frame of the CBC data. The printed formant values were then examined for inconsistencies such as those due to interference from adjoining segments. The removal of anomalies resulted in a reduction of vowel sample frames, most drastic in /u/, where all tokens of two of the newsreaders were deleted. The macro programs of Microsoft WORD were used to re-format the sample frame information by vowel and by Group (time period). The files identify the vowel, sex of the speaker, time period, and the individual speaker, and contain the values of the first, second and third formants (F1,F2,F3). The formant-value files were then uploaded from floppy diskettes into the mainframe computer for statistical processing.

The formant-value files were also used to plot F1,F2 confidence ellipses for each of the nine CBC sample cells (three vowels, three time periods). The PLOT program, for use with a Hewlett-Packard Plotter, determines the limits for ellipses at five standard deviations from the formant means. The vowels are plotted on an articulatorily-oriented formant chart for ease of viewing and conceptualizing (see Figures 1 to 6).

4.3.2 Measurements of speech rate.

To test the perception of changes in speech rate over time, newscasts from each of the time periods were measured on MSLEDIT. The three sets of exact day-and-month matches among the thirty samples were used. As the last two of these selections (marked by *) were of the two-host format, a further recording was added to allow a balanced comparison within the period. The dates (YYMMDD) used were as shown in Table 1.

Table 1: CBC newscasts used in tests of tempo and continuity measurements, by date (YYMMDD).

Group A (1937-1947)	*Group B (1957-1967)*	*Group C (1977-1987)*
430507	*630507*	*830507*
440606	*640606*	*840606**
461010	*661010*	*861010**
		871201

* *two-reader newscast*

The recordings were fed through MSLEDIT in overlapping twenty-two second sections. MSLEDIT specifies the length of marked sections by a digital read-out on the screen. The total time of the newscast was calculated, as well as the duration of each news item. The time-lapse between items was isolated and measured, then the time between each sentence of the story. These boundaries were based on standard concepts of sentence and story organization, as defined by the author and used in the preparation of the transcriptions. Finally, pauses within the sentences were located perceptually and measured. Sentence duration and phrase

length -- where phrase is defined by the occurrence of pauses -- were established. The articulation rate was determined by the number of syllables produced within the phrases. The various totals were accumulated and averaged. Percentages of silent time to speech time were established.

A silent interval of .15 second was used to define the pause. This is much more stringent than the level set for similar tests (.40 second - Scherer, London, & Wolf, 1973; .27 second -- Kowal, Basset, & O'Connell, 1985). The pauses were not identified by position within grammatical constituents or for oratorical intent.

4.4 Statistical analyses.

SAS analyses were used to establish the mean F1, F2 and F3 values of the three vowels for each speaker, each group, and across the entire sample of newsreaders (n=35). The individual formant values were calculated from an average of twelve 20 msec. sample frames for each speaker (four per token). Group A (1937-1947) consists of ten recordings of ten single newsreaders. The ten recordings of Group B (1957-1967) contain eleven voices as a result of the two-host format of *The World at Six* newscasts that began in 1966. The Group C recordings (1977-1987) contain examples of fourteen newsreaders, two of whom are women. Initial formant means tests included data from the two female newsreaders. When these were compared with the values of male-only tests, the group formant averages were noticeably higher, to a degree inconsistent with numerical changes in samples only. A valid statistical evaluation for the females could not be expected because of the disparity in numbers and small sample size. For these reasons, and because of questions of reliability in F1,F2 normalization

across males and females (cf. Hindle, 1978, and Johnson, 1989), subsequent statistical processing used data from the voices of male newsreaders only (n=33).

4.4.1 Tests of correlation and variance.

Vowel by vowel correlations of mean formant values were used to establish the degrees of similarity between the newsreaders within each group, and between the groups across time. The correlation is calculated from the distances between the mean F values. A positive (+) correlation shows that the value of one formant will be similar in value to the other (i.e., if the F1 is high, then F2 will be high; if F1 is low, then the F2 will also be low). A negative correlation indicates that the F values will be opposite (i.e., a low value formant will have a high value counterpart). The closer to either of the whole numbers +1 or −1, the greater the similarities in relationships (not necessarily Hertz) among the speech samples. Correlations are incorporated into the graphic models of vowel formant distribution for the three groups of CBC newsreaders (see Figures 2 to 6).

ANOVA and MANOVA tests (univariate and multivariate analyses of variance) were run to compare the F values for each speaker of a group, and the values of each group against those of another. ANOVA tests the means of one formant at a time (F1,F1; F2,F2). MANOVA first generates a new, single set of variables from the two mean F values, and then compares the resultant set with the set of another group.

The conventional level of significance ($p < .05$) (Ferguson, 1976) was adopted for these tests. Results with a probability (p) level equal to or less than five percent allow 95% confidence in rejection of the hypothesis that differences found are due only to chance. A result of $p < .01$ is highly significant, and $p < .001$ is

very highly significant. In the tests of correlation, significant p levels suggest a *similarity* that is due to some external influence (e.g., training or class expectations). In the analyses of variance, however, low p values indicate statistically significant *differences* between the individual newsreaders or between the groups compared.

4.4.2 Comparison with Vancouver Survey data.

To test vowel quality statistically as a sociolinguistic variable, the F1,F2 data from the CBC newsreaders were compared with compatible /æ ɒ u/ formant data from the *Survey of Vancouver English* (Gregg, 1984). The "MM" test group (i.e., middle-aged males, born between 1920 and 1944) contains informants (n=32) from all four socioeconomic status (SES) classes of the Vancouver Survey. The classes are identified as 1,2,3, and 4, and associated incrementally with successively greater incomes and education, etc.

SAS methods determined the F1,F2 means. ANOVA and MANOVA tests were run within and across the twelve cells (three vowels, four SES classes), and for each of the four Vancouver Survey classes against each of the three CBC newsreader groups.

The results of the analyses and measurements outlined in this Chapter are brought together in the following pages.

Chapter V

DATA

5.1 Voice quality settings of CBC newsreaders.

The voices of ten newsreaders from each of the three groups of speakers were analyzed. Table 2 lists the findings of the auditory evaluations set out as numerical totals for voice quality settings within each group. Appendix D supplies the settings of the individual newsreaders.

The lowered larynx, creaky voice, and open jaw settings are the predominant features in that they occur in the great majority of cases and across all three time periods. The other features are shared in various combinations by the groups. Group A (1937–1947) is distinguished by the highest incidence of both tongue backing and the spread-lips configuration, while tongue fronting and rounded lips are dominant in both Group B (1957–1967) and Group C (1977–1987). The feature denasality contrasts Group B (1957–1967) with both Group A (1937–1947) and Group C (1977–1987).

Changes in incidence of the most common articulatory settings across the three time periods are demonstrated in Table 3. This was done through the grouping of the values found for consecutive time periods displayed in Table 2. The settings of Group B (1957–1967) are brought together first with Group A (1937–1947) and then separately combined with those of Group C (1977–1987). The mathematical symbols denote increases or decreases in the incidence of the various settings within the later of the two new groupings.

Table 2: Distribution of voice quality features of male CBC newsreaders by group (time period).

		Group A (1937-47)	Group B (1957-67)	Group C (1977-87)
Supralaryngeal settings				
Labial	*rounded*	3	5	6
	neutral	2	4	2
	spread	5	1	2
Mandibular	*open*	8	9	8
	close	2	2	2
Lingual	*fronting*	4	10	8
	backing	12	6	6
Velo-	*nasal*	9	4	7
pharyngeal	*neutral*	0	2	2
	denasal	4	7	3
Laryngeal	*raised larynx*	4	0	3
	neutral	1	2	0
	lowered larynx	8	12	10
Tension	*tense*	4	4	5
	neutral	5	5	4
	lax	1	1	1
Phonation types				
Modal voice		2	3	3
Creaky voice		11	12	9

Table 3: Articulatory settings of CBC newsreaders -- changes over time.

	a). 1937-1967	*b). 1957-1987*
(1)	*rounded lips*	*+*
(2)	*open jaw*	*=*
(3)	*retracted tongue*	*fronted tongue*
(4)	*neutral tension*	*tense voice*
(5)	*nasality*	*-*
(6)	*lowered larynx*	*+*
(7)	*creaky voice*	*-*

incidence: +increased; =same; -decreased.

5.2 CBC vowel quality -- formant values.

The mean formant values for each of the three CBC Groups are brought together for comparison as Table 4. The individual mean formant values from which these were derived are shown in Appendix E.

Table 4: CBC Mean Formant Values -- by group

		/æ/	/ɒ/	/u/
Group A	*F1*	*655*	*635*	*358*
(1937-1947)	*F2*	*1449*	*1106*	*1254*
	F3	*2394*	*2427*	*2357*
Group B	*F1*	*641*	*604*	*357*
(1957-1967)	*F2*	*1354*	*1032*	*1094*
	F3	*2386*	*2435*	*2317*
Group C	*F1*	*620*	*606*	*326*
(1977-1987)	*F2*	*1400*	*1066*	*1229*
	F3	*2323*	*2337*	*2266*
		/æ/	/ɒ/	/u/
Average	*F1*	*639*	*615*	*347*
Values	*F2*	*1401*	*1068*	*1192*
(1937-1987)	*F3*	*2368*	*2400*	*2313*

Table 4 demonstrates that Group A (1937-1947) shows the numerically highest F1 and F2 Hertz values for all three vowels measured -- and, except for the matter of a few Hz in /ɒ/, that is true also for F3. As we have the most information on differences in voice quality from the first two formants, the greatest amount of attention is paid to those values here. Group B (1957-1967) consistently realizes the lowest F2 values, and the lowest F1 for all three vowels is displayed by Group C (1977-1987).

The formant values established for each period correspond to the articulatory settings found among the newsreaders. The high F1,F2 values for the 1937–1947 group correspond to the acoustic characterstics of a spread-lips configuration and the comparatively higher incidence of raised larynx. The low F2 value for 1957–1967 group reflects the almost total use of the lowered larynx setting in that time period with no occurrences of the raised larynx setting. The wider range in formant values for the 1977–1987 group correspond to observations of a shift toward a tenser overall setting (Laver, 1980, p. 153). The lower F1 value is also accounted for by the higher percentage of liprounding in Group C (1977–1987).

Group B (1957–1967) shows up as the most distinctive of the three groups in a number of the statistical measures. Group B shows the only positive (+) correlations for all three F values. Group B also displays the smallest standard deviation in all three vowels except F2 in /u/ (see Appendix F, also Figures 1 to 6). The values for /u/ in Group B are also the only ones to show significant variance levels between the CBC groups (see Appendix H). The MANOVA tests differentiate /u/ in Group B (1957–1967) very significantly ($p < .01$) from Group A (1937–1947), and significantly ($p < .05$) from Group C (1977–1987).

The ANOVA tests for /u/ show that only the second formant values differ ($p=.002$) between 1937–1947 and 1957–1967 (Groups A and B). This F2 difference in the high back vowel is due to the shift from the spread-lips to the rounded-lips setting from one time period to the next. Between the 1957–1967 and 1977–1987 groups (B and C), both formant values for /u/ differ significantly, but less extremely ($p=.02$). These differences reflect changes in the length of the vocal tract, primarily due to the absence of the raised larynx setting in the 1957–1967 period compared with 23% incidence in the 1977–1987 period (Group C).

The F1,F2 values for /æ/ of Group C (1977–1987) show the only significant correlation ($p = .03$) found within the nine CBC sample cells (see Appendix G). Neither significant correlations nor significant variances were found in the F1,F2 values for /ɒ/ in any of the three time periods.

5.2.1 Vancouver Survey -- formant values.

No significant correlations were found in the formant values for /æ ɒ u/ among any of the four SES classes for middle-aged male informants of the Vancouver Survey (see Appendix K).

Significantly, the tests of variance show that SES classes MM2 and MM3 do not separate for any of the three vowels in this data. A random pattern of differentiation was found between the vowel production of MM4 informants and the three other SES classes. The most distinctive of the three vowels for MM1 is /u/ (see Appendix L). It can be said from these findings that the four Vancouver SES classes constitute three statistical units: MM1, MM2+3, and MM4.

The mean formant values for the four Vancouver Survey SES classes can be found in Table 5. Appendix J supplies the individual mean for each of the informants.

Table 5: Mean Formant Values for the four SES classes of the Vancouver Survey

		/æ/	/ɒ/	/u/
-MM1	F1	610	599	407
	F2	1480	1024	1069
-MM2	F1	619	600	381
	F2	1368	1014	1355
-MM3	F1	570	571	365
	F2	1448	1116	1390
-MM4	F1	685	628	385
	F2	1452	989	1378
		/æ/	/ɒ/	/u/
Combined mean values	F1	621	600	385
	F2	1437	1036	1298

5.2.2 Comparison of CBC and Vancouver Survey.

The vowels of CBC newsreaders cannot be associated statistically with any particular class of the Vancouver Survey. The tests of variance between the two studies show the greatest differences in production of /u/, almost no variance in the production of /ɒ/, and random variance in /æ/ (see Appendix M). In the overall pattern then, these results are similar to those for the individual studies (cf. Appendices H, L, and M).

The combined mean F values for the CBC newsreaders and the Vancouver Survey are brought together for comparison as Table 6. While there is an apparent similarity in the averaged formant values for the low vowels /æ/ and /ɒ/, the ANOVA and MANOVA tests have shown that the informant groups cannot be considered equivalent for any of the three vowels. For the high back vowel /u/

particularly, the differences in both averaged F values approach levels of auditorily perceivable difference.

Table 6: Comparison of averaged formant values for CBC newsreaders and for the Vancouver Survey

		/æ/	/ɒ/	/u/
*	F1	639	615	347
**		621	600	385
*	F2	1401	1068	1192
**		1437	1036	1298

* CBC Newsreaders
** Vancouver Survey.

In conclusion then, the formant values for /æ ɒ u/ for the CBC newsreaders are proposed as an acoustic model to represent one national standard of Canadian English (see Table 4). Interestingly, it is the latest group, Group C (1977–1987), that displays the greatest overall similarity to the combined F1,F2,F3 values for all three periods. These results suggest a levelling of performance among CBC newsreaders.

5.3 CBC vowel charts: 1937–1987.

The three vowels /æ ɒ u/ produced by the CBC Groups are presented according to place of articulation in Figures 1 to 6. The vowel ellipses were plotted from five standard deviations of the means from the original sample frames. (The standard deviation shows the limit of variation in Hertz displayed by the sixty-eight percent of the samples.) Figures 1 to 3 show, chronologically, each

time period with all three vowels. Figures 4 to 6 are graphs of the individual vowels, with the ellipse of each of the three periods overlaid one on another. The smaller standard deviations displayed by Group B (1957–1967) show as smaller ellipses. The figures show good separation of the back vowels /u/ and /ɒ/ in all cases, but indicate a slight overlapping in the acoustic characteristics of the low vowels /æ/ and /ɒ/. The ellipses of Figures 4 to 6 show that Group A (1937–1947) has the lowest and most backed articulation. This backing is especially apparent in the /æ/ confidence ellipses. The positioning in the vowel charts is in accord with the lingual settings found that contrast the 1937–1947 group with those of the later periods.

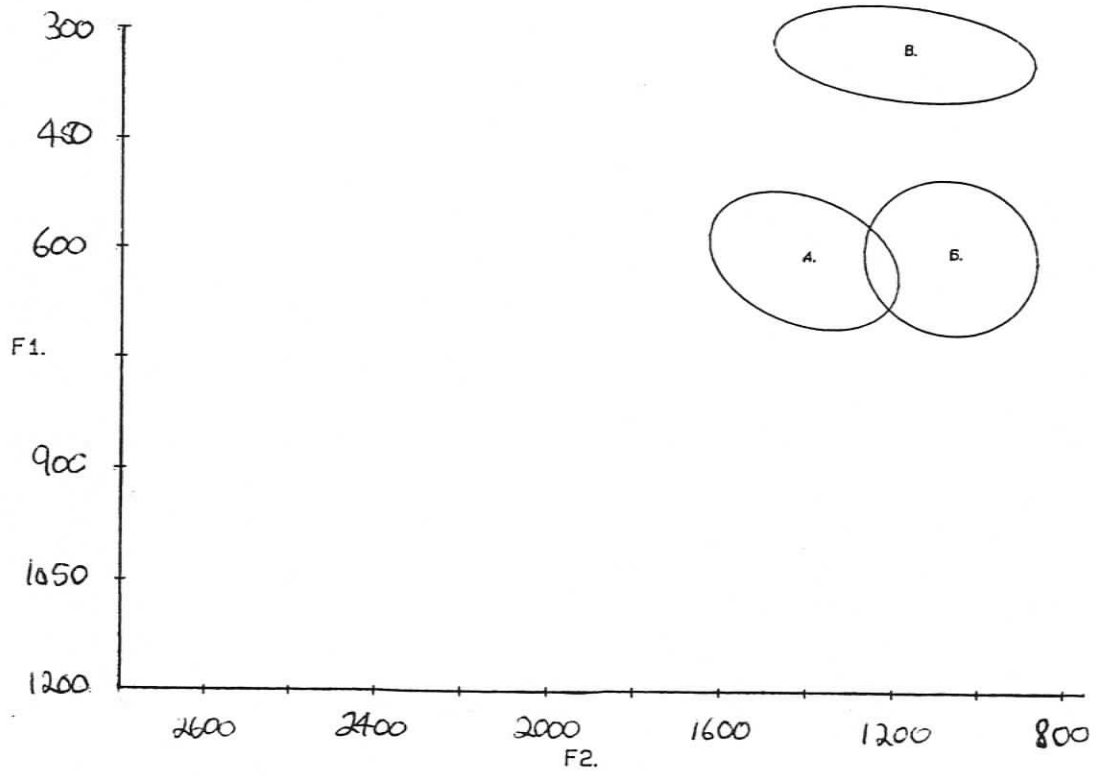

Figure 1: Formant distribution ellipses: 1937–1947 (Group A).
Vowels /æ ɒ u/

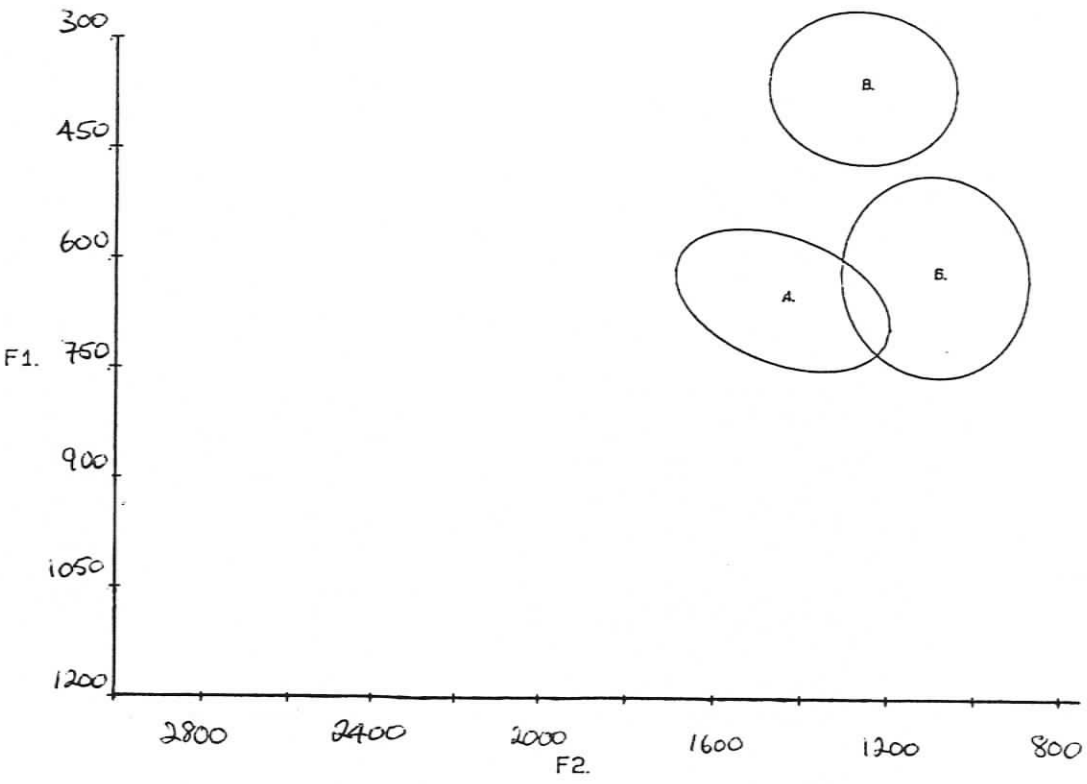

Figure 2: Formant distribution ellipses: 1957–1967 (Group B).

Vowels /æ ɒ u/

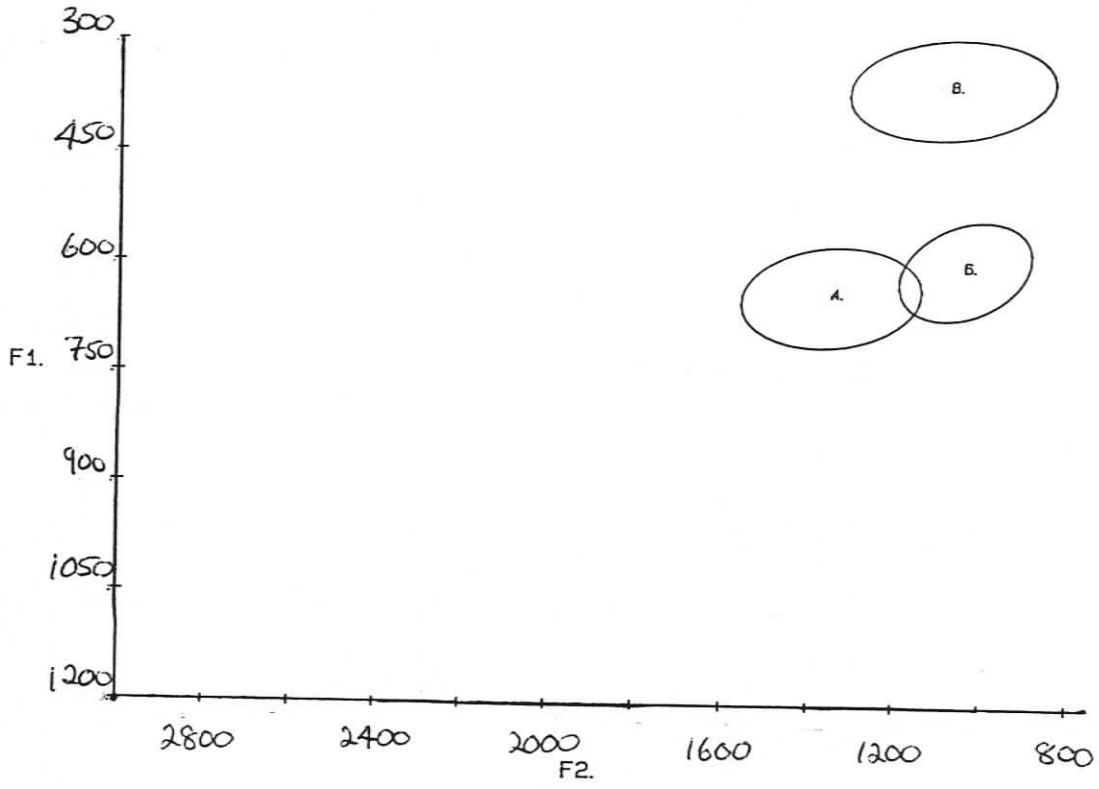

Figure 3: Formant distribution ellipses: 1977–1987 (Group C).
Vowels /æ ɒ u/

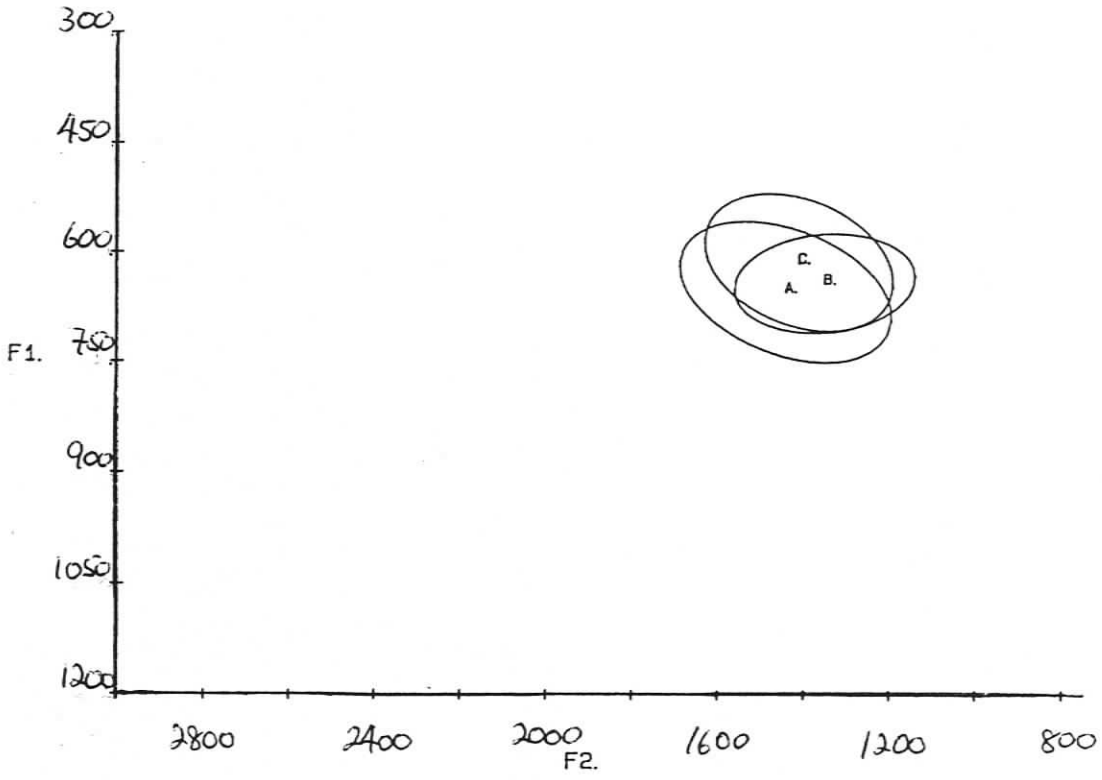

Figure 4: Formant distribution for low front vowel (Groups A to C).

/æ/

1937-1947 (Group A); 1957-1967 (Group B); 1977-1987 (Group C).

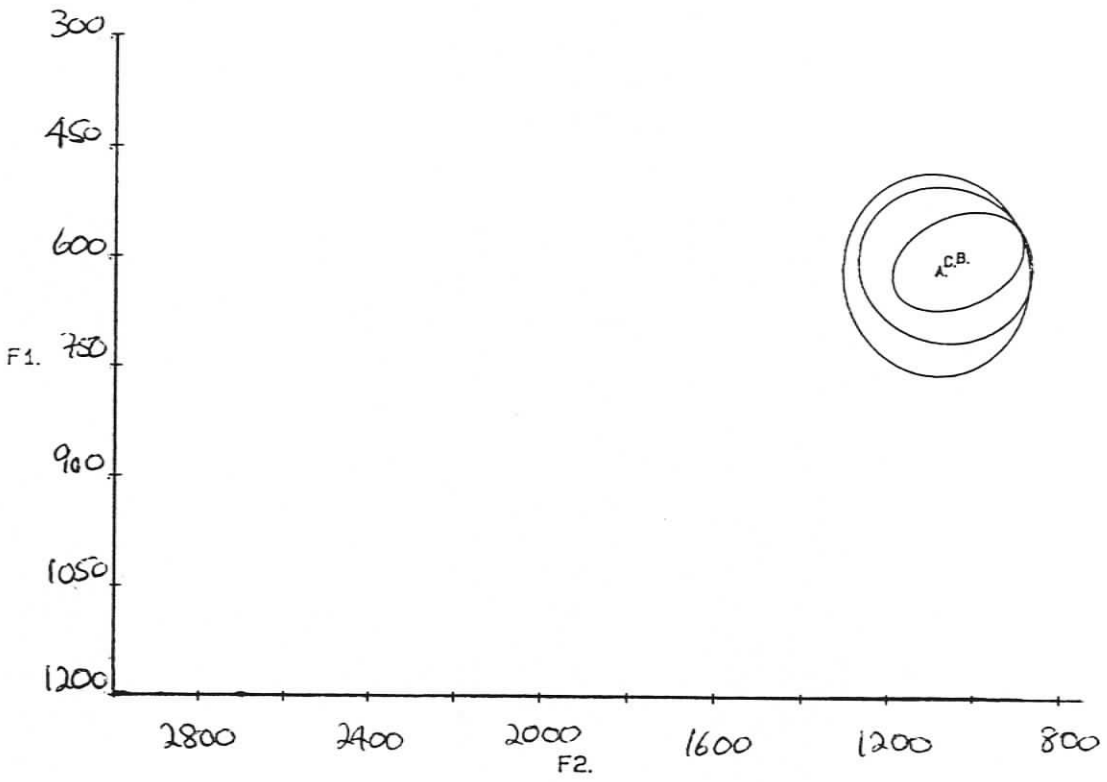

Figure 5: Formant distribution for low back vowel (Groups A to C).

/ɒ/

1937-1947 (Group A); 1957-1967 (Group B); 1977-1987 (Group C).

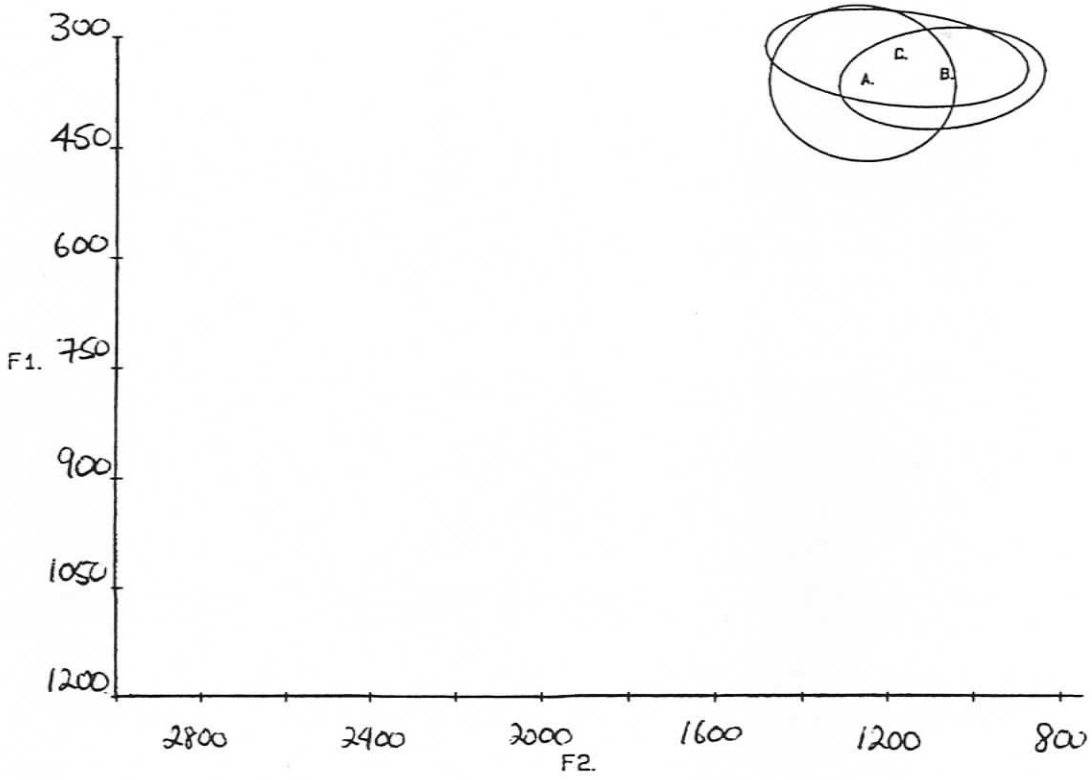

Figure 6: Formant distribution for high back vowel (Groups A to C).

/u/

1937-1947 (Group A); 1957-1967 (Group B); 1977-1987 (Group C).

5.4 Tempo and continuity: Changes over time.

The group means presented in Table 7 show that a shift in pause time has occurred over all three time periods. When the figures are divided into pre-1966 and post-1966 groupings the difference becomes quite dramatic. The changes in total speech time (TST) are interesting, but taken alone they can show only the general trend toward less talk-time for the newsreaders. That is because the lengths of news items determined the overall lengths of the original newscast samples. Nevertheless, the TST for post-1966 is half of that for pre-1966. More specific are the percentage of silent pause time (PSP) measurements: following the 1966 "revolution," the PSP's dropped to sixty percent of those before 1966. The mean pause times in all positions have been shortened, but the relationship of between-news-items pauses (BIPM) and between-sentences pauses (ISPM) have changed the most drastically. Prior to 1966, the pauses that separated the news items from each other were over three times as long as those which marked out the individual sentences. After 1966, however, the between-sentence pauses (ISPM) are some seven times as long as those between items (BIPM). Listener perception of sentence and story structure must necessarily undergo some change.

The figures of Table 8 show that post-1966 sentences have been reduced to about eighty-five percent of the previous mean sentence length (MDS), while within-sentence pauses (WSPM) have dropped to seventy-five percent. A twenty-seven percent increase in the length of the phrases (MDAS -- i.e., articulated sequences) follows naturally from those changes. At the same time, the articulation rate (AR), or syllables per phrase, has remained almost constant at ninety-eight percent of the pre-1966 rate.

Table 7: Measurements of spoken/silent time in CBC newscasts 1943–1987, by position in the text.

TST: total speech time (secs.)
PSP: percentage of silent pause time
ISPM: mean duration of inter-sentential pauses
BIPM: mean duration of between-item (i.e., story) pauses

Date–Group	TST	PSP	ISPM	BIPM
1943-A	*107.9*	*19.5%*	*.942*	-
1944-A	*133.9*	*18.5%*	*.922*	-
1946-A	*138.2*	*20.5%*	*.843*	*2.45*
1963-B	*108.3*	*16.7%*	*.727*	*3.34*
1964-B	*108.6*	*20.1%*	*.781*	*2.60*
1966-B	*72.8*	*13.4%*	*.581*	*.92*
1983-C	*53.3*	*14.5%*	*.643*	*.97*
*1984-C**	*73.1*	*7.7%*	*.375*	*.56*
*1986-C**	*44.1*	*12.8%*	*.422*	*.52*
1987-C	*59.5*	*9.8%*	*.363*	*.59*
Group Means				
Group A	*126.6*	*19.51%*	*.902*	-
Group B	*96.6*	*16.71%*	*.696*	*2.28*
Group C	*56.4*	*12.14%*	*.503*	*.78*
*Group C**	*58.6*	*10.25%*	*.395*	*.68*
pre-1966	*119.4*	*19.04%*	*.843*	*2.80*
post-1966	*60.5*	*11.64%*	*.477*	*.71*

** Signifies two-reader format. Speaker turns are not differentiated within these samples.*

Newsreading is reproduced speech. Reporters gather the facts; editorial policy dictates story selection; and trained newswriters compose the news bulletins in a style suitable for reading aloud (v. CBC 1938, 1940, 1941, 1956, 1962, 1987). Newsreading is the oral interpretation of written text. Written language provides

Table 8: Duration of spoken sequences in CBC newscasts 1943–1987, with pause length (secs.) and articulation rate (sylls.)

MDS: mean duration of sentences (secs.)
MDAS: mean duration of articulated sequences
WSPM: mean duration of within-sentence pauses
AR: articulation rate (syllables per second)

Date-Group	MDS	MDAS	WSPM	AR
1943-A	*5.10*	*2.63*	*.314*	*5.40*
1944-A	*5.49*	*2.87*	*.372*	*5.64*
1946-A	*5.66*	*2.15*	*.301*	*5.49*
1963-B	*6.68*	*2.32*	*.456*	*4.45*
1964-B	*6.62*	*2.62*	*.324*	*5.98*
1966-B	*4.20*	*3.25*	*.305*	*5.53*
1983-C	*6.18*	*3.17*	*.277*	*5.57*
*1984-C**	*5.75*	*3.97*	*.306*	*4.88*
*1986-C**	*3.61*	*2.26*	*.220*	*5.12*
1987-C	*5.52*	*3.36*	*.211*	*5.40*
Group Means				
Group A	*5.42*	*2.55*	*.329*	*5.51*
Group B	*5.83*	*2.73*	*.361*	*5.32*
Group C	*5.85*	*3.26*	*.244*	*5.49*
*Group C**	*4.68*	*3.11*	*.263*	*5.00*
pre-1966	*5.91*	*2.52*	*.353*	*5.39*
post-1966	*5.05*	*3.20*	*.263*	*5.30*

the reader with the choice of intonation and stress, and choice in the number and placing of pauses. Yet newsreading is characterized by a lack of hesitations, false starts, or filled pauses. This study did not attempt to characterize the use of the pause because it has been pointed out that, where pauses are inserted into text, they "are a matter of the reader's taste and experience, and it is difficult to say why one rendering is more effective than another" (Abercrombie, 1971, p. 155).

W.H. Brodie was aware of the tendency to speed up news delivery, and did not approve of it. The following observations anticipate the changes in tempo that were to become evident after 1966:

> It is too commonly thought that an increase in pace necessarily means increased liveliness. This is not so; reading at a pace which demands the listener's constant and close attention often defeats its own object. Some people can read the news very fast and make every word audible, but even though the listener may have heard every word, he may not have had time to digest the component parts and formulate them in his mind as an intelligible whole (*Reading the news*, 1946).

These changes in tempo can be seen as a move toward a more competent model of speech. Smith, Brown, Strong, and Rencher (1975) have demonstrated that an increase in rate caused subjects to sound more competent and a decrease to sound less competent. Unfortunately, their study does not indicate the starting speech rates. The present findings about the articulation rates of CBC newsreaders agree with those of previous research which indicate that

> fluent reading without pronounced rhetorical intent shows little variance in articulation rate per phrase, where phrase length is defined by the number of syllables between two pauses (Kowal, 1983, as cited in Kowal, Basset, & O'Connell, 1985, p. 2).

Chapter VI

CONCLUSIONS

This study has identified changes in voice quality settings, vowel quality, and dynamics in the voices of CBC Radio newsreaders spanning the years 1937 to 1987. The samples examined were taken from thirty recorded newscasts organized into three groups of ten recordings, representing the first, third, and fifth decades of CBC's fifty-year history. Chapter 2 contains a brief account of the early development of CBC Radio news and of the CBC Broadcast Language Department. Chapter 3 provides descriptions of voice quality settings, vowel formant measurement, and the use of pauses in CBC Radio newsreading. The sampling and testing methods used are detailed in Chapter 4, and the data obtained are set out in Chapter 5.

The three groups of newsreaders tested (1937–1947, 1957–1967, 1977–1987) show patterns of voice quality settings that, while also bearing basic similarities one to another, identify in minor ways the decades that they reflect. The acoustic analyses support these findings. Specific patterns of formant values have been identified which can be seen to coincide with the generalized vocal settings for the groups. A dramatic change in voice dynamics has been identified that does not conform strictly to the organization of the three time-period groupings.

The predominant voice quality settings are lowered larynx, open jaw, and the use of creaky phonation. The majority of newsreaders across all three time

periods display these features. The other settings examined are shared in various combinations by the groups (see Table 2). The high incidence of the lowered larynx, rounded (protruded) lips, and the open jaw is seen as a voice setting configuration suitable to speakers trained to enhance vocal resonance (Lessac, 1960; Linklater, 1976). The earliest group (1937–1947) is distinguished by the highest incidence of both tongue backing and the spread-lips configuration, while in the two later groups (1957–1967 and 1977–1987) tongue fronting and rounded lips are dominant. The fronting of the tongue -- and possibly open jaw -- might be attributed to the increased influence of the American accent on Canadian English since the Second World War (Warkentyne & Brett, 1981). Nevertheless, the overall voice quality configurations for CBC Radio newsreaders do differ both from those identified for American English by Esling & Wong (1983), and from those for British English by Honikman (1964).

The individual vowel analyses suggest a vowel shift in progress. Although the lack of the vocalic opposition in words like *cot/caught* typical of Canadian English was observed in the newsreader speech, an auditory impression of a gradual, slight fronting of the low back vowel /ɒ/ was gained from listening to the thirty newscasts chronologically. In addition, the low front vowel /æ/ shows a significant correlation in F values among CBC newsreaders of the 1977–1987 period only. Taken together, these two are seen as a "solidifying" of /æ/ in order to "make room" for the fronting of /ɒ/ and to preserve the distinction between the low vowels.

Statistical tests of vowel formant values show that the speech of CBC Radio newsreaders cannot be associated with any particular class of the Vancouver

Survey. The ranges in combined averaged F values do not vary greatly for the two low vowels /æ/ and /ɒ/. However, the differences in the averaged F1,F2 values for the high back vowel /u/ suggest auditorily perceptible differences across the two informant groups. The finding of a correlation of formant values only within CBC vowels suggests that newsreading represents a more defined standard than does the Canadian English of the Vancouver region. The formant measurements and statistical tests of /u/ showed extensive variation among both CBC Radio newsreaders and Vancouver Survey informants. The high back vowel phoneme remains ill-defined for Canadian English.

Both the examination of voice quality settings and analyses of vowels taken from the three test periods show a far greater uniformity in speech production during the middle period (1957-1967), just prior to adjustments in CBC Radio newscast format. Changes in editorial and management policy around the mid-1960s resulted most noticeably in great modifications to the tempo of newsreading. The news announcer was no longer required to read for fifteen minutes straight. Many breaks in the text were introduced through the inclusion of reporters' voices, and through turn-taking by two newsreaders on the major newscasts, *World at Six* and *World Report*. Sentence length has not changed considerably, but the phrases have been lengthened and the pauses have been shortened (see Tables 7 and 8). A drastic reduction in the percentage of silent time within the newscast has been the result. At the same time, no reduction of articulation rate, measured in syllables per second, was apparent. These results indicate that the newsreaders are exceptionally skilled speakers.

The voice dynamic component in CBC Radio newscasts has changed over the years. The pause is no longer used so extensively to clarify sentence and story organization for the audience. An assumption is that pitch fluctuations are now used far more in order to structure the text orally. This greater pitch movement was observed during the preparation of the thirty transcriptions, but the effect on comprehension of the newscasts (for the author) was not perceptibly different from one rate to the other. This clarity is the result of the controlled articulation rates of the newsreaders.

The CBC is an excellent subject and source for the study of radio speech. However, not all policies and procedures of the past fifty years are conveniently well-documented. The primary, ongoing concern of the Corporation has been the production of quality programs. Early recording technology was cumbersome, and those involved were not always concerned with the potential historical value of their work. For the most part, radio broadcasts dispersed into the air at the moment of presentation. Through the years, CBC departments have grown and shrunk, been decentralized and recentralized, and have undergone numerous changes in personnel and priorities. Conflicts over limited space (and time and money) have caused large volumes of stored materials to be summarily trashed. For many years preservation was arbitrary and haphazard and, as a result, gaps exist in both audio and written records. Nevertheless, huge amounts of broadcast material have been amassed in various private, corporate, and public collections across the country. These resources are still in the process of being catalogued.

The thirty transcriptions of this study constitute the first such collection of CBC newscasts. Copies of the transcriptions, complete with the names of the

newsreaders, have been sent to the CBC Radio Program Archives and the CBC Reference Library in Toronto, and to the NFTSA, Ottawa, to be available for use in future research.

Recorded broadcasts are readily-available resources for linguistic studies in formal and informal speech styles. Because of the findings regarding controlled articulation rates, CBC Radio newscasts might prove to be particularly suitable for psycholinguistic tests of the effects of intonation patterns and speech rate on listener perception and comprehension. The results of this study of CBC Radio newsreaders also await comparative acoustical analyses with samples from other Canadian studies. A comparison with the speech of Ottawa informants (Woods, 1979) might be particularly rewarding, considering the extensive phonological comparison between Ottawa and Vancouver that has already been done (de Wolf, 1988).

The accent of CBC Radio newsreading is General Canadian; the stronger regional dialect accents such as Ottawa Valley and Newfoundland are not usually heard over the CBC National News Service. The voices of CBC Radio newsreaders are not strictly uniform but, collectively, they represent a national standard for formal Canadian speech.

The role of the radio newsreader has changed over the years. From being one of sole dispenser of information, the newsreading task has expanded to include introducing and summarizing on-site voice reports. Changes in newscasting are likely to continue into the future, particularly as a result of developments in communications technology. Extremely compact, portable transmitting equipment and satellite relays now allow reports to be received instantly from all around the

world. Since the technology exists, it is conceivable that one day newscasts could consist entirely of reporters speaking from remote locations without a newsreader to create a bridge between them. Yet, the human element in communication remains. The introduction of the assorted accents inherent in a "global news" format would result in a loss of the accustomed CBC standard. The current generation of CBC Radio listeners might not readily accept such a drastic shift in news style. The majority of older listeners still prefer to hear male, rather than female, newsreaders (CBC, *1988 Qualitative radio study*). Language attitudes are slow to change and CBC Radio is highly responsive to the results of its audience surveys. News language does not introduce speech innovation but, rather, reflects the expectations of the speech community. For these reasons, the voices of CBC Radio newsreaders serve well to illustrate conservative, formal Canadian speech throughout the decades.

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Rae, John. (174, December 12). A rose by any other name. *The Globe and Mail.*

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Silbert, Dave. (1985). Beyond rip and read. *Content Magazine*, p. 2.

This McArthur was a General too: He fought for CBC News, and is now writing its history. (1966, May 23). *Montreal Gazette*, p. 14.

Too bad. (1962, October 16). *Toronto Telegram*, p. 18.

Union demands CBC fire Burke; Deifenbaker fears partisan news. (1966, November 10). *The Globe & Mail*, p. 15.

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APPENDIX A

DATES OF TRANSMISSION

Recording #	Date (YYMMDD)	Speaker #
Group A (1937–1947)		
1	371201	901
2	410617	902
3	430507	903
4	431200	904
5	440606	905
6	450423	906
7	450925	907
8	460201	908
9	461010	909
10	471118	910
Group B (1957–1967)		
11	570524	911
12	581104	912
13	630507	913
14	631203	914
15	640606	915
16	650423	916
17	650925	917
18	660201	918
19	661010	919
20	671120	920
20x	671128	921

x = Second newsreader of a two-reader format.

Recording #	Date (YYMMDD)	Speaker #
Group C (1977–1987)		
21	770524	922
21x	770524	923
22	781105	924
23	830508	925
24	831204	926
25	840606	927
25x	840606	928
26	850423	929
26x	850423	930
27	861010	931
27x	861010	932
28	871108	933
29	871119	934
30	871201	935

x = Second newsreader of a two-reader format.

APPENDIX B

ENVIRONMENTS OF VOWEL TOKENS

Words excerpted from recorded newscasts -- as sources for acoustic analysis of vowel nuclei.

Group A (1937-1947)

/æ/		/ɒ/		/u/	
4001	Africa	6001	fall	8001	Vancouver
4002	straggling	6002	columns	8002	excluded
4003	battleships	6003	probably	8003	two
4004	Africa	6004	brought	8004	troops
4005	attacks	6005	fall	8005	two
4006	last	6006	thought	8006	super
4007	Jack	6007	stopped	8007	
4008	collapsed	6008		8008	two
4009	captured	6009	off	8009	good
4010	valley	6010	on	8010	pursuit
4011	have	6011	all	8011	route
4012	spectacular	6012	Florence	8012	do
4013	dagger	6013	assault	8013	
4014	attacks	6014	operation	8014	two
4015	task	6015	fought	8015	intruder
4016	half	6016	roughshod	8016	
4017	last	6017	all	8017	super
4018	have	6018	opposition	8018	two
4019	back	6019	docks	8019	two
4020	that	6020	Ottawa	8020	juvenile
4021	pass	6021	voluntary	8021	

Group A (1937–1947) (cont.)

/æ/		/ɒ/		/u/	
4022	Palestine	6022	withdrawal	8022	
4023	attacks	6023	caused	8023	
4024	that	6024	policy	8024	
4025	overcast	6025	all	8025	two
4026		6026	fog	8026	
4027	back	6027	saw	8027	
4028	battered	6028	all	8028	good
4029	battles	6029	followers	8029	two
4030	badly	6030	obvious	8030	Guggiara

Group B (1957–1967)

/æ/		/ɒ/		/u/	
4031	capital	6031	law	8031	grew
4032	attacked	6032	shot	8032	
4033	adequate	6033	documents	8033	
4034	gas	6034	following	8034	
4035	battle	6035	tossing	8035	two
4036	balloting	6036	already	8036	through
4037	satellite	6037	rocket	8037	looping
4038	passing	6038	Ottawa	8038	Cooper
4039	last	6039	cod	8039	includes
4040	match	6040	Washington	8040	
4041	added	6041	consolidation	8041	Kruschev
4042	Castro-ites	6042	called	8042	concluding
4043	part	6043	college	8043	
4044	dam	6044	fall	8044	schools
4045	passed	6045	laws	8045	poor
4046	tax	6046	auto	8046	
4047	attacked	6047	provinces	8047	U.S.
4048	planned	6048	caused	8048	retooling
4049	Pakistani	6049	called	8049	
4050	Halifax	6050	call	8050	supervise
4051	platform	6051	co-operative	8051	Vancouver
4052	half	6052	stop	8052	super
4053	last	6053	off	8053	schoolchildren
4054	action	6054	stop	8054	including
4055	national	6055	Ottawa	8055	two
4056	after	6056	policies	8056	improvement
4057	last	6057	not	8057	U.S.
4058	devaluation	6058	shockwaves	8058	news
4059	challenge	6059	Ottawa	8059	throughout
4060	Vietnam	6060	Ontario	8060	
4061	Callaghan	6061	stock	8061	
4062	chancellor	6062	opposition	8062	hoots
4063	that	6063		8063	soon

Group C (1977–1987)

/æ/		/ɒ/		/u/	
4064	Haslam	6064	Holland	8064	news
4065	Valerie	6065	hostages	8065	continue
4066	disaster	6066	tolerating	8066	removed
4070	Palestinians	6070	offices	8070	
4071	actions	6071	shops	8071	future
4072	Africa	6072	occupied	8072	Vancouver
4073	Alvin	6073	Jonn	8073	
4074		6074	Montreal	8074	
4075		6075		8075	choose
4076	blasted	6076	rocket	8076	two
4077	attack	6077	shot	8007	Druze
4078	batteries	6078	Washington	8078	two
4079	allied	6079	all	8079	
4080	collapse	6080	colleague	8080	
4081	gathered	6081	also	8081	
4082	Punjab	6082	also	8082	
4083	Halifax	6083		8083	newsrooms
4084	Atlantic	6084	top	8084	news
4088	national	6088	Oxley	8088	
4089	and	6089	cross	8089	newsroom
4090	and	6090	top	8090	news
4091	campaign	6091	Bob	8091	news
4092	that	6092	Gorbachov	8092	human
4093	that	6093	Gorbachov	8093	moves
4094	national	6094	contract	8094	
4095	hand	6095	Moscow	8095	to
4096	hand	6096	Washington	8096	who
4097	gathered	6097	hostages	8097	two
4098	attack	6098	hostages	8098	two
4099	faction	6099	law	8099	Abu
4100	Haslam	6100	shot	8100	municipal
4101	Catholics	6101	all	8101	
4102	landslide	6102	dollars	8102	Bruce
4103	back	6103	not	8103	
4104	attacked	6104	Ottawa	8104	Mulroney
4105	last	6105	object	8105	Vancouver

APPENDIX C

VOICE QUALITY ADVICE IN CBC PUBLICATIONS.

Handbook for announcers (CBC, 1946).
Avoid *

*close jaw and tongue retraction: "There is a tendency to slur a consonant occurring between two vowels, especially the letter *t* -- e.g., le'er for letter" (p. 9). (cf. *You don't say 2*(4)).

"The letter *l*... too often becomes a sound which may be awkwardly represented by *se-oof*, for self. It should be fully articulated with the point of the tongue definitely touching the roof of the mouth just above the top teeth" (p. 9). (cf. *You don't say 2*(3), *2*(4)).

*tongue retraction: "When *r* in post-vocalic positions is pronounced, care must be taken not to retract or curl back the tongue too far. No pure vocal tone can be produced with the tongue completely curled back" (p. 9).

*substitution of a higher vowel: "The *a* in marriage, carry, etc., must not acquire the *e* sound as in merry" (p. 10). (cf. *You don't say 1*(15), *2*(4); also *Generally speaking 1*(43), *2*(26)).

* palatalization: " *T* and *D* must not acquire too much of the sound of *j* in such words as duty" (p. 10).

You don't say (1975–1983), six volumes. Avoid *

*spread lips with nasalization "Haow, naow, braown, caow, ... etc. The tendency to put an 'a' sound before the 'ow' in words such as those listed here appears to be growing in Canada. The sound 'aow' in these instances is incorrect, and offensive to many Canadians" (vol. 1(2)) (cf vol 2(4) and "The use of this American sound").

*close jaw "the ear must be trained to hear the words accurately, then the mouth and voice must be used to reproduce those sounds with equal accuracy. Otherwise,...'A Barrie area apiary' comes comes out as 'A Berrie erria ape'ry' and 'Merry Mary, marry me' sounds like 'Merry Merry, merry me'" (vol. 1(15), 2(4)). (cf. *Generally speaking* 2(26).)

*close jaw and tongue retraction: "The liquid sound of *l* is often omitted entirely or turned into a *w* in Canadian speech" (vol. 2(3)).

*"Do make an effort to give the rich, liquid, lilting illimitable lyricism to the *l*. Do not gutteralize it. Do not turn it into a *w*. And, above all, do not ignore it. – To a greater or lesser degree many speakers do all of these things" (vol.2 (4)). (cf. *Handbook*, p. 9.)

Generally speaking (1984–1986), three volumes. Avoid *

*loss of rounding from lax vowel insertion "watch for the word 'oil,' don't make it sound like 'oiyaul.' Likewise for 'school,'and 'pool'" (vol. 1(8)).

*close jaw with spread lips "you'll find many people saying 'KENADA' or even 'Kannda' and that we are 'Kinadians'... Another lazy sound to watch for is 'REEL' or 'REELY' when the speaker is intending to say 'REAL' and 'REALLY'" (vol. 1(9)). (cf. 1(36) just -> jest; 1(43) catch -> ketch; 3(11) experiment -> expeeriment; provide -> pervide; 3(15) terrorists -> tear-wrists.)

*palatalization "length ... and strength. .... make certain of the 'NG' sound in those and other like words" (vol. 1(14). (cf. 1(27) actually -> akshully.)

Some other points worthy of particular mention in a review of advice about Canadian English: the 1946 *Handbook* does not mention inter-vocalic /t/ -voicing;

You don't say (November issue, 1976) stresses the use of five different vowels in each of the words *hat, father, water, audience,* and *law;* The November, 1984, issue of *Generally speaking* suggests that the /hw/ variant in *what, where, when,* etc., is the desirable one.

APPENDIX D

VQ SETTINGS OF INDIVIDUAL CBC NEWSREADERS

Group A (1937–1947)

	lip	jaw	tng	nas	lrx	tns	crk
901	Rnd	Opn	2B	2D	1R	Tns	Mod
902	Rnd	Opn	2B	1D	Neu	Neu	1C
903	Spr	Opn	1F	1N	2L	Neu	3C
904	Neu	Opn	1B	1N	1R	Tns	1C
905	Spr	Cls	2B	1N	2L	Neu	1C
906	Neu	Opn	1F	3N	1R	Lax	2C
907	Rnd	Opn	1B	1D	2L	Neu	1C
908	Spr	Cls	2B	1N	1L	Neu	1C
909	Spr	Opn	2F	1N	1L	Tns	1C
910	Spr	Opn	2B	1N	1R	Tns	Mod

Group B (1957–1967)

	lip	jaw	tng	nas	lrx	tns	crk
911	Rnd	Opn	2F	1D	2L	Neu	Mod
912	Neu	Opn	1B	Neu	1L	Neu	Mod
913	Rnd	Opn	2B	1N	1L	Neu	1C
914	Neu	Opn	1B	1N	2L	Tns	2C
915	Rnd	Opn	1B	1D	2L	Neu	2C
916	Rnd	Opn	2F	2N	2L	Tns	2C
917	Neu	Opn	2B	1D	1L	Tns	1C
918	Spr	Cls	2F	3D	Neu	Lax	2C
919	Rnd	Opn	2F	Neu	2L	Neu	2C
920	Neu	Cls	1F	1D	Neu	Tns	Mod

Group C (1977–1987)

	lip	jaw	tng	nas	lrx	tns	crk
924	Rnd	Opn	2F	2N	1L	Neu	2C
925	Rnd	Opn	1B	1N	1L	Neu	Mod
926	Spr	Cls	1B	1N	2L	Lax	1C
927	Rnd	Opn	2B	1N	2L	Tns	1C
930	Rnd	Opn	1F	2D	1R	Tns	1C
931	Spr	Cls	2F	Neu	2L	Tns	2C
932	Neu	Opn	1F	Neu	1R	Tns	1C
933	Neu	Opn	2B	1D	1L	Neu	1C
934	Rnd	Opn	1F	1N	1L	Neu	Mod
935	Rnd	Opn	1F	1N	1R	Tns	Mod

APPENDIX E

INDIVIDUAL MEAN FORMANT VALUES - CBC

Group A (1937–1947)

Group A Vowel /æ/ Individual formant values.

	Formants			Standard Deviations		
	F1	**F2**	**F3**	**F1**	**F2**	**F3**
901	721	1256	2270	48	131	316
902	607	1326	2273	44	56	315
903	659	1516	2347	50	162	72
904	646	1464	2287	38	124	220
905	631	1351	2470	21	62	111
906	622	1653	2476	42	65	101
907	736	1476	2526	39	46	384
908	657	1346	2465	33	116	67
909	614	1673	2531	44	117	91
910	662	1425	2300	37	120	219
Totals	**655**	**1449**	**2394**	**40**	**100**	**108**

Group A Vowel /ɒ/ Individual formant values.

	Formants			Standard Deviations		
	F1	**F2**	**F3**	**F1**	**F2**	**F3**
901	747	1101	2458	47	87	211
902	550	1022	2590	33	174	445
903	570	1275	2310	79	38	134
904	613	1329	2501	49	285	241
905	667	1052	2392	49	119	158
906	565	1012	2292	44	93	149
907	703	1083	2446	71	119	299
908	629	971	2459	50	59	106
909	501	1158	2353	47	77	145
910	702	1062	2470	30	123	238
Totals	**635**	**1106**	**2427**	**77**	**115**	**91**

Group A Vowel /u/ Individual formant values.

	Formants			Standard Deviations		
	F1	F2	F3	F1	F2	F3
901	456	1307	2371	53	163	522
902	363	1078	2413	21	62	158
903	443	1261	2268	57	77	100
904	334	1287	2256	22	153	129
905	344	1307	2412	41	50	193
906	363	1239	2343	17	300	131
907	332	1241	2566	14	200	174
909	263	1328	2372	20	142	178
910	321	1234	2213	46	79	84
Totals	**358**	**1254**	**2357**	**60**	**74**	**105**

Group B (1957–1967)

Group B Vowel /æ/ Individual formant values.

	Formants			Standard Deviations		
	F1	F2	F3	F1	F2	F3
911	643	1539	2199	32	57	140
912	681	1248	2249	32	160	104
913	665	1287	2333	35	73	89
914	603	1355	2358	25	93	127
915	623	1316	2259	38	184	128
916	673	1450	2418	41	133	335
917	660	1308	2502	25	84	99
918	658	1446	2683	29	163	175
919	606	1373	2329	31	58	101
920	676	1343	2614	31	148	104
921	565	1228	2302	42	127	121
Totals	**641**	**1354**	**2386**	**37**	**93**	**154**

Group B Vowel /ɒ/ Individual formant values.

	Formants			Standard Deviations		
	F1	F2	F3	F1	F2	F3
911	625	1063	2460	31	117	151
912	635	944	2315	27	48	164
913	642	1093	2441	40	97	123
914	551	909	2385	37	111	74
915	576	1024	2335	25	65	103
916	612	1009	2089	30	101	66
917	588	966	2458	59	64	94
918	597	1156	2675	35	57	178
919	584	1043	2482	29	69	147
920	636	1107	2723	50	23	174
921	594	1036	2420	51	44	200
Totals	**604**	**1032**	**2435**	**28**	**73**	**170**

Group B Vowel /u/ Individual formant values.

	Formants			Standard Deviations		
	F1	F2	F3	F1	F2	F3
911	339	1234	2160	14	2	31
912	349	1075	2344	49	125	172
913	333	1174	2287	19	111	113
914	404	1133	2072	18	74	323
915	381	855	2512	20	48	116
916	364	1071	2290	13	186	19
917	348	1113	2259	18	202	68
918	336	1065	2563	41	170	82
919	358	1010	2326	45	67	124
920	348	1280	2409	71	77	152
921	369	1021	2269	86	239	32
Totals	**357**	**1094**	**2317**	**21**	**115**	**141**

Group C (1977–1987)

Group C Vowel /æ/ Individual formant values.

	Formants			Standard Deviations		
	F1	F2	F3	F1	F2	F3
923	617	1335	2332	57	87	63
924	585	1288	2213	33	67	45
925	757	1220	2379	12	33	109
926	602	1377	2161	44	151	111
927	672	1368	2348	30	108	128
928	619	1295	2288	40	101	209
930	594	1593	2336	22	151	49
931	538	1572	2290	20	169	46
932	571	1544	2466	35	95	61
933	634	1459	2254	72	160	137
934	574	1375	2253	79	65	111
935	674	1378	2557	40	136	136
Totals	**620**	**1400**	**2323**	**58**	**118**	**108**

Group C Vowel /ɒ/ Individual formant values.

	Formants			Standard Deviations		
	F1	F2	F3	F1	F2	F3
923	618	1026	2329	88	32	129
924	569	1147	2200	64	138	263
925	667	999	2396	62	126	118
926	588	966	2198	28	143	80
927	574	946	2484	36	101	102
928	617	1225	2331	53	121	109
930	658	1070	2227	54	62	49
931	551	1146	2209	47	112	179
932	579	1067	2461	19	175	88
933	707	1077	2426	58	104	66
934	535	1031	2274	44	143	129
935	625	1056	2506	59	163	164
Totals	**606**	**1066**	**2337**	**53**	**82**	**121**

Group C Vowel /u/ Individual formant values.

	Formants			Standard Deviations		
	F1	F2	F3	F1	F2	F3
923	376	1198	2254	73	328	113
924	321	1349	2109	26	356	28
925	296	1512	2327	7	149	110
926	303	1078	2384	18	96	150
928	319	1251	2451	19	203	288
930	288	1314	2228	17	114	22
931	357	1047	2297	27	131	89
932	270	1246	2311	28	100	140
933	355	1066	2229	24	73	53
934	346	1346	2060	47	281	30
935	358	1118	2276	5	90	139
Totals	**326**	**1229**	**2266**	**34**	**145**	**111**

APPENDIX F

VOWEL FORMANT DATA - CBC

Vowel /æ/

Group A	Formants	SD	Min.	Max.
F1	655	46	588	736
F2	1449	146	1256	1719
F3	2394	108	2270	2531

Group B	Formants	SD	Min.	Max.
F1	641	37	565	681
F2	1354	93	1228	1539
F3	386	154	2199	2683

Group C	Formants	SD	Min.	Max.
F1	620	58	538	757
F2	1400	118	1220	1593
F3	2323	108	2161	2557

Vowel /ɒ/

Group A	Formants	SD	Min.	Max.
F1	635	77	501	747
F2	1106	115	971	1329
F3	2427	91	2292	2590

Group B	Formants	SD	Min.	Max.
F1	604	28	551	642
F2	1032	73	909	1156
F3	2435	170	2089	2723

Group C	Formants	SD	Min.	Max.
F1	606	53	535	707
F2	1066	82	946	1225
F3	2337	121	2198	2506

Vowel /u/

Group A	Formants	SD	Min.	Max.
F1	358	60	263	456
F2	1254	74	1078	1328
F3	2357	105	2213	2556

Group B	Formants	SD	Min.	Max.
F1	357	21	333	404
F2	1094	115	855	1280
F3	2317	141	2072	2563

Group C	Formants	SD	Min.	Max.
F1	326	34	270	376
F2	1229	145	1047	1512
F3	2266	111	2060	2451

APPENDIX G

ANALYSES OF CORRELATION - CBC

Vowel /æ/

Group A

	F1	F2	F3
F1	....	-.442 (p=.20)	-.114 (p=.75)
F2	-.442 (p=.20)	....	+.552 (p=.09)
F3	-.114 (p=.75)	+.552 (p=.09)	....

Group B

	F1	F2	F3
F1	....	+.210 (p=.53)	+.359 (p=.27)
F2	+.210 (p=.53)	....	+.140 (p=.68)
F3	+.359 (p=.27)	+.140 (p=.68)	....

Group C

	F1	F2	F3
F1	....	-.612 (p=.03)	+.369 (p=.23)
F2	-.612 (p=.03)	....	+.127 (p=.69)
F3	+.369 (p=.23)	+.127 (p=.69)	....

Vowel /ɒ/

Group A

	F1	F2	F3
F1	....	+.022 (p=.95)	+.092 (p=.80)
F2	+.022 (p=.95)	....	−.134 (p=.71)
F3	+.092 (p=.80)	−.134 (p=.71)	....

Group B

	F1	F2	F3
F1	....	+.431 (p=.18)	+.125 (p=.71)
F2	+.431 (p=.18)	....	+.617 (p=.04)
F3	+.125 (p=.71)	+.617 (p=.04)	....

Group C

	F1	F2	F3
F1	....	−.010 (p=.97)	+.323 (p=.33)
F2	−.010 (p=.97)	....	−.285 (p=.39)
F3	+.323 (p=.33)	−.285 (p=.39)	....

Vowel /u/

Group A

	F1	F2	F3
F1	....	−.070 (p=.85)	−.113 (p=.77)
F2	−.070 (p=.85)	....	−.139 (p=.72)
F3	−.113 (p=.77)	−.139 (p=.72)	....

Group B

	F1	F2	F3
F1	....	−.426 (p=.19)	−.319 (p=.33)
F2	−.426 (p=.19)	....	−.421 (p=.19)
F3	−.319 (p=.33)	−.421 (p=.19)	....

Group C

	F1	F2	F3
F1	....	−.457 (p=.15)	−.277 (p=.40)
F2	−.457 (p=.15)	....	−.259 (p=.44)
F3	−.259 (p=.40)	−.259 (p=.44)	....

APPENDIX H

ANALYSES OF VARIANCE - CBC

Vowel /æ/

	multivariate test p value	univariate test p values	
V4A by V4B	F1*F2 p=.143	F1 p=.42	F2 p=.07
V4A by V4C	F1*F2 p=.079	F1 p=.12	F2 p=.38
V4B by V4C	F1*F2 p=.487	F1 p=.32	F2 p=.31

Vowel /ɒ/

	multivariate test p value	univariate test p values	
V6A by V6B	F1*F2 p=.181	F1 p=.42	F2 p=.09
V6A by V6C	F1*F2 p=.471	F1 p=.54	F2 p=.31
V6A by V6C	F1*F2 p=.651	F1 p=.83	F2 p=.35

Vowel /u/

	multivariate test p value	univariate test p values	
V8A by V8B	F1*F2 p=.011	F1 p=.86	F2 p=.002
V8A by V8C	F1*F2 p=.413	F1 p=.22	F2 p=.71
V8B by V8C	F1*F2 p=.031	F1 p=.02	F2 p=.02

APPENDIX I

INDIVIDUAL MEAN F VALUES – VANCOUVER SURVEY

MM1

	/æ/		/ɒ/		/u/	
	F1	**F2**	**F1**	**F2**	**F1**	**F2**
	592	1456	594	1041	371	1028
	629	1469	642	1003	425	1067
	692	1618	664	986	432	892
	541	1333	582	1047	392	1283
	586	1631	623	1133	376	986
	582	1528	584	1035	413	1141
	607	1484	556	979	440	1125
	649	1323	550	969	405	1032
MM1 mean	**610**	**1480**	**599**	**1024**	**407**	**1069**

MM2

	/æ/		/ɒ/		/u/	
	F1	**F2**	**F1**	**F2**	**F1**	**F2**
	692	1343	608	876	371	1028
	589	1391	593	985	418	1235
	650	1507	600	1004	371	1497
	711	1190	675	950	421	1251
	557	1456	599	1196	362	1502
	551	1395	577	965	373	1622
	626	1294	583	1002	336	1285
	575	1368	566	1132	397	1420
MM2 mean	**619**	**1368**	**600**	**1014**	**381**	**1355**

MM3

	/æ/		/ɒ/		/u/	
	F1	**F2**	**F1**	**F2**	**F1**	**F2**
	520	1427	522	1088	324	1436
	643	1150	622	1009	390	1250
	661	1627	592	1032	402	1387
	468	1458	552	1661	354	1561
	636	1507	577	938	421	1389
	484	1515	553	1258	346	1397
	527	1566	547	980	348	1411
	619	1331	604	965	339	1291
MM3 mean	**570**	**1448**	**571**	**1116**	**365**	**1390**

MM4

	/æ/		/ɒ/		/u/	
	F1	**F2**	**F1**	**F2**	**F1**	**F2**
	666	1275	610	989	388	1294
	711	1367	664	1003	383	1205
	568	1395	536	1055	335	1809
	699	1748	608	986	416	1301
	775	1409	652	939	371	1247
	687	1345	645	958	378	1511
	692	1630	683	995	421	1277
MM4 mean	**685**	**1452**	**628**	**989**	**385**	**1378**

APPENDIX J

TESTS OF CORRELATION – VANCOUVER SURVEY

Vowel /æ/

Group	n.	mean F1	std dev.	mean F2	std dev.	correlation	p=
4MM1	8	610	46	1480	113	+.283	.49
4MM2	8	619	61	1368	97	+.539	.16
4MM3	8	570	78	1448	149	+.221	.59
4MM4	8	685	61	1452	170	+.143	.75

Vowel /ɒ/

Group	n.	mean F1	std dev.	mean F2	std dev.	correlation	p=
6MM1	8	599	40	1024	53	+.217	.60
6MM2	8	600	33	1014	102	−.365	.37
6MM3	8	571	33	1116	241	−.381	.35
6MM4	8	628	49	989	36	−.642	.11

Vowel /u/

Group	n.	mean F1	std dev.	mean F2	std dev.	correlation	p=
8MM1	8	407	25	1069	116	−.057	.89
8MM2	8	381	28	1355	190	−.193	.64
8MM3	8	365	34	1390	93	−.232	.57
8MM4	8	385	29	1378	213	−.719	.06

APPENDIX K

TESTS OF VARIANCE – VANCOUVER SURVEY

Vowel /æ/

	multivariate test p value	univariate test p values	
4MM1 by 4MM2	F1*F2 p=.16	F1 p=.74	F2 p=.05
4MM1 by 4MM3	F1*F2 p=.44	F1 p=.23	F2 p=.63
4MM1 by 4MM4	F1*F2 p=.05	F1 p=.01	F2 p=.71
4MM2 by 4MM3	F1*F2 p=.31	F1 p=.18	F2 p=.22
4MM2 by 4MM4	F1*F2 p=.08	F1 p=.05	F2 p=.25
4MM3 by 4MM4	F1*F2 p=.03	F1 p=.007	F2 p=.95

Vowel /ɒ/

	multivariate test p value	univariate test p values	
6MM1 by 6MM2	F1*F2 p=.97	F1 p=.97	F2 p=.80
6MM1 by 6MM3	F1*F2 p=.29	F1 p=.15	F2 p=.30
6MM1 by 6MM4	F1*F2 p=.26	F1 p=.23	F2 p=.17
6MM2 by 6MM3	F1*F2 p=.25	F1 p=.10	F2 p=.28
6MM2 by 6MM4	F1*F2 p=.46	F1 p=.20	F2 p=.53
6MM3 by 6MM4	F1*F2 p=.06	F1 p=.01	F2 p=.19

Vowel /u/

	multivariate test p value	univariate test p values	
8MM1 by 8MM2	F1*F2 p=.008	F1 p=.08	F2 p=.002
8MM1 by 8MM3	F1*F2 p=.0001	F1 p=.01	F2 p=.0001
8MM1 by 8MM4	F1*F2 p=.01	F1 p=.13	F2 p=.003
8MM2 by 8MM3	F1*F2 p=.62	F1 p=.34	F2 p=.64
8MM2 by 8MM4	F1*F2 p=.91	F1 p=.81	F2 p=.82
8MM3 by 8MM4	F1*F2 p=.51	F1 p=.26	F2 p=.88

APPENDIX L

TESTS OF VARIANCE - VANCOUVER SURVEY BY CBC

Vowel /æ/

	multivariate test p value	univariate test p values	
V4A by 4MM1	F1*F2 p=.14	F1 p=.04	F2 p=.60
V4A by 4MM2	F1*F2 p=.06	F1 p=.15	F2 p=.18
V4A by 4MM3	F1*F2 p=.03	F1 p=.009	F2 p=.99
V4A by 4MM4	F1*F2 p=.53	F1 p=.25	F2 p=.95
V4B by 4MM1	F1*F2 p=.01	F1 p=.12	F2 p=.01
V4B by 4MM2	F1*F2 p=.63	F1 p=.33	F2 p=.75
V4B by 4MM3	F1*F2 p=.03	F1 p=.01	F2 p=.11
V4B by 4MM4	F1*F2 p=.11	F1 p=.07	F2 p=.13
V4C by 4MM1	F1*F2 p=.36	F1 p=.68	F2 p=.15
V4C by 4MM2	F1*F2 p=.73	F1 p=.96	F2 p=.52
V4C by 4MM3	F1*F2 p=.30	F1 p=.11	F2 p=.44
V4C by 4MM4	F1*F2 p=.05	F1 p=.03	F2 p=.44

Vowel /ɒ/

	multivariate test p value	univariate test p values	
V6A by 6MM1	F1*F2 p=.15	F1 p=.42	F2 p=.08
V6A by 6MM2	F1*F2 p=.14	F1 p=.42	F2 p=.09
V6A by 6MM3	F1*F2 p=.25	F1 p=.09	F2 p=.90
V6A by 6MM4	F1*F2 p=.07	F1 p=.91	F2 p=.02
V6B by 6MM1	F1*F2 p=.94	F1 p=.78	F2 p=.79
V6B by 6MM2	F1*F2 p=.87	F1 p=.79	F2 p=.65
V6B by 6MM3	F1*F2 p=.09	F1 p=.03	F2 p=.28
V6B by 6MM4	F1*F2 p=.18	F1 p=.19	F2 p=.17
V6C by 6MM1	F1*F2 p=.49	F1 p=.71	F2 p=.24
V6C by 6MM2	F1*F2 p=.45	F1 p=.72	F2 p=.24
V6C by 6MM3	F1*F2 p=.24	F1 p=.09	F2 p=.48
V6C by 6MM4	F1*F2 p=.10	F1 p=.39	F2 p=.03

Vowel /u/

	multivariate test p value	univariate test p values	
V8A by 8MM1	F1*F2 p=.003	F1 p=.04	F2 p=.001
V8A by 8MM2	F1*F2 p=.21	F1 p=.29	F2 p=.15
V8A by 8MM3	F1*F2 p=.01	F1 p=.67	F2 p=.004
V8A by 8MM4	F1*F2 p=.11	F1 p=.26	F2 p=.11
V8B by 8MM1	F1*F2 p=.001	F1 p=.0003	F2 p=.65
V8B by 8MM2	F1*F2 p=.0009	F1 p=.05	F2 p=.001
V8B by 8MM3	F1*F2 p=.0001	F1 p=.56	F2 p=.0001
V8B by 8MM4	F1*F2 p=.0001	F1 p=.03	F2 p=.002
V8C by 8MM1	F1*F2 p=.0003	F1 p=.0001	F2 p=.01
V8C by 8MM2	F1*F2 p=.001	F1 p=.002	F2 p=.12
V8C by 8MM3	F1*F2 p=.002	F1 p=.03	F2 p=.01
V8C by 8MM4	F1*F2 p=.0003	F1 p=.002	F2 p=.10

APPENDIX M

GLOSSARY OF ABBREVIATIONS

BL	Broadcast Language
BN	Broadcast News
CBC	Canadian Broadcasting Corporation
CBCPA	CBC Program (Radio) Archives
DCM	Dan C. MacArthur, 1st Chief Editor, NNS
NNS	CBC National News Service, began 1 Jan. 1941
PAC	Public Archives of Canada, Ottawa.
PAC-DCM	The Formative Years - unfinished ms. in PAC, written by Dan C. MacArthur (DCM)
PAC-MG	PAC Manuscript Group
PAC-RG	PAC Radio Group