

## Research Portal

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### Application - Insight Development Grants

#### Identification

##### Applicant

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**Family Name:** Arnhold

**First Name:** Anja

**Middle Names:**

**Current Position:** Assistant professor

**Primary Affiliation:** University of Alberta

**Department/Division:** Linguistics

##### Application

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**Application Title** Speech prosody of new vs. shared information in Canadian English

**Committee** 13 - Anthropology, archaeology, linguistics and translation

**Joint or special initiative** Select

**Is this a [research-creation project](#)?**  
 Yes  No

**Does your proposal involve [Aboriginal Research](#) as defined by SSHRC?**  
 Yes  No

##### Scholar Type

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**Are you an [Emerging Scholar](#) or [Established Scholar](#)?** Emerging

Have you received a previous grant (with the exception of a fellowship and/or knowledge mobilization grant) as principal investigator or project director, through any of the following organizations: SSHRC, Natural Sciences and Engineering Research Council, or Canadian Institutes of Health Research?

Yes  No

When did or will you obtain your highest degree? For doctoral and master's degrees, this is the thesis defense date for the first highest degree obtained.

2013-06

Confirmed Scholar Type  Emerging

### Administering Organization

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**Organization** University of Alberta

**Department/Division** Linguistics

### Invitations

Role	Last Name	First Name	Organization	Department
Collaborator	Nadasdi	Terry	Alberta Foundation for the Arts	Linguistics

### Activity Details

#### Certification Requirements

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Yes  No

Does the proposed research involve humans as research participants?

Yes  No

Does the proposed research involve animals?

### Environmental Impact

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Yes  No

**A. Will any phase of the proposed research take place on federal lands in Canada, other than lands under the administration and control of the Commissioner of Yukon, the Northwest Territories or Nunavut, as interpreted in section 2(1) of the [Canadian Environmental Assessment Act, 2012](#) (CEAA 2012)?**

 Yes  No

**B. Will any phase of the proposed research take place outdoors and outside of Canada?**

 Yes  No

**C. (i) Will the grant permit a designated project, as listed in the CEAA 2012 [Regulations Designating Physical Activities](#) (RDPA), to be carried out in whole or in part?**

**OR (ii) Will any phase of the proposed research depend on a designated project, as listed in the RDPA, being carried out by a third party? [Regulations Designating Physical Activities](#)**

 Yes  No

### Keywords

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**List up to 10 keywords that best describe the proposal.**

Prosody, Intonation, Linguistics, Phonology, Phonetics, Canadian English, Canada, Information structure, Sociolinguistics, Dialectology

### Disciplines

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**Indicate and rank up to three disciplines relevant to your proposal, with #1 the most relevant and #3 the least relevant.**

1. Linguistics Phonology
2. Linguistics Phonetics
3. Linguistics Sociolinguistics

### Areas of Research

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**Indicate and rank up to three areas of research relevant to your proposal, with #1 the most relevant and #3 the least relevant. If you select "Not Subject to Research Classification" in #1, the system will automatically remove any other areas of research when you save this page.**

1. Communication
2. Science and technology
3. Education

### Temporal Periods

**Indicate up to two historical periods covered by your proposal.**

	From		To	
	Year	Period	Year	Period
1.	<input type="text"/>		<input type="text"/>	
2.	<input type="text"/>		<input type="text"/>	

### Geographical Regions

**Indicate and rank up to three geographical regions relevant to your proposal, with #1 the most relevant and #3 the least relevant.**

1. Western Canada
2. Central Canada
3. Atlantic Provinces

### Countries

**Indicate and rank up to five countries relevant to your proposal, with #1 the most relevant and #5 the least relevant.**

1. Canada
- 2.
- 3.
- 4.
- 5.

### Revisions since previous application

In evaluating my previous application, the committee commented that the proposal was very interesting and promising, but should explore potential outcomes and theoretical implications in more detail. I agree that I had not been very clear in stating the importance of having a basic description of Canadian English speech prosody as an indispensable foundation for both theoretical and applied research. I have revised the application, most importantly the summary and the detailed description, to better reflect the stimulating effect I expect this research to have, if funded. I have also made clearer how the theoretical description (an inventory of accents and boundary tones) would be derived from the collected data.

The committee further judged that the methods could benefit from more refinement. In response, I have clarified and added more details to the methods section of the detailed description. I have also added preliminary results from a pilot study I conducted since the last application. The completion of this pilot study fulfilled the first phase

(two months) of my previous research plan, giving more time to the remaining phases and streamlining the plan.

## Summary of Proposal

Unlike Standard American English, Canadian English is vastly understudied regarding intonation or prosody, i.e. the melody and rhythm of speech. This is particularly problematic because prosody performs many functions that are crucial to communication, e.g. distinguishing questions from statements. Because of its many functions, prosody also interfaces with most other components of the linguistic system. This means that a lack of understanding of prosody impacts most theoretical and applied research that involves spoken language in ways that are poorly understood. The proposed project forms the first step in a larger program to address this gap by examining how speakers of Canadian English use prosody to distinguish new information from information that is already shared.

The development of a standardized annotation system for Standard American English prosody has had an impact on the field that is hard to overstate: It has given researchers the tools to consistently code speech data obtained in controlled lab experiments, allowing them to compare different studies and thus evaluate theoretical models of prosody. It has also enabled the manual and in some cases even automatic annotation of large corpora of spontaneous conversations, opening them up for data mining and computational modelling. This has benefitted not only research in linguistics and other fields, but also applications in speech technology, allowing advances in automatic speech recognition and synthesis.

However, while standardized annotation systems have subsequently been developed for many languages and language variants, there is no such system for Canadian English. Importantly, we cannot simply assume that Canadian English prosody is the same as for Standard British or American English. Indeed there is preliminary evidence that Canadian English prosody differs from both of the other variants and deserves an investigation of its own.

The current project will focus on one of the core functions of prosody: the highlighting of new and important information. Speakers regularly transmit new information by relating it to information of which the listener is already aware. In most languages, they highlight new information prosodically, meaning that they will pronounce the same sentence differently depending on the question it answers, e.g.:

- (1) A: What sport does everyone love?  
B: Everyone loves hockey.
- (2) A: Who loves hockey?  
B: Everyone loves hockey.

However, the exact form of the difference depends on the prosodic system of the language, which is a part of grammar. Therefore, it differs between languages as well as between varieties of the same language.

The project will investigate how Canadian English speakers use prosody to mark new information, as well as how speakers perceive this marking. The first part will largely concentrate on a relatively homogeneous group, University of Alberta undergraduate students, but will acoustically analyze and statistically model both scripted speech and spontaneous conversation. The second part of the project will broaden the scope to include Canadian English speakers of various ages, occupations and education levels from all over Canada in a perception study.

The outcome of the project will be a detailed analysis of an important communicative function of prosody, which takes regional and social variation within Canada into account. The findings will further be a first step towards an overall account of Canadian English prosody and an annotation system based on it, thus laying the groundwork for a growing scientific area spanning linguistics and neighbouring fields like psychology, education, social sciences and computer science.

This research is also relevant beyond its academic interest. Canada's status as a destination for immigration makes it especially important to establish what Canadian English, one of the two official languages, is and how it works. Prosody plays a crucial role in identifying a speaker as belonging to a particular group. It is also central for

the intelligibility of non-native speakers and therefore for the successful integration of newcomers, so the project will initiate knowledge dissemination to immigration service providers and the general public.

Given the importance of language for identity, it seems particularly timely to investigate the unique characteristics of Canadian English speech just after celebrating the 150th anniversary of Confederation.

## **Roles and Responsibilities**

The research team will consist of the applicant, collaborator, a graduate student and four undergraduate students, whose roles and responsibilities are described under Roles and Training of Students.

### **Applicant**

Anja Arnhold (PhD Goethe-University Frankfurt, Germany, 2013) is an assistant professor at the University of Alberta. She will bear primary responsibility for research, student training and project management. She will derive the initial hypotheses to be tested through rating studies in phase 1 of the project, determine the design of these studies testing perception of different prosodic patterns, create the materials together with the students and supervise data collection (see Detailed Description, Timelines). She will lead analysis of the collected data and the compilation of a revised inventory of prosodic patterns that speakers perceive as contrastive. For phase 2, she will train two students, S1 and S2, in information structure annotation, i.e. the categorization of new vs. shared information in a corpus of spontaneous conversations. She will train two other students, MA and S3, in the identification of prosodic patterns in the same corpus, supervise the annotations and evaluate inter-annotator reliability, as well as testing the inventory derived from phase 1 against this second data set. Finally, she will lead dissemination of research findings, including guiding the students in contributing to resulting scientific publications, as well as engaging the general public and community stakeholders like immigration services providing English language training (see Knowledge Dissemination).

As a researcher, the applicant has made contributions to linguistic research on the prosodic systems of several languages, most importantly Finnish (Uralic), West Greenlandic and Inuktitut (Eskimo-Aleut), but she has also worked on British and Canadian English, German and the Turkic language Yakut. A focus of her work has been the prosodic marking of information structure. She has extensive expertise in designing, conducting and evaluating experimental research, both production studies and perception experiments.

The applicant also has experience in supervising graduate students in collaboration with colleagues and on her own. She also regularly involves undergraduate students in her research, as paid research assistants, interns, or via directed research courses that she teaches in addition to her regularly scheduled teaching load. In these courses, students assist in research tasks for course credit (e.g. running experimental studies with participants, preparing research materials) and present research articles to other students taking the course orally and in writing. Through this kind of collaboration and co-supervision, the applicant has established ties with her colleagues, which she will expand with this project.

As the PI in several smaller research grants, she has also acquired the necessary experience in project management. For example, she has recently received a Killam cornerstone grant and a faculty-internal SAS grant. The University of Alberta has further supported her as a new faculty member with a Capital Equipment Recruitment Fund (CERF) Special grant to buy specialized equipment for speech recording and software to conduct speech perception experiments and rating studies. These resources will be used by the current project. Combined with the fact that commonly used software for acoustic and statistical analysis (Praat, R) is free, this means no funds for equipment are requested from SSHRC.

Dr. Arnhold will be responsible for contributing 90% to the project and will spend the majority of her research time on this project (80%).

### **Collaborator**

Terry Nadasdi (PhD University of Toronto, 1995) is a full professor at the University of Alberta and an expert in sociolinguistics, Canadian French and adult second language teaching and acquisition. He will provide consultations on sociolinguistic and regional variation within Canada throughout the project. Most importantly, the applicant will seek his input in phase 1 of the project, when experimental data will be gathered from Canadian speakers with a variety of different regional and social backgrounds. In particular, the collaborator's advice will be valuable in deciding on the background information to be collected from the participants. The collaborator's expertise will likewise be useful in evaluating the resulting data, and in relating it to the studies involving a more restricted group of participants. Finally, he will contribute the sociolinguistic perspective in the overall

interpretation of the project findings.

The collaborator has extensive experience with publicizing his research in television, radio and print media in both English and French. He will employ this experience in knowledge mobilization, ensuring that the knowledge created by the project is disseminated in both of Canada's official languages.

Dr. Nadasdi's relative contribution will be 10% and he will allocate 10% of his time on this project.

## **Roles and Training of Students**

The project will employ an MA-student (MA) and three advanced undergraduate students (S1, S2, S3) to help with the time- and labour-intensive collection and annotation of speech data, and an additional undergraduate student (S4) exclusively for knowledge mobilization.

MA will be involved in all steps of conducting the perception experiment in phase 1 of the project and in prosodic annotation and data evaluation in phase 2 (19 months total, 12 hours/week; also see Detailed Description and Timelines). S1 will work with MA in phase 1 and will perform information structure annotation in phase 2 (15 months total, 12 hours/week). In phase 2, S2 will join S1 for information structure annotation (5 months total, 12 hours/week), while S3 will work with MA on prosodic annotation and take part in the analysis of the results (9 months total, 12 hours/week).

Students will gain theoretical and practical expertise in linguistics. They will further receive training in research ethics. Methodologically, they will acquire skills in conducting two types of empirical research, experimentation and quantitative analysis of corpus data. Through working with the applicant, they will learn about experimental design, statistical analysis and phonological interpretation of the results. They will also be trained to work with acoustical analysis software, and will gain insights into data management, statistical analysis and the empirically-based evaluation of linguistic hypotheses. Pairing MA and S1 with different undergraduate students further allows peer-to-peer training, giving them valuable leadership experience and allowing the undergraduates to ask questions and receive guidance not only from the applicant, but also from a fellow student.

S4 will program the project website and visualize research results (5 months total, with interruptions, 8 hours/week). They will need strong computational skills, but may or may not have a background in linguistics, visualization or communication, so that they will further expand their expertise. This also presents a chance to form connections across disciplinary boundaries, as the student will work closely with the rest of the team.

MA, S1 and S3 will also be involved in presenting the findings through publication in first-rate journals. This will give them a track-record benefiting them if they choose a scientific career, as well as transferable skills in presenting research findings. All students will further take a leading role in knowledge mobilization and dissemination reaching beyond the scientific community, training their professional communication skills.

The students will interact with the applicant and the collaborator, giving them exposure to two different, but overlapping fields in linguistics, experimental phonology/phonetics and sociolinguistics. They will also be part of a lively collaborative environment at the Department of Linguistics at the University of Alberta, where graduate and undergraduate students are actively involved in research. Moreover, as the applicant is a collaborator in the SSHRC-funded Talent Program Partnership Grant 'Words in the World' (2016-2022, PI Gary Libben, Brock University), the students will further profit from the collaborative training opportunities of this Research Training Initiative.

## **Knowledge Mobilization Plan**

We will exchange knowledge with the academic community, practitioners and the general public.

For communication with the scientific community, we will present our work at a national or international conference, e.g. Speech Prosody, International Congress of Phonetic Sciences or meetings of the Canadian

Linguistics Association. We will publish two articles in top-tier journals, e.g. Journal of Phonetics, Laboratory Phonology or Journal of Sociolinguistics, one based on each phase. This will ensure interactions with colleagues in linguistics, but also applied areas like language technology.

To engage the general public and inform public debates, we will create a website disseminating our findings starting around month 9 (also see Timelines), which will include maps visualizing our findings on variation within Canada (hosted at no cost on university server space). We will also advertise participation in the perception study conducted in phase 1 on social media. This will allow the general public to learn about and actively participate in our research. Press releases and media appearances will further publicize the website and the project's findings in year 2.

A desirable impact of the project is improved language teaching and assessment for newcomers to Canada. The project's findings will be able to inform curricula developed by policy makers and practitioners. We are aware that this is a long-term goal and will begin a reciprocal knowledge transfer in year 1 by contacting the about 20 immigration services in Edmonton providing language training to ask whether/how prosody and information structure are incorporated in their teaching and what specific knowledge of Canadian prosody they would require to improve their services.

Sustainability of knowledge mobilization will be increased by the fact that the project is part of an overarching research plan, extending several years into the future.

## Expected Outcomes

### Scholarly Benefits

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**Indicate up to three scholarly benefits of the proposed project. (required)**

1. Knowledge creation/intellectual outcomes
2. Enhanced theory
3. Student training/skill development

### Summary of Expected Scholarly Outcomes

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The project will spearhead investigation into an understudied aspect of Canadian English. It will establish a first phonological description of prosodic patterns, providing an inventory of contrasting pitch movements. This inventory will be the seed to be grown into a complete standardized annotation system in future research. A reliable annotation system for prosody is an indispensable tool for research on spoken language developing theoretical as well as applied models. Thus, the project will enable future research in linguistics and adjacent disciplines like psychology, education, social science and language technology (e.g. allowing annotation of speech corpora for theoretical and computational modelling).

Five students will be employed by the project, developing academic as well as transferable skills, interacting with other students involved in research at the department, while further students will be affected via teaching.

### Societal Benefits

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**Indicate up to three societal benefits of the proposed project.**

1. Critical knowledge
2. Cultural outcomes
3. Enriched public discourse

### Summary of Expected Societal Outcomes

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The project will fill a critical knowledge gap on a vital part of Canadian English, particularly on the varied

functions prosody performs in communication.

As prosody is also an important marker of identity, improved understanding of the specifics of Canadian English among Canadians and non-Canadians will be a valuable cultural outcome.

This will further enhance the public discourse on issues such as national identity and its adaptation in a globalized world, as the public will have more information on the complexity and variety found within Canadian English speech.

A long-term benefit may be enhanced professional practice in language teaching and assessment on the basis of the new knowledge created.

## Audiences

**Indicate up to five potential target audiences for the proposed project.**

1. Academic sector/peers
2. General public
3. Private sector companies
4. Media
5. Not-for-profit/community organizations

## Summary of Benefits to Potential Target Audiences

The academic sector will profit from the knowledge created and from the possibilities for further research that it will spark. The findings will also lay the groundwork for applied uses by private sector companies, for example in the area of speech technology. To facilitate this, we will share the data gathered by the project by depositing it in a publicly accessible repository like the Dataverse network, for further use by researchers and the general public.

Instigating research on this crucial aspect of the Canadian English language and linguistic diversity will also have benefits to the general public, informing public discussion on topics of interest and importance to Canada at this time. We expect these to be reflected in the media.

Finally, our findings have the potential to improve language teaching and assessment performed by private sector companies and not-for-profit organizations.

## Funds Requested from SSHRC

### Year 1

<b>Personnel costs</b>			
<b>Student salaries and benefits/Stipends</b>	<b>Number</b>	<b>Amount</b>	<b>Justification</b>
<b>Undergraduate</b>	1	\$11,253.00	1 student RA at \$937.73 monthly pay (\$17.76 hourly pay plus 10 % benefits = 19.54 * 12 hours/week * 4 weeks) * 12 months: \$937.73*12 = 11,252.76 [S1: perception data gathering and analysis, information structure annotation]; S4 will be paid from the applicant's start up grant (see Funds from Other Sources)

<b>Masters</b>	1	\$22,691.00	Monthly rate for RA appointment at 12 hours/week according to collective agreement (\$2,062,80), plus 10% non-discretionary benefits = \$2,269.08 * 10 months [MA: perception data gathering and analysis, prosodic annotation]
<b>Doctoral</b>			
<b>Subtotal</b>		<b>\$33,944.00</b>	
<b>Non student salaries</b>	<b>Number</b>	<b>Amount</b>	<b>Justification</b>
<b>Postdoctoral</b>			
<b>Professional/Technical Services</b>			
<b>Other</b>			
<b>Subtotal</b>		<b>\$0.00</b>	
<b>Travel and Subsistence Costs for Research</b>	<b>Number</b>	<b>Amount</b>	<b>Justification</b>
<b>Applicant/Team Member(s)</b>			
<b>Student(s)</b>			
<b>Subtotal</b>		<b>\$0.00</b>	
<b>Travel and Subsistence Costs for Dissemination</b>	<b>Number</b>	<b>Amount</b>	<b>Justification</b>
<b>Applicant/Team Member(s)</b>			
<b>Student(s)</b>			
<b>Subtotal</b>		<b>\$0.00</b>	
<b>Other Expenses</b>		<b>Amount</b>	<b>Justification</b>
<b>Supplies</b>			
<b>Non-disposable equipment</b>			
<b>Participant payments</b>		\$824.00	150 participants * \$5.49 payment for 30 minutes participation (3.25£, of which £2.50 go to the participant; data collection via homepage Prolific Academic requires a minimum payment of £5 per hour and adds a 30% commission, see <a href="https://www.prolific.ac/researchers#pricing">https://www.prolific.ac/researchers#pricing</a> )

<b>Subtotal</b>		<b>\$824.00</b>	
<b>Grand total year 1</b>		<b>\$34,768.00</b>	
<b>Year 2</b>			
<b>Personnel costs</b>			
<b>Student salaries and benefits/Stipends</b>	<b>Number</b>	<b>Amount</b>	<b>Justification</b>
<b>Undergraduate</b>	3	\$14,066.00	2 student RAs at \$937.73 monthly pay (see Year 1 for calculation) for 3 months (Months 13-15): $2 * \$937.73 * 3 = \$5,626.38$ [S1&S2: information structure annotation]; 1 student at \$937.73 monthly pay for 9 months (Months 16-24): $\$937.73 * 9 = 8,439.57$ [S3: prosodic annotation, data analysis]; S4 will be paid from the applicant's start up grant (see Funds from Other Sources)
<b>Masters</b>	1	\$20,933.00	Monthly rate for RA appointment at 12 hours/week according to collective agreement (\$2,062.80), plus 10% non-discretionary benefits = \$2,269.08 + 2.5% estimated increase = \$2,325.81 * 9 months (Months 16-24) [MA: prosody annotation, data analysis]
<b>Doctoral</b>			
<b>Subtotal</b>		<b>\$34,999.00</b>	
<b>Non student salaries</b>	<b>Number</b>	<b>Amount</b>	<b>Justification</b>
<b>Postdoctoral</b>			
<b>Professional/Technical Services</b>			
<b>Other</b>			
<b>Subtotal</b>		<b>\$0.00</b>	
<b>Travel and Subsistence Costs for Research</b>	<b>Number</b>	<b>Amount</b>	<b>Justification</b>
<b>Applicant/Team Member(s)</b>			
<b>Student(s)</b>			
<b>Subtotal</b>		<b>\$0.00</b>	
<b>Travel and Subsistence Costs for Dissemination</b>	<b>Number</b>	<b>Amount</b>	<b>Justification</b>

<b>Applicant/Team Member(s)</b>	1	\$2,750.00	The applicant or collaborator will attend one national or international conference. International conference: \$500 registration + \$1500 for airfare + \$750 accommodation costs for five nights. Costs for meals, local transport, and costs exceeding those estimates will be covered from the applicant's personal professional spending account.
<b>Student(s)</b>			
<b>Subtotal</b>		<b>\$2,750.00</b>	
<b>Other Expenses</b>	<b>Amount</b>		<b>Justification</b>
<b>Supplies</b>			
<b>Non-disposable equipment</b>			
<b>Publication fees</b>		\$2,400.00	For gold open access publication of one journal article. Estimated fees \$2400 per article, based on current pricing of target journals (Journal of Phonetics: USD1100 = \$1,396.78 + \$70 GST; Journal of Sociolinguistics: USD2500 = \$3,175 + \$159 GST). Fees for the second article will be paid from the applicant's professional personal spending account
<b>Subtotal</b>		<b>\$2,400.00</b>	
<b>Grand total year 2</b>		<b>\$40,149.00</b>	
<b>Grand total</b>		<b>\$74,917.00</b>	

### Funds from Other Sources

You must include all contributors (e.g., individuals, not-for-profit organizations, philanthropic foundations, private sector organizations) that are providing contributions for the project. Indicate whether or not these contributions have been confirmed.

If a funding source is not listed, you must:

- type the source name in Funding Source
- identify the contribution type
- enter an amount.

If you have received, from a single funding source, more than one contribution of the same type (e.g., cash) and confirmation status, you must combine these into one entry (e.g., two \$20,000 confirmed cash contributions from a university become one \$40,000 confirmed cash contribution).

For examples of Canadian and international sources of eligible cash and/or in-kind support, see [SSHRC's Guidelines for Cash and In-Kind Contributions](#).

**Note:** All contributions must be indicated in Canadian currency.

Funding Source	Contribution Type	Confirmed	Year 1	Year 2	Total
University of Alberta,	In-kind	Yes	\$5,075.00	\$500.00	\$5,575.00

Funding Source	Contribution Type	Confirmed	Year 1	Year 2	Total
Department of Linguistics					
Details	Comprises rent and maintenance for dedicated lab space to be used for gathering data in months 5-8 of the project (\$4575 for 5 months in year one), plus support for administrative assistance and more minor miscellaneous support provided for administering and conducting the project (\$500 per year).				
Applicant's personal professional spending account	Cash	Yes	\$0.00	\$2,800.00	\$2,800.00
Details	Automatic allocation of \$1,400 per year, can be carried over to the next year. To be used on open access publishing fees for one article (estimate: \$2400) and to cover travel costs exceeding funds requested from SSHRC (remaining \$400, as required).				
University of Alberta, Faculty of Arts	Cash	Yes	\$1,250.00	\$1,875.00	\$3,125.00
Details	The applicant will pay the salary for S4 from her start-up grant awarded by the University of Alberta, Faculty of Arts (current balance \$6,253). Total cost: 1 student RA at \$625.15 monthly pay (\$17.76 hourly pay plus 10 % benefits * 8 hours/week * 4 weeks) for 5 months (spread over Months 9-24): \$625.15 * 5 = \$3,125.76 [knowledge mobilization]				
Grand total					\$11,500.00

## Reviewer Exclusion

### Excluded Reviewers

Exclusion Type	Family Name / Collaboration	First Name	Initials	Organization	Department	Email
No records to display.						

## OBJECTIVES

The project will provide a first step towards a systematic description of Canadian English prosody, i.e. the rhythm and melody of spoken Canadian English. In particular, it will chart how prosody marks the distinction between new information and information that speakers expect is already shared between them and the listeners, and how listeners understand this marking. Preliminary findings indicate that Canadian English speakers use prosody differently from British and American speakers (see below), warranting further investigation.

The outcome will be a core inventory of prosodic patterns of Canadian English that will serve as the seed for an annotation system like those being used in leading theoretical and applied research on American and British English, as well as many other languages. Like for these other languages and language variants, such a core inventory will hopefully be used and expanded in future research, sparking further knowledge-creation in linguistics and other fields. It will also lay the grounds for a planned Insight Grant on the interaction of prosody and other areas of grammar. Finally, the project will give us a better understanding of the unique characteristics of Canadian English, taking into account regional and sociolinguistic variation within Canada.

## CONTEXT

### CANADIAN ENGLISH PROSODY

Canadian English is often discussed in terms of its history and British vs. American influences, mostly on the use of certain words and spellings (e.g. “chesterfield”, “centre”) or segmental phonological phenomena like vowel inventories and vowel shifts, and especially Canadian raising (Chambers 1973, 2006; Clarke, ed., 1993; Clarke et al., 1995; Boberg 2000; Labov et al., 2005; Orkin, 2015). Sometimes, prosody is mentioned in passing with the implication that Canadian English is generally similar to both American and British English and that this intermediate status extends to prosody, as well (e.g. Dodds de Wolf, 1992). Except for studies of uptalk (final rising pitch on statements, James et al., 1989; Lacey et al., 1997; Shokeir, 2008; Talla Sando, 2009), empirical studies rarely investigate the particulars of Canadian English, but often assume that Canadian speakers are representative of (North American) English more generally (Halford, 1996, 2007; Goodhue et al., 2015; Klassen et al., 2016; Wagner & McAuliffe, 2017).

Some information on how Canadian English prosody marks new vs. shared information comes from DePape et al.’s (2012) six control subjects in a study of prosodic highlighting abilities in individuals with autism spectrum disorders. The controls (132 words total) produced most words with a rise-fall contour and expanded the falling part on all new words, but the rising part only for sentence-final new words. Newness also correlated significantly with longer durations.

### PROSODY AND INFORMATION STRUCTURE

Prosody signals the difference between shared and new information (the ‘focus’ of the utterance), i.e. it marks information structure<sup>1</sup>, in many languages. Interestingly, how this works differs strongly between languages and even dialects of the same language. For example in Standard British English, words conveying new information are generally highlighted with prominent pitch falls (i.e. falling accents), while words expressing shared information carry pitch rises or no accents

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<sup>1</sup>Information structure involves several distinctions such as new vs. shared/given, focus vs. background, topic vs. comment (Krifka, 2008), which are theoretically distinguishable, but often co-extensive. For the sake of simplicity, I will only use the terms “new/focus” and “shared” here.

at all (Chen et al., 2007). In contrast, Donegal Irish English likewise frequently de-accented shared information, but places rising accents on new information (O'Reilly et al., 2010). Indian English mostly uses rises in all cases, but signals focus with prosodic phrase breaks before or after new information (Féry et al., 2016). Thus, prosodic marking of new vs. shared information depends on the overall prosodic system of a language or variety. Information structure marking is therefore commonly studied to understand prosodic systems more generally (e.g., Jun 2005, 2014).

#### THE OVERARCHING RESEARCH PLAN

As a recent hire at a Canadian university, this project would give me the opportunity to embark on a systematic study of Canadian English, an area that is both new to me and has great potential to build new knowledge for the research community at large. This project is also part of a research plan to culminate in an Insight Grant application for a project investigating the interplay of prosody and other grammatical highlighting tools like word order. The basic question is whether there is a trade-off between different grammatical tools or whether they are used additively (Is prosodic prominence the same or weaker in a sentence with marked word order than in a syntactically unmarked sentence?). The investigation will vary the availability of different grammatical tools experimentally and compare three different languages—Canadian English, Mandarin Chinese and Finnish—so a good understanding of the prosodic systems of all three languages is indispensable. I am familiar with the flexible word order and relatively inflexible prosody of Finnish (Arnhold 2014, 2015, 2016; Arnhold & Féry, 2013; Arnhold & Kyröläinen, 2017), Chinese is well-described as quite inflexible regarding both word order and prosody (Xu, 1999; Féry et al., 2010), but the present project will be absolutely necessary to determine the prosodic system of Canadian English.

In preparation for the Insight Grant application, I have secured support for two smaller studies on the production and perception of a syntactic highlighting tool, cleft sentences (e.g. “It’s mom who called”) in English and Chinese (Killam and SAS grants). These studies investigate prosody of cleft sentences and their syntactically unmarked equivalents. Data collection and annotation is almost complete and I expect to submit the results for publication this spring.

#### PRELIMINARY FINDINGS

Preliminary results of the Killam study (Fig. 1, left) indicate that Canadian English speakers use a different pitch pattern in a neutral context than when the context question indicates that only the sentence-initial subject (e.g. “the owner”) is new information to the listener, i.e. focused. Interestingly, while the neutral pattern (in black) is similar to that of a representative American speaker (right panel), sentence contours for subject focus differ markedly (red lines).

The American highlighted the focus by expanding the pitch rise and fall on subject constituents like “the owner” and by lowering pitch on all following words. By contrast, Canadian speakers used lower pitch than in neutral context for most of the sentence when only the subject was new. Focused subject durations were similar to those in neutral contexts (mean difference: 10ms), whereas the American did use duration to mark the difference (mean difference: 64ms). In sum, Canadian speakers did not use focus marking strategies that are well-attested for American English, namely raising the pitch peak and lengthening duration (e.g. Eady & Cooper, 1986; Pierrehumbert & Hirschberg, 1990; Breen et al., 2010). Instead, Canadian speakers produced pitch peaks 34ms earlier for focused subjects compared to neutral context, while the difference was only 11ms and peaks appeared later on focused subjects in American speech (see also Breen et al., 2010). This might indicate that in Canadian speech, the shape and timing of the pitch movement

on the focused subject is more important than its size. The difference from American English is even clearer in the careful speech of the Canadian English speaker who produced the same sentences as stimuli for the SAS grant perception study: Peaks of focused subject were 82ms earlier than in neutral contexts, while there was no marking in terms of size of pitch movements or duration. An earlier peak as a cue to newness would fit DePape et al.'s (2012) findings of expanded falls, but not rises. Further investigation is clearly necessary, but these findings suggest that Canadian English employs very different prosodic highlighting from American English.

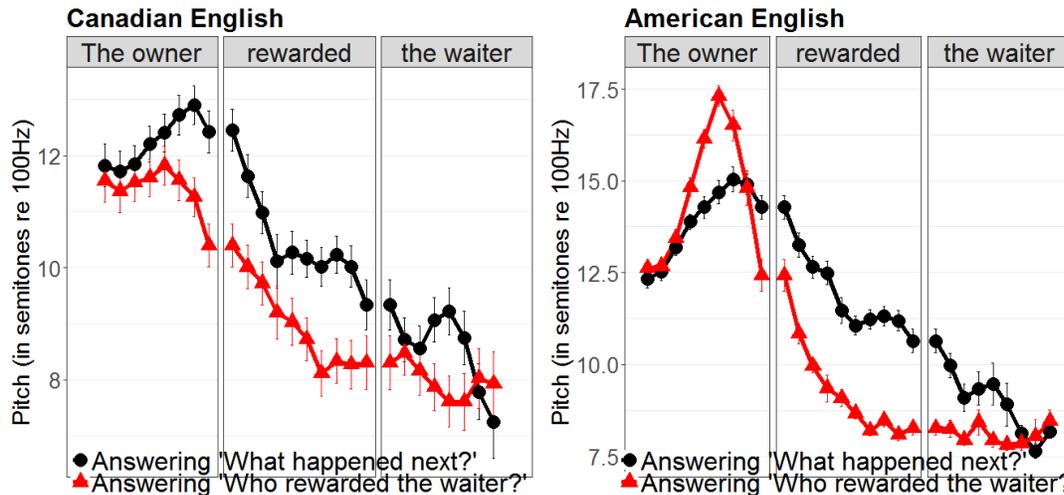


Fig. 1: Prosodic marking of focus (red line) vs. a neutral context (black line) in Canadian and American English. Average time-normalized pitch contours. Error bars indicate standard error.<sup>2</sup>

Canadian English also differs from British English. My colleagues and I replicated two studies (Chen et al., 2007; Chen & Lai, 2011) showing that native speakers of British English associate falling accents with newness, but rising accents and unaccented words with shared information: When they hear spoken instructions to move pictures on a screen in two steps, like “Put the candy above the square; now put the *candle*...”, they will look at the picture of the candle (vs. the candy) already before they have heard the complete word if “candle” carries a falling accent (marking it as new, whereas they expect another mention of the candy to come with a rising or no accent). Dutch second language speakers of English, however, interpret both rising and falling accents as markers of newness, prompting them to look at the candle faster than an unaccented realization. In our study using the original British English instructions (Mok et al., submitted), native speakers of Canadian English behaved similarly to Dutch second language speakers. Thus, the distinction between British falling and rising accents did not rapidly signal a distinction between new and shared information for Canadian listeners. It remains to be investigated whether this is due to Canadian English contrasting different accent categories than British English (e.g. falling vs. high instead of falling vs. rising) or due to differences in the realizations of the same categories (e.g. earlier peaks for Canadian than British falling accents).

<sup>2</sup> Canadian contours based on 493 utterances annotated so far: 23 speakers (undergraduate students, 6 male), 24 sentences per condition distributed across 4 lists. American contours based on a single female graduate student’s production of all 24\*2=48 sentences, which are representative of prosodic focus marking in American English according to the extensive literature.

## METHODOLOGY

The project will adopt the autosegmental-metrical approach to prosody (Pierrehumbert, 1980; Ladd, 1996), which has been successfully applied to several varieties of English (Silverman et al., 1992; Grabe et al., 2000; Fletcher et al., 2005; Gut, 2005; Féry et al., 2016), as well as many other languages (Gussenhoven, 2004; Jun, 2005, 2014). This approach models continuous pitch movements as realizations of a series of targets specified as either high (H) or low (L), with interpolation between neighbouring targets. Targets can either be associated with prosodic units, appearing at their boundaries (e.g. a phrase-final pitch rise signaling a question would be modelled with a high boundary tone H%) or they can mark places of prominence, i.e. accents realized on stressed syllables (e.g. a rise as on the word “solicitor” in “My solicitor would never do that (but my friend would)” would be modelled as L+H\*, i.e. a combination of a low and a high tone, where the high one aligns with the stressed syllable “li”). A phonological description in this framework consists of an inventory of accents and boundary tones that speakers contrast meaningfully (e.g. H% boundary tone signaling a question vs. L% signaling a statement). For example, the original inventory for American English contained six contrasting accents: H\* (high), L\* (low), L+H\* (early rise), L\*+H (late rise), H+L\* (early fall), H\*+L (late fall; Pierrehumbert, 1980; revisions in Silverman et al., 1992; Veilleux et al., 2006). The project will produce both a first inventory of accents and boundary tones and a phonetic description of the timing, size and shape of pitch movements, as well as further acoustic variation, e.g. in word duration.

The project will have two phases (see Timelines). The starting point will be a preliminary inventory of possible accents and hypotheses about their association with new vs. shared information, derived from the Killam and SAS grants. Phase 1 will use perception experiments to test and revise the initial inventory and hypotheses. Stimuli will be utterances manipulating number, height and timing of pitch turning points (see Fig. 2). Listeners will rate the resulting prosodic shapes as realizations of new/focused vs. shared information (e.g. answering “Who rewarded the waiter?” vs. “What happened?”). For example, as described above, the data suggest that in marking focus, a distinction between early and late pitch peaks is more important than the height of the peak. This would be substantiated if listeners gave lower ratings when the focused constituent (“the owner” in an answer to “Who...?”) is manipulated to have a later peak, but not when the peak is lowered compared to the original. This would indicate a phonological contrast between a neutral rising (L\*+H) accent and a high/falling (H\*/H\*+L) accent marking a focused constituent.

Each participant will rate about 60 items (ca. 30 minutes). Experiments will be conducted at the University of Alberta with 20 participants comparable to those whose speech was used to derive the hypotheses (undergraduate students). An internet-based version using the same materials will be run via the website Prolific Academic ([www.prolific.ac](http://www.prolific.ac)), which maintains a database of research participants. People who have signed up for the database can choose and independently complete a study if they match the researcher’s selection criteria. Since rating responses are numeric, adding more data points does not increase the time needed for analysis, so we will recruit 150 participants via Prolific Academic and additionally advertise the study on social media. All participants will be asked to complete a sociolinguistic background questionnaire. This will give some indication of regional and other variation within Canadian English prosody. Data will be analyzed with linear mixed-effects regression models (Baayen et al., 2008).

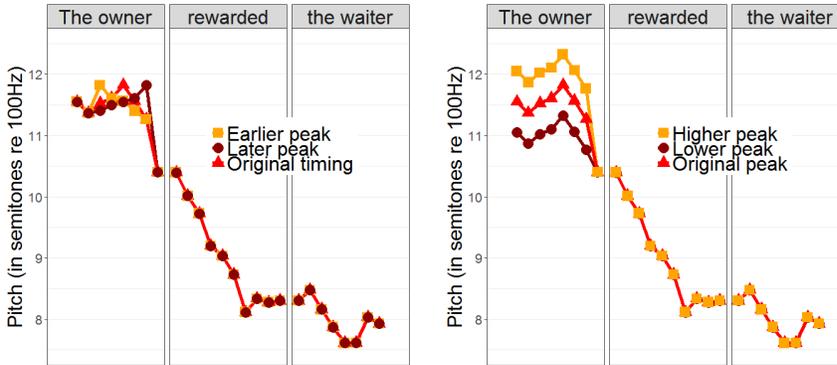


Fig. 2: Schematic illustration of manipulated timing (left panel) and height (right panel) of pitch turning points (manipulations of number of turning points not illustrated). Original contours (red) based on Fig. 1, left panel.

In phase 2, the revised inventory resulting from phase 1 will be tested by applying it to data from the Corpus of Spontaneous Multimodal Interactive Language (CoSMIL, Järvi­kivi et al., 2013-2015). The corpus consists of audio- and video-recorded conversations between University of Alberta undergraduate students. Two to three conversations (ca. 40 minutes each) will be randomly selected for analysis. The data will be annotated in two ways. First, two independent trained student annotators will classify all referring expressions as new or shared information (see categories in Gundel et al., 1993). Annotators will use transcriptions instead of listening to the conversations. This will guarantee that their categorizations are based on information structure as evident from the conversational context, not the prosodic cues to it. Second, two other independent student annotators will classify the prosodic realizations of all referring expressions by applying the prosodic categories established in phase 1, as well as potentially identifying realizations not covered by those categories (prosodic annotation). The prosodic annotators will not hear the context of the conversation and will be randomly presented with new/focused or shared information without knowing the information structural category of each item. Having two independent annotators for each annotation will allow calculation of inter-annotator agreement ( $\kappa$ -statistic, see Carletta, 1996). In cases of disagreement, the applicant will do a third independent classification and then choose a category, but employing students to do the initial annotations is important to minimize the potential influence of researcher bias. This data will allow us to analyze 1) whether the inventory of accents and boundary tones derived from phase 1 is also sufficient to account for prosody in spontaneous conversation or whether further categories need to be added, 2) whether the associations between accent types and information structural categories observed in phase 1 also appear in spontaneous conversation. To address the second question, the analysis will use linear mixed-effects regression models (Baayen et al., 2008) to test whether the annotated accent category significantly predicts the information structural category.

In sum, the project will paint a multifaceted picture of a core communicative function of Canadian English prosody through quantitative studies of speakers' productions and listeners' interpretations of experimentally elicited and conversational speech data, and through in-depth analysis of a relatively homogenous group (University of Alberta undergraduate students) and a less detailed study of a wider range of speakers. The resulting inventory of prosodic patterns will be a first step toward an annotation system for Canadian English, which is not only a necessary precondition for my planned Insight Grant application. It will also enable the kind of theoretical and applied research that has concentrated on American English for several decades to model Canadian English as a distinct language variant with its own characteristics.

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The project will progress in two phases, with the outcome of each phase feeding into the next one, so that the produced knowledge is successively refined (also see Detailed Description). Below is the timeline for tasks conducted by the applicant (A), collaborator (C) an MA-student (MA) and four undergraduate students (S1, S2, S3, S4).

**Preliminary inventory of prosodic patterns**  
**Hypotheses about relevant contrasts**  
 (based on preparatory work funded by Killam and SAS grants)

<b>Phase 1: Test perceptually relevant contrasts between prosodic patterns</b>	
Month 1 to Month 4	A, MA & S1: Create and pilot stimuli and questionnaire for perception experiments
Month 5 to Month 8	MA & S1: Run participants at the University of Alberta A: Handle internet-based data collection with more varied participants
Month 9 to Month 10	A, MA & S1: Analysis, revise inventory of prosodic patterns, start training on information structure annotation (for phase 2)

Advice from C

Knowledge Mobilization  
S4

**Revised inventory of prosodic patterns**

<b>Phase 2: Apply inventory to spontaneous conversational speech</b>	
Month 11 to Month 15	S1 & S2 (supervised by A): Identify new and shared information in data (information structure annotation)
Month 16 to Month 21	MA & S3 (supervised by A): Identify prosodic patterns of new and shared information in data (prosodic annotation)
Month 22 to Month 24	A, MA & S3: Analysis, writing up results, dissemination of findings

Advice from C

**Revised inventory of prosodic patterns**