Research
Office for Research & Discovery

F200: Application for Human Research

PROJECT TITLE: Collaborative Research: Attrition in complex prosodic systems: tone and stress in Uspanteko (USP, Mayan)

INVESTIGATOR INFORMATION

Principal Investigator Name, Degree(s):	Robert Henderson, PhD Linguistics
Affiliation	☒ UA ☐ B–UMG ☐ Other:
Principal Investigator **UA NetID**	rhenderson
Status/Rank:	Assistant Professor
Center:	
Department:	Linguistics
College:	SBS
Contact phone:	313-806-9009
Official Institutional Email:	rhenderson@email.arizona.edu

ADVISOR CONTACT INFORMATION (REQUIRED FOR ALL STUDENTS AND RESIDENTS)

Name, Degree(s), **UA NetID**:	
Contact phone:	
Official University Email:	

ALTERNATE/COORDINATOR or Co-PI CONTACT INFORMATION

Name, **UA NetID**:	
Contact phone:	
Official University Email:	

HSPP Use Only:

SECTION 1: REQUIRED SIGNATURES

1. PRINCIPAL INVESTIGATOR

I will conduct my study according to the University of Arizona HSPP policies and procedures for research with human subjects.

Signature	Date	Print Name
	12/26/15	Robert Henderson

2. ADVISOR (FOR ALL STUDENTS AND RESIDENTS ACTING AS THE PI)

I will oversee the student researcher according to the University of Arizona HSPP policies and procedures for research with human subjects.

Signature	Date	Print Name

3. SCIENTIFIC/SCHOLARLY REVIEW (SEE HSPP GUIDANCE ON REQUIREMENTS FOR SCIENTIFIC/SCHOLARLY ASSESSMENT - INCLUDE DOCUMENTATION FOR OPTIONS A AND B WITH SUBMISSION MATERIALS.)

a. ☒ Nationally based, federal funding organization (NIH, NSF) subject to full peer review

b. ☐ Nationally based, non-federal funding organization (March of Dimes, Amer Academy of Pediatrics) subject to peer review

c. ☐ Locally constituted peer review (signature required)

Signature	Date	Print Name

4. DEPARTMENT/CENTER/SECTION REVIEW

I have reviewed this application and determined that all departmental requirements are met and that the investigator has adequate resources to conduct the Human Research.

Signature	Date	Print Name/Email
	12/28/15	Adam Ussishkin/ussishki@email.arizona.edu

5. RESPONSIBLE PHYSICIAN (PROJECTS INVOLVING MEDICAL PROCEDURES WHICH THE PI IS NOT AUTHORIZED TO CONDUCT)

I am a physician licensed by the State of Arizona (or US license for the SAVAHCS). I will be responsible for ensuring that all procedures that are part of this project and that require the attendance of a licensed physician will have a suitable physician present during the procedures. If at any time this is not possible, I will inform the IRB before any procedures are conducted.

Signature	Date	Print Name

HSPP Use Only:

6. Native American or International Indigenous Populations Review

Signature needed only if research takes place in Indian Country or among international Indigenous populations, actively recruits Native Americans or international Indigenous populations for enrollment, and/or requires stratification of Native Americans or international Indigenous populations as one of the statistical analyses or study aims.

- Contact American Indian Studies, (520) 621-7108

I have examined the proposal cited above and advise that further appropriate tribal/Indigenous approval ☐ is or ☐ is not necessary.

Signature	Date	Print Name

[NOTE: This is attached as an appendix (ITEM 7) since AIS did not sign the sheet directly, but sent me a PDF of the signed sheet.]

SECTION 2: GENERAL INFORMATION

1. How many Human Research studies does the PI have open?
   0
2. How many research staff will be involved in the Human Research?
   2
3. What is the expected length of this project?
   four years
4. Retention of study materials before, during, and after completion of the project:
   a. Where will original signed consent and PHI Authorization documents be stored (building name and room)? Location: Douglass 216a

   b. How long will consents be maintained after conclusion of the project?
   ☒ 6 years (UA standard) ☐ 6 years after child reaches 18 ☐ Other (explain):
5. Is or will the project be funded by an external funding source? ☐ No ☒ Yes- Complete below:

   a. Funding PI: Robert Henderson
   b. Proposal Title: Collaborative Research: Attrition in complex prosodic systems: tone and stress in Uspanteko (USP, Mayan)
   c. Funder Name: National Science Foundation
   d. Total funding amount **OR** per subject amount: 170,078
   e. UAccess- Provide one of the following below:
      i. Proposal Development #: 19771
      ii. Institutional Proposal #:
   f. IRB Payment eDoc # (Required for For-profit sponsored research):

Submit complete copy, cover-to-cover, of grant or award.

6. Conflict of Interest (COI):
   The Principal Investigator hereby affirms that ALL individuals who meet the definition of *investigator* for this project in the current *Policy on Investigator Conflict of Interest in Research* have completed the mandatory Conflict of Interest training and Disclosure of Significant Financial Interests.

   ☒ Yes - All individuals who meet the definition of "investigator" have completed COI training and disclosure.
   ☐ No (explain):

7. Additional requirements:

Certain types of research require additional regulatory documentation. Please identify which of the following apply to your project. Complete the appropriate Appendix and submit as part of the submission materials.

☐ Children (subjects under 18) - Appendix A
☐ Drugs/Devices (A clinical investigation of a drug or device) - Appendix B
☐ Multi-Site study (The UA IRB will review research activities for an investigator or research staff not affiliated with the UA who is 'engaged in the research' (e.g. consenting, collecting data, or

analyzing identifiable information) - Appendix C
☐ Pregnant Women/Neonates - Appendix D
☐ Prisoners - Appendix E
☐ Waivers of consent, waiver of a signature, or waiver or alteration of PHI - Appendix F
☒ None apply to the proposed study

8. Location of Research

Banner – University Medicine Group:

☐ Phoenix Campus	☐ Biological specimens	☐ Clinical Data
☐ Tucson Campus	☐ Biological specimens	☐ Clinical Data
☐ South Campus	☐ Biological specimens	☐ Clinical Data

University of Arizona Cancer Center:

☐ North Campus	☐ Biological specimens	☐ Clinical Data
☐ Orange Grove Clinics	☐ Biological specimens	☐ Clinical Data
☐ Phoenix	☐ Biological specimens	☐ Clinical Data

Other: Uspantan, Guatemala (and surrounding aldeas---i.e., hamlets)

SECTION 3. PROJECT NARRATIVE

1) Background

Uspanteko, also known as Tz'unun Kaab' or 'sweet hummingbird', is one of the roughly thirty Mayan languages still in use today. A member of the K'ichean branch of the family, it is spoken almost exclusively in the municipality of Uspantán, a small and relatively remote area in the highlands of Guatemala. Richards (2003) reports a speaker population of about 1200, and even a generous estimate of the present strength of the language would put this number at no more than 2000. Uspanteko has diverged greatly from its relatives in the K'icean subbranch of Mayan languages. The most striking innovations can be found in the system of word-level prosody. Uspanteko is notable as the only Mayan language in Guatemala to have developed a full-fledged system of contrastive lexical tone. The tonal system of Uspanteko has been described in a number of publications, most notably Grimes 1971, 1972, Campbell 1977, Can Pixabaj 2006 and Bennett & Henderson 2013. Although these works offer somewhat different characterizations of the tonal facts, there is a broad consensus over the basic distribution of tone in the language. Bennett & Henderson (2013) provide the following descriptive generalizations, based on earlier literature and their own direct fieldwork: (A) Default stress falls on the word-final syllable. (B) Final stressed syllables containing a long vowel may be contrastively specified for high tone. (C) Long vowels do not occur outside of final stressed syllables. (D) Words with a short vowel in the final syllable may also carry a contrastive high tone, but in that case both lexical pitch and stress occur on the penult rather than the final syllable. Uspanteko therefore constitutes a 'hybrid' prosodic system, combining word-level stress with privative lexical pitch accent (Hyman 2006, 2009). It is unusual among such hybrid systems in that

stress and tone placement are co-determined, with stress influencing the location of tone (B) and vice-versa (D) (e.g., van der Hulst et al. 2010:250-1).

While the phonological facts about Uspanteko tone, stress, and their interaction are fairly well understood, their phonetics is not. We propose to bridge this descriptive gap on Uspanteko by conducting an extensive phonetic analysis of stress and tone in Uspanteko. Along with the basic documentation of these two accentual features, we plan to investigate whether the phonetic realization of stress and tone depends on higher-level phrasal prosody or on demographic factors. Chief among these demographic factors is speaker age: finding age-graded differences in the phonetics of stress and lexical tone would help shed light on the process of language attrition in Uspanteko communities. We focus on phonetic documentation for several reasons. First, there are no existing phonetic descriptions of Uspanteko, apart from some preliminary and impressionistic observations in work like Can Pixabaj 2006 and Bennett & Henderson 2013. This reflects larger research trends in Mayan linguistics, which have skewed toward phonemic analysis rather than quantitative phonetic documentation, and which emphasize segmental phonology over prosodic phenomena.

The PI, Robert Henderson, has significant past experience conducting fieldwork-based research in Maya communities, including Uspanteko-speaking communities (Bennett and Henderson 2013). He also as on-going collaborations with American fieldworkers (Bennett and Henderson in prep a,b) and native speaker linguists in Guatemala (Henderson and Ajsivinac 2011). He is also fluent in a Mayan language, namely Kaqchikel, having spent many months in Guatemala every year for the past 7 years.

2) Purpose

- Document and analyze the acoustics of word-level stress and lexical tone in Uspanteko.
- Document the ongoing loss of lexical tone among younger speakers of Uspanteko.
- Collect and annotate a large corpus of spontaneous speech in Uspanteko, including narratives, from a demographically diverse group of speakers.
- Investigate the influence of phrasal and discourse context on the phonetics of stress and tone.
- Consider the implications of this data for theories of the phonetics-phonology interface, for the study of phonological obsolescence, and for models of language change in contact situations.

3) Lay Summary (approximately 400 words)

The sound systems of human languages differ widely, as any student of foreign languages knows. One way in which languages differ is their use of stress and tone. English is a language which uses stress to distinguish word meanings: compare the word "record" when used as a verb ("to recórd") and as a noun ("the récord"). Other languages use stress to mark the edges of words. Similar patterns are found with tone: in Tokyo Japanese, for instance, the meaning of the word "hashi" depends on the pitch melody with which it is spoken (with a high-low melody it means "chopsticks", and with a low-high melody it means "bridge"). Languages which use just one of these features are very common. Less common, and less studied, are languages which use stress and tone together. Until such languages are studied in greater detail, we will not have a complete picture of the sound systems of human languages and the ways in which they can vary.

This project investigates stress and tone in Uspanteko, a highly endangered Mayan language spoken by approximately 1000-3000 people in the central highlands of Guatemala. Uspanteko uses tone to distinguish word meanings, as in "síip" (high tone, means "tick") vs. "siip" (no high tone, means "gift"). Alongside tone, stress is used in Uspanteko to mark the edges of words. The primary aim of this project is to document and analyze the acoustic structure of stress and tone in Uspanteko. As the sound system of Uspanteko is typologically unusual, this project has the potential to contribute substantially to our understanding of cross-linguistic variation in the areas of stress and tone.

In particular, the kinds of data we will be collecting to address these issues will be (i) elicited word lists---we would ask the participant: "Who bought 'corn' in the market?" and record them saying: "Juan bought 'corn' in the market", where we are interested in the properties of the word 'corn' in Uspanteko---(ii) recordings of (non-sensitive) narratives, (iii) recordings of (non-sensitive) conversations, and (iv) pronunciation judgment tasks---We present the participant with a recording of a word in their language and ask if it sounds like how people actually say that word. Crucially, for data types (ii) and (iii) because we are interested in the form of what people say, not the content, it is easy to keep the conversation away from sensitive topics and topics that will identify a person. For our purposes, having to people talk about what they made for breakfast is just as good as having them talk on any other topic.

4) Setting of the Human Research

The location of an elicitation session depends on the preferences of the consultant. Some consultants may prefer to hold elicitation sessions at home, while others prefer meeting in a public place, at their place of work, or at a building associated with the local government (e.g. a municipal building, the local language academy, the market, a park, etc.). All efforts will be made to meet at one of the consultants preferred locations.

5) Resources available to conduct the Human Research

The NSF grant provides one .25 FTE linguistics graduate student for two years who Robert Henderson, will be supervising. This student will be working closely with us over the course of the study, and we will be providing mentorship and training for them.

In addition, we will be hiring local Guatemalan linguists who work at the Comunidad Linguistica Uspanteka to help, not with the research directly, but with logistics and text transcription services. Their local staff will also provide some support off of the grant payroll. The grant provides money for workshops / trainings for these linguists (and graduate students working on the project).

Ryan Bennett and Robert Henderson have worked with the Comunidad Linguistica Uspanteka before, along with other branches of the Academy of Mayan Languages of Guatemala. They are willing to help support logistical aspects of the research as they have in the past.

Note that Yale is a collaborator and they are receiving approval from their institution for their personnel.

6) Study Population

The study population consists of adult native speakers of the Uspanteko language from the town of Uspantan and surrounding areas. Native speakers of Uspanteko would uniformly self-identify as Maya or indigenous. We will encourage participation from both men and women. We will not be

working with any consultants under the age of 18, which is the age of majority in Guatemala. We expect that, over the course of the grant, we will have 150 participants in the various kinds of studies described below in (8).

7) Recruitment Methods and Consenting Process

a. Recruitment Process: Participants will be recruited from my own network of social contacts in Guatemala, or through Uspanteko branch of the Academy of Mayan Languages (Comunindad Linguistica Uspanteka, http://uspanteka.org.gt/). We do not expect to be recruiting participants via advertising, but through personal and professional connections.

Informed Consent: We will be using written consent as much as possible during the course of the study. The consent form is included in the appendix for inspection. We will be seeking consent in the field in Spanish given that many Uspanteko speakers speak Spanish, and if a speaker is literate in any language, it will be Spanish. An English translation of the Spanish consent form has also been included as an attachment for your reference.

If we encounter speakers of Uspanteko who are not literate, and thus skeptical of signing a document they do not understand (which is a real possibility), the consent form will be used as a consent script. We will record me reading the consent form along with the participant's replies. If the participant is not fluent in Spanish, then we will have a local collaborator interpret the consent script in Uspanteko as I present it in Spanish. This will also all be recorded with either a small tabletop microphone, a lightweight microphone placed on the speakers lapel, or a lightweight microphone attached to a small wire-frame headset. The recording equipment will either be a dedicated audio recording device, or a laptop computer.

Participants in the study will be given a card with the contact information of both Robert Henderson and Ryan Bennett (Collaboratoring PI). In addition, they will be given the contact information of a local person who we are in better contact with through which they can reach us. This is so that participants can reach us with concerns as our research goes forward. In particular, participants are informed in the consent script that they may contact us at any point and we will destroy any particular pieces of data or data annotations that they want with no questions asked.

8) Research procedures involved in the Human Research

In first year of the grant, participants will be asked to participate in tasks of the form in (i) and (ii). In the second year of the grant, speakers will either participate in tasks of the form in (i) and (ii), or in tasks of the form in (iii) and (iv). It will be the participants' choice. The third year of the grant is focused on collecting free-flowing speech. Participants will be asked to participate in tasks of the form (iii) and (iv). Elicitation sessions will last for about 60 minutes.

(i) Judgment tasks (audio presentation)

In an audio-based judgment task, audio fragment(s) will be played to a consultant (over headphones or over speakers), and the consultant will judge the pronunciation. Some examples of questions that will be asked are: 'Is this a good pronunciation? What word did you hear? Do these two words sound the same to you?'

(ii) Elicitation of word lists

This methodology involves asking speakers to produce a particular word in their native language, usually in a "frame" sentence like 'Diego bought X at the market'. Consultants will either read each word from a written list, or respond to prompts in a translation task (e.g. 'Say the Uspanteko word for tomato this time').

(iii) Spontaneous narratives

In this task, consultants will be asked to verbally recite a short narrative: a story about their daily life, a traditional story told in their community, or something along similar lines. This could involve the use of children's picture books as prompts for eliciting narratives, such as the widely-used and thoroughly vetted 'Frog stories' (see Stromqvist and Verhoeven 2004). The goal of this task is to prompt consultants to produce spontaneous, unplanned speech. The actual content of the narrative is beside the point. As such, consultant will never be asked to speak about personally, culturally, or legally sensitive matters. Indeed, we will make an active effort to keep the subject of these narratives as bland and as culturally neutral as possible.

(iv) Spontaneous conversation

Two or more consultants will be asked to engage in a brief conversation while being recorded. The point of this methodology is to replicate, as much as possible, the conditions of natural, everyday speech. As with the elicitation of narratives, every effort will be made to keep the topic of conversation as quotidian and culturally neutral as possible. The kinds of conversations elicited could range from unstructured (free conversation) to fairly structured in nature (e.g. map tasks, a kind of board game where one speaker provides verbal directions in order to help a second speaker reach a particular destination on a fictional map). Once again, the goal of this task is to prompt consultants to produce spontaneous, unplanned speech. The actual content of the conversation is beside the point.

All of the fieldwork methodologies outlined above ideally involve making audio recordings of spoken language. This will be done with a basic microphone and recorder setup. The microphone will be either a small tabletop microphone, a lightweight microphone placed on the speakers lapel, or a lightweight microphone attached to a small wire-frame headset. The recording equipment will either be a dedicated audio recording device, or a laptop computer.

In tandem with audio recording, fieldnotes are normally taken on a separate pad of paper or laptop. These notes consist of observations about the speakers' speech, grammaticality judgments, opinions offered, etc. Sometimes, when working with someone we know well and only have a couple of questions about the well-formedess of a construction or the translation of a construction, we will forgo an audio recording and just take handwritten notes. This is especially true when in a noisy environment, like a park or market, that precludes capturing good audio.

The audio data we collect in these tasks will be analyzed using PRAAT (phonetics software) to look at the acoustic properties of critical words, namely words with tones, long vowels, syncope, or other

prosodically interesting phenomena. The dependent measures for the analysis will include pitch, vowel duration, voice quality, vowel intensity (intensity integrated over time), vowel quality (steady-state F1/F2 values), and other standard acoustic measures. We will also investigate the relative timing of non-modal phonation and pitch peaks, given that such timing relations are known to vary cross-linguistically (Silverman 1997, Frazier 2013). The annotations made with PRAAT will not be secured, but instead published as metadata with the raw recordings on AILLA, which we ask for permission to do in the informed consent form. Publishing such annotations is a condition of the grant and standard practice in linguistics.

The various phonetic measures we make will also be correlated with the basic demographic data we will collect concerning age, gender, and town of residence. It is critical to know the age of participants because using age data we can see how a language is changing over time. Moreover, if younger speakers speak very differently than older speakers, it can signal language shift or attrition in progress. Gender information is important because women and men speak differently. For instance, women on average have a shorter vocal tract, and so on average have a higher fundamental frequency (or pitch) than men, which can affect the analysis. Finally, data about the location of residence of participants is important because the same language might have various dialects. In Guatemala, it is common for people from even nearby towns to speak quite differently. We need to know where participants live so they our analysis can identify dialects and take them into account. Collecting such demographic information is standard in linguistics and language documentation precisely because age, gender, and town of residence affects so greatly how people speak.

As discussed in the consent form and elsewhere, we will always consent to editing or destroying particular recordings and/or fieldnotes if requested by a consultant, at any point in time.

9) Cost to subjects

Consultants will incur at most minimal travel costs to travel to downtown Uspantan to participate, though we will often be in consultants' homes or in other public spaces near their homes. The maximum amount that someone would incur would be a bus ride for fifty cents or a dollar. In terms of time, consultants will not spend more than an hour on the tasks at hand.

10) Risks to subjects

The risks associated with participation in this fieldwork are no greater than those encountered in daily life. At worst, participants may experience some slight discomfort when asked to wear headphones or microphones during elicitation sessions.

Of course, there is always a chance (however small) that sensitive or emotionally charged topics may arise in the course of elicitation, though never by design. Participants retain the absolute right to request the destruction or modification of records, for any reason. In the event that a participant appears to suffer from emotional distress, I will offer to end the elicitation session immediately.

This study also includes a risk of loss of confidentiality. While the informed consent form asks for permission to publish recordings made in course of the study along with basic demographic data (initials, gender, age, town of residence), it is possible that someone would be able to infer the identity of participants. The informed consent form makes this possibility clear to participants so

they may decide whether to participate in the study. Given the nature of the data, though, (pronouncing words in an innocuous frame sentence, judging whether a certain sentence is pronounced normally, engaging in an innocuous scripted conversation, telling a traditional story), even if there is breach of confidentiality, we expect social harm to participants to be minimal.

11) Potential benefits to subjects and/or society

There are no known benefits associated with participation in this fieldwork. However, the results of the research may be of general interest to Mayan language communities, and will contribute to the documentation of the consultant's native language. People often take great pride in playing a critical role in such documentation work.

12) Provisions to protect the privacy of subjects and the confidentiality of data

Protection of subject privacy: Two kinds of data will be collected from participants: basic demographic information (age, gender, and place of birth), obtained conversationally; and the consultants' responses to particular elicitation tasks (outlined above). The nature of linguistic fieldwork makes it difficult to ensure total anonymity for participants. First, the audio recordings of fieldwork sessions will contain the consultants' voices, which weakens the anonymity of their participation. Second, consultants may reveal potentially identifying information on tape while participating in a spontaneous conversation or narrative task.

While we will only be collecting the information discussed in the previous paragraph from every participant, we will be collecting the names of participants who expressly want to identified by name. It is common in field situations to work with speakers who want to be identified by name for their contributions to the investigators research (Ladefoged 2003:15-6; Bowern 2008:180). This is as true in Guatemala as it is elsewhere. In such cases, its important to honor the consultants request, and give them due recognition in publications that arise from the fieldwork in question. For this reason, I have included a line in the verbal consent script (attached) that asks whether the participant is comfortable with being publically acknowledged for contributing to the fieldwork. The risks of identifying consultants publically are very minimal, given the nature of the data being collected. However, if I have any reason to suspect that divulging a consultants name in public would put them at risk, I will not do it, even if they previously consented to making their participation known.

a. **Protection of data confidentiality:** As discussed further in the data management plan contained in the attached NSF grant proposal, we will publicly share all audio and video recordings stemming from our field sessions, provided that our Uspanteko participants give free, prior, and informed consent for the sharing of such materials. All efforts will be made to anonymize data before it is shared (by removing names, for instance): recordings will be associated with basic information about the speaker (initials, gender, age, town of residence), but no other personal information will be tied to the recordings. As discussed in question (8) this demographic data is crucial for documenting the state of the language, as well as analyzing the language. While this is the only personal information we will be collecting, speakers may nonetheless divulge personal information during recording; we will never share such recordings if we think that doing so could put the speakers at any kind of risk.

Because our work is language documentation, it is important that the data be kept for posterity. Creating a record of the language that can be accessed, even if the language is no longer spoken, is the point. For this reason, the publically shared data discussed in the previous paragraph will be hosted indefinitely at the University of Texas at the Archive of the Indigenous Languages of Latin America.

13) Subject compensation

Subjects will receive Q100 per hour (~$12/hr. US) for their participation, payable in cash upon completion of each elicitation session. If a consultant decides to end their involvement early, before the end of the session, they will receive full payment in cash for work completed. Note: The current minimum wage in Guatemala is Q8.50/hr., or $1.09/hr. in US dollars. (http: //www.leylaboral.com/guatemala/Introguatemala.aspx). Most indigenous Mayans earn less than the legal minimum (http://www.guatemala-times.com/news/guatemala/ 2661-guatemala-60-percent-of-workers-earn-less-then-minimum-wage.html).

14) Withdrawal of subjects

We do not expect the need to remove participants from the study unless they wish to be removed. Our work is not longitudinal, and so this could take two forms. First, a participant could decide in the middle of an elicitation session they do not want to continue. We will of course stop, and ask whether we should delete the previously collected data and our notes. If a participant wishes to remove themselves from the study after completing an elicitation, we will remove their data from the analysis and ask what data and notes we should destroy, if any.

15) Sharing of results with subjects

According to the data management plan contained in the attached NSF grant proposal, after an embargo period the data will be stored for posterity on the Archive of the Indigenous Languages of Latin America (AILLA) which is accessible online for participants with access to the internet. In addition, all of our data and results (including published works) will be stored locally at the Comunidad Linguistica Uspanteka, the local branch of the Academy of Mayan Languages of Guatemala, which is situated in Uspantan. Finally, speakers who request a CD with any of their personal recordings will be given one, as discussed in the consent form.

16) Future use and long-term storage of data or specimens

As discussed in the data management plan contained in the attached NSF grant proposal, the PIs will store digital data indefinitely on the portable hard drives mentioned above. The data will also be stored on separate servers at the PIs' home institutions. Finally, digital data and associated annotations will be publicly archived at the Archive of the Indigenous Languages of Latin America (AILLA; ailla.utexas.org) hosted at the University of Texas. AILLA has confirmed their willingness to archive the material output of our proposed project (the agreement is included as a supplementary document). We will deposit digital materials with AILLA after the completion of each fieldwork trip, upon our return to the U.S.

Our consultants reserve the absolute right to request destruction of materials associated with their participation in the project. We will immediately and fully comply with such requests, though we cannot guarantee the complete destruction of publicly shared materials.

Results of this project will be shared in several ways. First, we will publicly share all audio and video recordings stemming from our field sessions, provided that our Uspanteko participants give free, prior, and informed consent for the sharing of such materials. All efforts will be made to anonymize data before it is shared: recordings will be associated with basic information about the speaker (initials, gender, age, town of residence), but no other personal information will be tied to the recordings. Speakers may nonetheless divulge personal information during recording; we will never share such recordings if we think that doing so could put the speakers at any kind of risk.

Second, we will share any and all annotations that we make in the process of analyzing audio and video data. These annotations will be in the Praat TextGrid format or the ELAN .eaf format. For spontaneous speech data, we will also share transcriptions as simple text and/or .xml files. All of these formats can be accessed and manipulated using widely available no-cost software.

Third, while we do not plan to take extensive free-form fieldnotes, any such notes (including handwritten notes) will be converted to digital .pdf files upon return from Guatemala. The resulting PDFs will always be stored with the accompanying audio to preserve their linkage.

Raw data, annotations, fieldnotes, and transcriptions will be shared in two locations. Though AILLA archives digital data in high-quality formats like .wav and MPEG-2, technical limitations prevent them from sharing data in such formats on their public servers. Instead, AILLA shares data in 'presentation' formats like .mp3/.mp4, which achieve smaller file sizes through lossy data compression. (High-quality file formats can be retrieved from AILLA by specific request.)

We will place absolutely no restrictions on the non-commercial use of our recordings, annotations, and transcriptions, other than those restrictions which are expressly noted in the AILLA use conditions, such as proper citation practices. Commercial use of our research materials will be absolutely prohibited, consistent with pre-existing AILLA policies.

We intend to place a temporary embargo on public access to our research materials. The rationale for such an embargo is that it allows us time to analyze these materials and publish research results based on our work before those materials are made available to other researchers.

17) Information management

Data management is discussed in both the attached grant, and in response to questions (16), (15), and (12ab). The highlights are the following:

Raw data collected during our fieldwork will consist of (i) audio in .wav format, recorded in mono at a 48 kHz sampling rate and 24 bit resolution; (ii) video recordings on mini cassette tape; and (iii) written notes taken during recording sessions. The video recordings will be converted to digital format (MPEG-2) on the same day that they are collected. We will have portable external hard drives on-site during each fieldwork trip, and will back up all audio and video data on the day that it is collected. Whenever reliable internet access is available, we will also back up our data to off-site servers using utilities like Dropbox and/or external server space at our home institutions.

The PIs will store digital data indefinitely on the portable hard drives mentioned above. The data will

also be stored on separate servers at the PIs' home institutions. Finally, digital data and associated annotations will be publicly archived at the Archive of the Indigenous Languages of Latin America (AILLA; ailla.utexas.org). AILLA has confirmed their willingness to archive the material output of our proposed project (the agreement is included as a supplementary document). We will deposit digital materials with AILLA after the completion of each fieldwork trip, upon our return to the U.S.

We intend to place a temporary embargo on public access to our research materials. The rationale for such an embargo is that it allows us time to analyze these materials and publish research results based on our work before those materials are made available to other researchers.

SECTION 4: LIST OF ATTACHMENTS FOR THIS SUBMISSION (REQUIRED) (Items listed here are expected to be attached as separate documents. These documents will appear in the UA HSPP IRB approval letter as 'documents submitted concurrently' with the review.)

Document Name	Version Date
1. F107 **2.** Full NSF Proposal (Including biosketch) **3.** Informed Consent Form English **4.** Informed Consent Form Spanish **5.** Sample wordlist used for elicitation tasks **6.** Collaborator's (Ryan Bennett) IRB approval from Yale for this project **7.** Native American or International Indigenous Populations Review	**1.** 12/26/15 **2.** 07/06/15 **3.** 12/26/15 **4.** 12/26/15 **5.** 12/26/15 **6.** 04/11/13 **7.** 01/05/16

See HSPP website for submission requirements.

Items needed for approval:

- **F107: Verification of Training Form**
- **Current PI/Co-PI CVs or biosketch**, if not included with copy of grant application
- **Informed Consent/Permission/Assent Form(s)** – including study specific release of information documents, DHHS approved sample consent forms. If consent will not be documented in writing, a script of information to be provided orally to subjects

F107: Verification of Human Subjects Training Form (VOTF)

Use to list all current Key Personnel	
IRB Project No.:	
Project Title:	Collaborative Research: Attrition in complex prosodic systems: tone and stress in Uspanteko (USP, Mayan)
Investigator:	Robert Henderson
Investigator's Contact Information:	Phone/Official University Email: 313-806-9009/rhenderson@email.arizona.edu
Alternate Contact:	Marian Wiseley
Alternate Contact's Information:	Phone/Official University Email: (520) 621-6897/mwiseley@email.arizona.edu

Name	UA Net ID	Research Role	Department & Institution	Consenting Individuals	CITI Training Date
Robert Henderson	rhenderson	PI	☒ UA ☐ B–UMG ☐ Other	☒ Yes ☐ No	12/21/2015
			☐ UA ☐ B–UMG ☐ Other	☐ Yes ☐ No	
			☐ UA ☐ B–UMG ☐ Other	☐ Yes ☐ No	
			☐ UA ☐ B–UMG ☐ Other	☐ Yes ☐ No	
			☐ UA ☐ B–UMG ☐ Other	☐ Yes ☐ No	
			☐ UA ☐ B–UMG ☐ Other	☐ Yes ☐ No	
			☐ UA ☐ B–UMG ☐ Other	☐ Yes ☐ No	
			☐ UA ☐ B–UMG ☐ Other	☐ Yes ☐ No	

F107: Verification of Human Subjects Training Form (VOTF)

			☐ UA ☐ B–UMG ☐ Other	☐ Yes ☐ No	

The pronunciation of Uspanteko

Thank you very much for participating in our project. The goal of the project is to collect recordings of spoken Uspanteko. We will use these recordings to preserve and study how Uspanteko is spoken today. In particular, we are going to be studying the sounds of Uspanteko and how it is spoken. Today you are going to be doing the following task(s):

[ ] We will present words to you in Uspanteko using a speaker or headphones and you will judge the pronunciation while we record your voice. We will ask you questions like: 'Is this a good pronunciation? What word did you hear? Do these two words sound the same to you?'

[ ] We will ask you to say a word in Uspanteko in a sentence while we record your voice. For instance, we will give you a word in Spanish, like 'corn', and you will say in Uspanteko 'Diego bought corn at the market'.

[ ] You will tell us a traditional story told in your community in Uspanteko while we record your voice. Or, if you prefer, we will give you a picture book for children and you can describe what happens in the book in Uspanteko while we record your voice.

[ ] You will have a conversation in Uspanteko with another speaker while we record your voice. To help start the conversation, we will give you a mundane topic to talk about. For instance, talk about what you had for breakfast or talk about your favorite food and how you make it.

We offer you Q100 for your participation. It will take around 60 minutes, with about 40 minutes of recording. If you decide to participate, you will be among about 150 people who are participating in the study.

You may stop participating at whatever moment, for whatever reason, without explaining why.

If you decide to stop participating early, you will still receive your entire pay.

There are no benefits to participating in the study, but also the risks are minimal. For instance, it is possible that it might be uncomfortable wearing the microphone, but that is all.

If you want a copy of the recordings that we make, it can be provided in CD.

Please mark each of the following statements that you approve:

____ I want to participate in the study, I am going to speak to you in Uspanteko, sharing with you my language and my own speech.

____ I give you permission to record my voice, using a small microphone that is placed on my head.

____ I give you permission to share these recordings and annotations of these recordings publicly in Guatemala, the United States, and other countries.

____ It is okay with me if you share in Guatemala, the United States, and other countries my age, my sex, the name of the city where I live, and the name of my place of birth.

____ I give you permission to share the initials of my name publicly in Guatemala, the United States, and other countries.

____ I understand that any aspect of these recording can be studied, by anybody, and I give my permission for this.

____ I understand that it's possible that these recordings will be used the process of writing books, articles, and other public works, and I give my permission for this.

____ I understand that these recordings will be hosted will be hosted indefinitely at the University of Texas at the Archive of the Indigenous Languages of Latin America.

Burchfield, Mason L -…, 1/6/2016 6:37 PM
Comment [1]: A statement about this must be made in the consent form.

____ I understand that while the directors of the study will not make my name public without my permission, it is possible that someone might discover that I participated in this study (for instance, by recognizing the sound of my voice).

Please answer the following questions:

Age: _____

Sex:_____

City/Town of Residence:_____

You have the right to ask that we destroy the recordings of your voice and/or annotations of the recording in any moment, for any reason, even in the future. If you need to contact us, please use the following information:

Dr. Ryan Bennett
Yale University

Dept. of Linguistics
ryan.bennett@yale.edu
(203) 432-7656 (EEUU)
http://pantheon.yale.edu/~rtb27/

Dr. Robert Henderson
University of Arizona
Dept. of Linguistics
rhenderson@email.arizona.edu
(313) 806-9009 (EEUU)
http://rhenderson.net

We will also give you a little card with this information if you like. If you have any questions, now or in the future, please let us know. Thank you!

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Subjects Protection Program at 520-626-6721 or online at http://orcr.arizona.edu/hspp.

I have read (or someone has read to me) this form, and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form**.**

Signature/Date:_____

_____
Reference Number

6. Native American or International Indigenous Populations Review

Signature needed only if research takes place in Indian Country or among international Indigenous populations, actively recruits Native Americans or international Indigenous populations for enrollment, and/or requires stratification of Native Americans or international Indigenous populations as one of the statistical analyses or study aims.

- Contact American Indian Studies, (520) 621-7108

I have examined the proposal cited above and advise that further appropriate tribal/Indigenous approval ☐ is or ☒ is not necessary.

Signature	Date	Print Name
Ronald L. Trosper	Jan 5, 2016	Ronald L. Trosper

for Henderson project

La pronunciación del Uspanteko

Muchas gracias a usted por participar en nuestro proyecto. La meta del proyecto es recopilar grabaciones del Uspanteko hablado. Usarémos estas grabaciones para preservar y estudiar cómo se habla el Uspanteko actual. In particular, investigamos los sonidos del Uspanteko y como se habla. Hoy usted va a hacer la(s) tarea(s) siguente(s):

[ ] Vamos a presentar palabras en Uspanteko a usted por altavoces o auriculares. Usted va a juzgar la pronuciación de las palabras mientra que grabamos su voz. Vamos a hacerle preguntas comos: '¿Piensa usted que la pronuciación es buena? ¿Que palabra se escuchó? ¿Suenan diferentes estas dos palabras?'

[ ] Vamos a pedirle que decir una palabra Uspanteka en una oración mientras que grabamos su voz. Por ejemplo, vamos a presentar una palabra en espanñol, como 'maíz', y usted va a decirla en Uspanteko, como 'Diego compró maíz en el mercado'.

[ ] Usted va a contar una historia típica de su comunidad mientras que grabamos su voz. O, si usted prefiera, le daremos un libro ilustrado para niños y usted puede describer lo que pasa en el libro en Uspanteko mientras que grabamos su voz.

[ ] Usted va a hablar en Uspanteko con otro hablante del idioma mientras que grabamos su voz. Para iniciar la conversación, vamos a darles un tema mundano sobre que pueden hablar. Por ejemplo, hablar sobre lo que ustedes comieron para el desayuno o hablar sobre su comida favorita y como esta hecho.

Le ofrecemos Q100 por su participación. Durará alrededor de 60 minutos, con aproximadamente 40 minutes de grabación. Si usted decide participar, estará entre unas 150 personas quien participan en el estudio.

Usted puede dejar de participar en cualquier momento, por cualquier razón, sin explicarnos porqué.

Si decide acabar con su participación temprano, todavía recibirá su pago entero.

No hay beneficios para los participantes en este studio, sino también los riesgos son mínimos. Por ejemplo , es possible que prodría ser incomodo llevar el micrófono, pero eso es todo.

Si usted quiere una copia de las grabaciones que hacemos, se la podemos proveer en disco compacto.

Por favor marque cada uno de las siguientes declaraciones que usted aprueba:

____ Quiero participar en el proyecto, y voy a hablarles en Uspanteko, compartiendoles mi idioma y mi habla propia.

____ Les doy permiso para grabar mi voz, usando un micrófono pequeño que se coloca en la cabeza.

____ Les doy permiso para compartir estas grabaciones e anotaciones de las grabaciones públicamente, en Guatemala, los Estados Unidos, y otros paises.

____ Está bien conmigo compartirles en Guatemala, los Estados Unidos, y otros paises mi edad, mi sexo, el nombre de mi ciudad/pueblo actual, y el nombre de mi lugar de nacimiento.

____ Les doy permiso para compartir las iniciales de mi nombre públicamente, en Guatemala, los Estados Unidos, y otros paises.

____ Entiendo que cualquier aspecto de estas grabaciones quizás sea estudiado, por cualquier persona, y doy mi permiso.

____ Entiendo que es posible que estas grabaciones se usen en el proceso de escribir libros, artículos, y otras obras públicas, y doy mi permiso.

____ Entiendo que estas grabaciones se alojarán de manera indefinida en la Universidad de Texas en el Archivo de los Idiomas Indígenas de América Latina.

____ Entiendo que mientras que los directores del estudio no compartir mi nombre publicamente sin permisión, es posible que alguien pueda descubrir que he participado en este estudio (por ejemplo, al reconocer el sonido de mi voz).

Conteste por favor las siguientes preguntas:

Edad: _____

Sexo:_____

Ciudad/pueblo actual:_____

Usted tiene el derecho de pedirnos destruir las grabaciones de su voz y/o estas anotaciones en cualquier momento, por cualquier razón, incluso en el futuro. Si necesita contactarnos, use por favor la siguiente información:

Dr. Ryan Bennett
Yale University
Dept. de Lingüística
ryan.bennett@yale.edu
(203) 432-7656 (EEUU)
http://pantheon.yale.edu/~rtb27/

Dr. Robert Henderson
University of Arizona
Dept. de Lingüística
rhenderson@email.arizona.edu
(313) 806-9009 (EEUU)
http://rhenderson.net

También le podemos dar un papelito con esta información, si usted quiere.
Si usted tiene algunas preguntas, ahora o en el futuro, por favor avísenos. ¡K'omo re ato'ik!

Si usted tiene preguntas sobre sus derechos como participante en este estudio o para discutir otras preocupaciones relacionadas con el estudio con alguien que no es parte del equipo de investigación, puede comunicarse con el Programa de Protección de Sujetos Humanos en 520-626-6721 o en http://orcr.arizona.edu/hspp.

He leído (o alguien me ha leído) este formulario, y estoy consciente de que me pide mi participación en un estudio de investigación. He tenido la oportunidad de hacer preguntas y los investigadores respondieron a mis preguntas. Yo voluntariamente estoy de acuerdo en participar en este estudio .

No renuncio a cualquier derecho legal al firmar este formulario. Se me dará una copia de este formulario.

Firma/Fecha:_____

_____
Numero de referencia

warb'al	dormitorio	ak'aam	tu cuerda	mi cuerda				
k'atan	caliente	jumuq'	una puña	una puña				
atz'aq	tu azulejo	teleb'	hombro	hombro				
atz'am	tu sal	sukuk' piojo	piojo	piojo				
pátan	capal	sikiil	pepita de ayote	pepita de ayote				xájb'a
wáqan	tu piedra	pyéeq'	olote	olote				
táq'aj	llano	insíip	mi regalo	tu regalo				
wáb'aj	tu piedra	wáqan	mi pie	tu pie				
ach'aat	tu cama	k'oxob'	achiote	achiote				
achaaq	tu pozole	qacháaj	nuestra ceniza	nuestra ceniza				
aqaaj	tu papá	aqaaj	tu papá	mi papá				
ak'aam	tu cuerda	intul	mi banano	tu banano				
qacháaj	nuestra ceniza	ékel	niño	niño				
acháaj	tu ceniza	atz'aq	tu azulejo	mi azulejo				
ak'áaj	tu harina	ajóoq	tu tuza	mi tuza				
qajáab'	nuestra lluvia	lékej	arriba	arriba				
sukuk'	piojo	achaaq	tu pozole	mi pozole				
inqul	mi cuello	ch'úch'ij	sauve, blando	sauve, blando				
jumuq'	una puña	wáb'aj	mi pie	tu pie				
intul	mi banano	insíip	mi ardilla	tu ardilla				
íxim	maiz	watz'am	mi sal	tu sal				
ch'úch'ij	sauve, blando	apoom	tu copal	mi copal				
ínchi	mi boca	wuquub'	siete	siete				
k'ísis	cipres	inpoot'	mi güipil	tu güipil				
tuluul	zapote	imuul	conejo	conejo				
sikiil	pepita de ayote	warb'al	dormitorio	dormitorio				
imuul	conejo	elq'om	ladron	ladron				
wuquub'	siete	ach'eek	mi rodilla	tu rodilla				
insíip	mi regalo	inpoop	mi petate	tu petate				
inch'úuk'	mi codo	ab'óot	tu algodon	mi algodon				
insíip	mi ardilla	inch'úuk'	mi codo	tu codo				
inwúuj	mi libro	pátan	capal	capal				

mesob'	escoba	acháaj	tu ceniza	mi ceniza				
teleb'	hombro	inwúuj	mi libro	tu libro				
elq'om	ladron	tuluul	zapote	zapote				
k'oxob'	achiote	táq'aj	llano	llano				
lékej	arriba	íxim	maiz	maiz				
ékel	niño	k'ísis	cipres	cipres				
ójor	antes	injóoq'	mi tuza	tu tuza				
intéleb'	mi hombro	ójor	antes	antes				
inpoop	mi petate	qajáab'	nuestra lluvia	nuestra lluvia				
apoom	tu copal	mesob'	escoba	escoba				
inpoot'	mi güipil	ach'aat	tu cama	mi cama				
ach'eek	mi rodilla	inqul	mi cuello	tu cuello				
pyéeq'	olote	k'atan	caliente	caliente				
ab'óot	tu algodon	ak'áaj	tu harina	mi harina				
injóoq'	mi tuza	intéleb'	mi hombro	tu hombro				
ajóoq	tu tuza	íchij	hierba	hierba				

02 INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT DIRECTORS(PI/PD) and co-PRINCIPAL INVESTIGATORS/co-PROJECT DIRECTORS

Submit only ONE copy of this form **for each PI/PD and co-PI/PD** identified on the proposal. The form(s) should be attached to the original proposal as specified in GPG Section II.C.a. Submission of this information is voluntary and is not a precondition of award. This information will not be disclosed to external peer reviewers. ***DO NOT INCLUDE THIS FORM WITH ANY OF THE OTHER COPIES OF YOUR PROPOSAL AS THIS MAY COMPROMISE THE CONFIDENTIALITY OF THE INFORMATION.***

PI/PD Name: Ryan T Bennett

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☒ White

Disability Status: (Select one or more)
- ☐ Hearing Impairment
- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
- ☐ Other
- ☒ None

Citizenship: (Choose one) ☒ U.S. Citizen ☐ Permanent Resident ☐ Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name): ☐

REQUIRED: Check here if you are currently serving (or have previously served) as a PI, co-PI or PD on any federally funded project ☒

Ethnicity Definition:
Hispanic or Latino. A person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race.
Race Definitions:
American Indian or Alaska Native. A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.
Asian. A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.
Black or African American. A person having origins in any of the black racial groups of Africa.
Native Hawaiian or Other Pacific Islander. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.
White. A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

WHY THIS INFORMATION IS BEING REQUESTED:

The Federal Government has a continuing commitment to monitor the operation of its review and award processes to identify and address any inequities based on gender, race, ethnicity, or disability of its proposed PIs/PDs. To gather information needed for this important task, the proposer should submit a single copy of this form for each identified PI/PD with each proposal. Submission of the requested information is voluntary and will not affect the organization's eligibility for an award. However, information not submitted will seriously undermine the statistical validity, and therefore the usefulness, of information recieved from others. Any individual not wishing to submit some or all the information should check the box provided for this purpose. (The exceptions are the PI/PD name and the information about prior Federal support, the last question above.)

Collection of this information is authorized by the NSF Act of 1950, as amended, 42 U.S.C. 1861, et seq. Demographic data allows NSF to gauge whether our programs and other opportunities in science and technology are fairly reaching and benefiting everyone regardless of demographic category; to ensure that those in under-represented groups have the same knowledge of and access to programs and other research and educational oppurtunities; and to assess involvement of international investigators in work supported by NSF. The information may be disclosed to government contractors, experts, volunteers and researchers to complete assigned work; and to other government agencies in order to coordinate and assess programs. The information may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records", 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records", 63 Federal Register 268 (January 5, 1998).

02 INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT DIRECTORS(PI/PD) and co-PRINCIPAL INVESTIGATORS/co-PROJECT DIRECTORS

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PI/PD Name: Robert Henderson

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☒ White

Disability Status: (Select one or more)
- ☐ Hearing Impairment
- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
- ☐ Other
- ☒ None

Citizenship: (Choose one) ☒ U.S. Citizen ☐ Permanent Resident ☐ Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name): ☐

REQUIRED: Check here if you are currently serving (or have previously served) as a PI, co-PI or PD on any federally funded project ☐

Ethnicity Definition:
Hispanic or Latino. A person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race.
Race Definitions:
American Indian or Alaska Native. A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.
Asian. A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.
Black or African American. A person having origins in any of the black racial groups of Africa.
Native Hawaiian or Other Pacific Islander. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.
White. A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

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Collection of this information is authorized by the NSF Act of 1950, as amended, 42 U.S.C. 1861, et seq. Demographic data allows NSF to gauge whether our programs and other opportunities in science and technology are fairly reaching and benefiting everyone regardless of demographic category; to ensure that those in under-represented groups have the same knowledge of and access to programs and other research and educational oppurtunities; and to assess involvement of international investigators in work supported by NSF. The information may be disclosed to government contractors, experts, volunteers and researchers to complete assigned work; and to other government agencies in order to coordinate and assess programs. The information may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records", 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records", 63 Federal Register 268 (January 5, 1998).

List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:
Not Listed

REVIEWERS NOT TO INCLUDE:
Not Listed

List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:
Not Listed

REVIEWERS NOT TO INCLUDE:
Not Listed

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 15-1

PD 98-1311 **07/15/15**

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)

BCS - LINGUISTICS

FOR NSF USE ONLY

NSF PROPOSAL NUMBER

1551043

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION
07/06/2015	1	04040000 BCS	1311	043207562	12/26/2015 4:41pm S

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)

060646973

SHOW PREVIOUS AWARD NO. IF THIS IS
☐ A RENEWAL
☐ AN ACCOMPLISHMENT-BASED RENEWAL

IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☒ IF YES, LIST ACRONYM(S)

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE

Yale University

AWARDEE ORGANIZATION CODE (IF KNOWN)

0014266000

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE

Yale University
Office of Sponsored Projects
New Haven, CT. 065208327

NAME OF PRIMARY PLACE OF PERF

Yale University

ADDRESS OF PRIMARY PLACE OF PERF, INCLUDING 9 DIGIT ZIP CODE

Yale University
Dow Hall
New Haven ,CT ,065208366 ,US.

IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)
☐ SMALL BUSINESS ☐ MINORITY BUSINESS ☐ FOR-PROFIT ORGANIZATION ☐ WOMAN-OWNED BUSINESS

☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE

TITLE OF PROPOSED PROJECT **Collaborative Research: Attrition in complex prosodic systems: tone and stress in Uspanteko (USP, Mayan)**

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ **208,375**	**36** months	**01/01/16**	

THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

☒ BEGINNING INVESTIGATOR (GPG I.G.2)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e)
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d)
☐ HISTORIC PLACES (GPG II.C.2.j)
☐ VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____
PHS Animal Welfare Assurance Number _____
☒ FUNDING MECHANISM **Research - other than RAPID or EAGER**

☒ HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number **FWA00002571**
Exemption Subsection _____ or IRB App. Date **Pending**
☒ INTERNATIONAL ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)
GT MX
☒ COLLABORATIVE STATUS
A collaborative proposal from multiple organizations (GPG II.D.4.b)

PI/PD DEPARTMENT
Linguistics

PI/PD FAX NUMBER
203-432-4087

PI/PD POSTAL ADDRESS
370 Temple St.
Room 204
New Haven, CT 065208366
United States

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Email Address
PI/PD NAME **Ryan T Bennett**	**PhD**	**2012**	**203-432-7656**	**ryan.bennett@yale.edu**
CO-PI/PD				
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CO-PI/PD				
CO-PI/PD				

CERTIFICATION PAGE

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Drug Free Work Place Certification

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Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency? Yes ☐ No ☒

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(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, ''Disclosure of Lobbying Activities,'' in accordance with its instructions.
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AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME **Jennifer Pomales**	**Electronic Signature**	**Jul 6 2015 3:19PM**

TELEPHONE NUMBER	EMAIL ADDRESS	FAX NUMBER
	jennifer.pomales@yale.edu	

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 15-1

PD 98-1311 **07/15/15**

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)

BCS - LINGUISTICS

FOR NSF USE ONLY

NSF PROPOSAL NUMBER

1551666

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION
07/14/2015	1	04040000 BCS	1311	806345617	12/26/2015 4:41pm S

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)

742652689

SHOW PREVIOUS AWARD NO. IF THIS IS
☐ A RENEWAL
☐ AN ACCOMPLISHMENT-BASED RENEWAL

IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☒ IF YES, LIST ACRONYM(S)

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE

University of Arizona

AWARDEE ORGANIZATION CODE (IF KNOWN)

0010835000

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE

888 N Euclid Ave
TUCSON, AZ 85721-0001

NAME OF PRIMARY PLACE OF PERF

University of Arizona

ADDRESS OF PRIMARY PLACE OF PERF, INCLUDING 9 DIGIT ZIP CODE

University of Arizona
888 N Euclid Ave, AZ
TUCSON ,AZ ,857210001 ,US.

IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)
☐ SMALL BUSINESS ☐ MINORITY BUSINESS ☐ FOR-PROFIT ORGANIZATION ☐ WOMAN-OWNED BUSINESS

☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE

TITLE OF PROPOSED PROJECT **Collaborative Research: Attrition in complex prosodic systems: tone and stress in Uspanteko (USP, Mayan)**

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ **166,923**	**36** months	**01/01/16**	

THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

☐ BEGINNING INVESTIGATOR (GPG I.G.2)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e)
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d)
☐ HISTORIC PLACES (GPG II.C.2.j)
☐ VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____
PHS Animal Welfare Assurance Number _____
☒ FUNDING MECHANISM **Research - other than RAPID or EAGER**

☐ HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number _____
Exemption Subsection _____ or IRB App. Date _____
☒ INTERNATIONAL ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)
GT
☒ COLLABORATIVE STATUS
A collaborative proposal from multiple organizations (GPG II.D.4.b)

PI/PD DEPARTMENT
Linguistics

PI/PD FAX NUMBER

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P.O. Box 210025
Tucson, AZ 85721
United States

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Email Address
PI/PD NAME **Robert Henderson**	**PhD**	**2012**	**520-621-6897**	**rhenderson@email.arizona.edu**
CO-PI/PD				
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AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME **Tyler Roberts**	**Electronic Signature**	**Jul 14 2015 2:34PM**

TELEPHONE NUMBER	EMAIL ADDRESS	FAX NUMBER
520-626-6113	**tro@email.arizona.edu**	**520-626-4130**

PROJECT SUMMARY

Overview:

A pair of researchers from Yale University and the University of Arizona request funding for a large-scale documentation project on the phonetics of word-level prosody in Uspanteko (USP), an endangered Mayan language spoken in the Guatemalan highlands. Uspanteko has no more than 2000 remaining speakers, and younger speakers are largely shifting to K'iche' (QUC, Mayan) and Spanish as their primary languages. Our scientific goals are the following:

1. Document and analyze the acoustics of word-level stress and lexical tone in Uspanteko.
2. Doument the ongoing loss of lexical tone among younger speakers of Uspanteko.
3. Collect and annotate a large corpus of spontaneous speech in Uspanteko, including community narratives, from a demographically diverse group of speakers.
4. Investigate the influence of phrasal and discourse context on the phonetics of stress and tone.
5. Consider the implications of this data for theories of the phonetics-phonology interface, for the study of phonological obsolescence, and for models of language change in contact situations.

The proposed project will investigate these questions by collecting audio recordings of Uspanteko speakers in Guatemala over a three-year period. This will be the largest and most comprehensive documentation of word-level prosody in any Mayan language to date, and the most in-depth study of any aspect of Uspanteko phonology. The study is timely, given that Uspanteko may disappear in only a few generations. Results of the project include both theoretical and descriptive journal publications, as well as a publicly-shared corpus of high-quality audio recordings with associated phonetic and morphological annotations. Data and annotations will be archived with the Archive of the Indigenous Languages of Latin America. Past projects have demonstrated the tractability of these goals, and have established that the results of the project would be received with interest in the field of linguistics and in the Uspanteko community.

Intellectual Merit :

Existing documentation of Uspanteko prosody is sparse and relatively shallow. The phonetics and phonology of Mayan languages is under documented; this is particularly true of languages with relatively few speakers, like Uspanteko. The data we collect will be of clear interest to Mayanists, and also to researchers working on theoretical issues in phonology, phonetics, or prosodic typology.

Broader Impacts :

We plan to record elicitation data and spontaneous speech with a demographically diverse population of speakers. These materials will be publicly shared, and should be valuable for linguists, sociologists, anthropologists, and members of the Uspanteko community. Our collaborations with native-speaker linguists in Guatemala will provide financial and logistical support for their ongoing work on the documentation of Uspanteko. The grant includes provisions for three multiday training workshops on phonetic documentation and analysis, to be held in Guatemala each year of the grant. In-depth training in the practice of phonetic documentation will be provided to a single Guatemalan linguist over the course of the grant. Undergraduate and graduate research assistants will learn to how to analyze field recordings, help develop large-scale corpora, and gain extensive familiarity with Mayan languages. Students will have the chance to participate fully in this work, including the possibility of co-authored publications and/or conference presentations.

1551043

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Project Description (Including Results from Prior NSF Support) (not to exceed 15 pages) **(Exceed only if allowed by a specific program announcement/solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)**	15	
References Cited	5	
Biographical Sketches (Not to exceed 2 pages each)	2	
Budget (Plus up to 3 pages of budget justification)	7	
Current and Pending Support	1	
Facilities, Equipment and Other Resources	1	
Special Information/Supplementary Documents (Data Management Plan, Mentoring Plan and Other Supplementary Documents)	3	
Appendix (List below.) **(Include only if allowed by a specific program announcement/ solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)**		
Appendix Items:		

*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

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Project description

Collaborative Research: Attrition in complex prosodic systems: tone and stress in Uspanteko (USP, Mayan)

1 Statement of the objectives of the project

We propose a three-year grant for the documentation and analysis of word-level prosody in Uspanteko (USP), an endangered Mayan language spoken by fewer than 2000 people in the Guatemalan highlands. The project will investigate the phonetic correlates of word-level stress and lexical pitch accent across a demographically diverse population of speakers. Data will come from elicitation tasks and spontaneous speech, mainly narratives. The primary research questions are (i) how phonemic contrast constrains the phonetics of stress and lexical pitch accent; (ii) how the phonetics of stress and tone vary with phrasal context; and (iii) whether phonological attrition is visible in the word-level prosody of Uspanteko. In the process of answering these questions, the project will produce a corpus of controlled data on the production of stress and tone across multiple speech communities and demographic groups, as well a collection of prosodically annotated texts.

'Hybrid' prosodic systems using lexical tone alongside word-level stress are rare both within Mayan and cross-linguistically. The project will thus not only support the documentation of an understudied and rapidly obsolescing Mayan language, but will also contribute to phonological theory, to prosodic typology, and to the literature on sound change in minority languages.

1.1 Background on Uspanteko and project overview

Uspanteko, also known as *Tz'unun Kaab'* or 'sweet hummingbird', is one of the roughly thirty Mayan languages still in use today. A member of the K'ichean branch of the family, it is spoken almost exclusively in the municipality of Uspantán, a small and relatively remote area in the highlands of Guatemala (Fig. 1). Richards (2003) reports a speaker population of about 1200, and even a generous estimate of the present strength of the language would put this number at no more than 2000. This makes Uspanteko a minority language among neighboring Mayan languages like K'iche' ($\sim$1 million speakers), Q'eqchi' ($\sim$750,000 speakers), Poqomchi' ($\sim$70,000 speakers), and Ixil ($\sim$75,000 speakers), as well as within the family more generally.

The outlook for Uspanteko is not sunny. Experts such as Grimes (1972) and Can Pixabaj (2006) agree with our impression that the language is rapidly losing ground to Spanish and K'iche'. These are the two majority languages of the region, and both are used in a wider range of social domains than Uspanteko, which at this point is mostly spoken in the home. Speakers of Uspanteko are typically trilingual, controlling Spanish, K'iche', and Uspanteko with fluency. While there are still some scattered rural towns where Uspanteko has retained its status as the primary community language, the shift to K'iche' is clearly in full swing among younger speakers. Intergenerational transmission is weak, and many children with Uspanteko-speaking parents have grown up with K'iche' as their only native language. Community members share the perception that Uspanteko is highly threatened, and regularly report that the language is no longer heard in large urban towns like San Miguel Uspantán (the regional capital of Uspantán). Speakers are acutely aware that this receding trend, if left unchecked, will ultimately lead to language death. It seems probable that Uspanteko, as a linguistic variety distinct from K'iche', may vanish within just a few generations.

The Uspanteko region is fairly remote, and can be difficult to access from elsewhere in the Guatemalan highlands. As a result, the municipality is something of a cultural and geographical island, separated but not entirely closed off from the surrounding linguistic ecology. Given this socio-linguistic context, and a thousand or so years of development from proto-K'ichean, it should

Figure 1: Map of Guatemala showing the municipality of Uspantán (dark grey). The speaker population of Uspanteko is concentrated in the area approximated by the dashed rectangle.

not be very surprising that Uspanteko has diverged significantly from the other languages of the K'ichean branch. The most striking innovations can be found in the system of word-level prosody. Uspanteko is notable as the only Mayan language in Guatemala to have developed a full-fledged system of contrastive lexical tone, as illustrated in (1) (examples from Can Pixabaj 2006).

(1) Contrastive lexical tone in Uspanteko ([V́] = high tone vowel, [V] = toneless vowel)

a. *naach* [ˈnaːt͡ʃ] 'shade' b. *páach* [ˈpáːt͡ʃ] 'right'

c. *ichaaj* [ʔiˈt͡ʃaːx] 'grass, herb' d. *incháaj* [ʔinˈt͡ʃáːx] 'my ash'

The tonal system of Uspanteko has been described in a number of publications, most notably Grimes 1971, 1972, Campbell 1977, Can Pixabaj 2006 and Bennett & Henderson 2013. Although these works offer somewhat different characterizations of the tonal facts, there is a broad consensus over the basic distribution of tone in the language. Bennett & Henderson (2013) provide the following descriptive generalizations, based on earlier literature and their own direct fieldwork:

(A) Default stress falls on the word-final syllable:

(2) *kojachape'* [ko.χa.t͡ʃaˈpeʔ] 'Grab us!'

(B) Final stressed syllables containing a long vowel may be contrastively specified for high tone:

(3) *siip* [siːpʰ] 'tick' vs. *síip* [síːpʰ] 'gift'

(C) Long vowels do not occur outside of final stressed syllables.

(D) Words with a short vowel in the final syllable may also carry a contrastive high tone, but in that case both lexical pitch and stress occur on the penult rather than the final syllable:

(4) *ch'úch'ij* [ˈt͡ʃ'ú.t͡ʃ'ix] 'soft'

Uspanteko therefore constitutes a 'hybrid' prosodic system, combining word-level stress with privative lexical pitch accent (Hyman 2006, 2009). It is unusual among such hybrid systems in that stress and tone placement are co-determined, with stress influencing the location of tone (B) and vice-versa (D) (e.g., van der Hulst et al. 2010:250-1).

These patterns are quite unique among K'ichean-branch languages. While default final stress (A) is the norm in the K'ichean sub-group, phonologically governed penultimate stress (D) is rather atypical, occurring only in a limited set of phrasal contexts in K'iche' (Henderson 2012a). Lexical tone (B/D) is of course a completely distinctive property of Uspanteko, shared with no other Mayan language in Guatemala, in any branch of the family.

Apart from these core generalizations, not much is known about the prosody of Uspanteko. Though the Mayan languages are reasonably well-studied, most work on Mayan has focused on morpho-syntax and basic phonemic analysis. Phonology and phonetics are comparatively underexplored areas. This is especially true for prosody, and for 'small' languages like Uspanteko. By way of illustration, consider that three extensive bibliographies of Mayan linguistic and anthropological research (Stross no date, Zavala & Smith-Stark 2007, England & Zavala 2013) jointly list a mere 11 publications dealing with Uspanteko.[1] Four of these publications are grammatical sketches of some kind, while the rest are narrative collections or specialized dictionaries. Only one of these sources promises a targeted phonological description of the language ("Compilación y análisis fonológico: idioma Maya Uspanteko"), but not being publicly available, whether it contains any discussion of Uspanteko prosody is unknown. Indeed, most descriptive sources on the language fail to mention either stress or tone; this includes at least two of the four major grammatical descriptions just mentioned (Comunidad Lingüística Uspanteka 2001 and Us Maldonado 2010). In contrast, these same bibliographies list over 90 treatments of K'iche', including several book-length grammatical descriptions and specifically phonological works like López Ixcoy 1994. Further documentation of Uspanteko is thus sorely needed, especially in the realm of phonetics and phonology, where existing research is most scarce.

We propose to bridge this descriptive gap by conducting an extensive phonetic analysis of stress and tone in Uspanteko. Along with the basic documentation of these two accentual features, we plan to investigate whether the phonetic realization of stress and tone depends on higher-level phrasal prosody or on demographic factors. Chief among these demographic factors is speaker age: finding age-graded differences in the phonetics of stress and lexical tone would help shed light on the process of language attrition in Uspanteko communities.

We focus on phonetic documentation for several reasons. First, there are no existing phonetic descriptions of Uspanteko, apart from some preliminary and impressionistic observations in work like Can Pixabaj 2006 and Bennett & Henderson 2013. This reflects larger research trends in Mayan linguistics, which have skewed toward phonemic analysis rather than quantitative phonetic documentation, and which emphasize segmental phonology over prosodic phenomena.

Second, phonetic documentation is essential for securing basic phonological generalizations about the accentual system of Uspanteko. A body of recent research has cogently argued that impressionistic descriptions of stress may be unduly influenced by the native language of the fieldworker. Such descriptions may also be marred by a failure to distinguish word-level prosody from phrasal prosody. Relevant work in this vein includes Fletcher & Evans 2002, de Lacy 2007, 2014, Blaho & Szeredi 2011, Newlin-Łukowicz 2012, Gordon 2014, Tabain et al. 2014. Similar concerns hold for the tonal system. There is little agreement on the tonal inventory of Uspanteko, apart from its binary character. This may reflect the fact that all previous descriptions

[1] Uspanteko language materials are occasionally published by the Comunidad Lingüística Uspanteka (CLU), the local government-supported language authority for Uspanteko (under the aegis of the Academia de Lenguas Mayas de Guatemala, or ALMG). Other major publishers of Mayan language materials include the *Proyecto Lingüístico Francisco Marroquín* (PLFM) and *Fundación Cholsamaj*; only the latter has published work on Uspanteko.

are impressionistic rather than instrumental in nature. Furthermore, Bennett & Henderson 2013 is the only source that shows any explicit indication of controlling for higher-level prosody in the description of tone, leaving open the possibility that past tonal descriptions have confounded word- and phrase-level prosody (e.g., Himmelmann 2006, Himmelmann & Ladd 2008, Jun & Fletcher 2014). Such worries can be mitigated when the impressionistic description of a prosodic system is buttressed by in-depth acoustic investigation of the sort we propose here.

Third, a phonetic description of Uspanteko accent would contribute significantly to our understanding of prosodic typology. Hybrid word-prosodic systems are typologically rare, poorly documented, and poorly understood relative to more canonical tone and stress systems. There is certainly previous phonetic research on the prosody of languages with both word-level stress and lexical pitch accent: Swedish, Basque, and Serbo-Croatian are particularly well-studied examples (e.g., Bruce 1977, Riad 2006, Zec & Zsiga 2010, Elordieta & Hualde 2014), and there have been positive steps toward documenting similar hybrid prosodic systems in minority languages (e.g., Remijsen 2002, Gussenhoven 2006, Gooden et al. 2009, Guion et al. 2010, among others). Still, it would be wrong to lump all such hybrid systems into a single typological category. There is substantial phonetic and phonological diversity across these languages, which precludes any clear generalizations about the 'typical' hybrid system. An important unanswered question is how the expression of lexical tone interacts with the expression of stress, and how both systems may be restricted by other kinds of phonemic contrast such as vowel length or voice quality distinctions (e.g., Berinstein 1979, Chávez-Peón 2008, and below). Furthermore, it is not known at present how the unique characteristics of hybrid prosodic systems might reflect their individual linguistic histories, especially the effects of language contact (e.g., Thomason 2001, Gooden et al. 2009 and below). We aim to contribute to the existing literature on the synchrony and diachrony of hybrid prosodic systems by adding another in-depth case study to this growing area of research.

Fourth, we suspect that phonetic attrition will outpace phonological attrition in the case of Uspanteko prosody. Tonal distinctions do not carry a high functional load in the language, and it is well-known that phonological contrasts with a low functional load are more likely to be lost over time (e.g. Wedel et al. 2013). There are few minimal pairs for lexical tone, and most instances of tone are introduced by inflectional affixes that already express the morphological information contributed by tone (Bennett & Henderson 2013).[2] Furthermore, when tone occurs on a non-final short vowel as in *íntz'i'* ['ʔín.t͡sʼiʔ] 'my dog', it is fully redundant with stress shift to the penult.

Given this background, we believe that tonal contrasts in Uspanteko are more susceptible to attrition than the other phonological, morpho-syntactic, and lexical features which distinguish Uspanteko from surrounding Mayan languages. In past elicitation with Uspanteko consultants it has become clear to us that many speakers already lack a tonal contrast on final long vowels. Further evidence that tonal attrition is underway comes from the fact that tone is inconsistently transcribed even in major descriptive works. For example, the Uspanteko word for 'squirrel' is transcribed as non-tonal [kukʰ]/[kukʼ] and as tonal [kúːkʼ] in Can Pixabaj's (2006) grammar, but as non-tonal [kuːkʰ] in the Méndez (2007) dictionary. Some of this variation reflects the fact that Uspanteko is part of a complex language continuum that includes 'pure' K'iche' and 'pure' Uspanteko as its endpoints, but which also includes various intermediary language varieties

[2]To illustrate, in a random sample of 20 pages (≈ 450 words) from the Uspanteko dictionary (Méndez 2007) the vast majority of tonal forms carry the verbal suffix *-ik*. Only 5 other tonal forms were attested in the sample, and all of these were either morphologically complex, with tone being introduced by a different suffix (e.g. *rib'óch'il* [r-iɓót͡ʃʼ-il] 'its nervous system'; cf. *rib'och'* [r-iɓot͡ʃʼ] 'its vein') or were borrowings from Spanish (e.g. *kúrus* < Sp. *cruz* 'cross').

that combine elements of both languages. It is nonetheless clear that tonal forms are losing out to non-tonal, K'iche'-like lexemes rather than vice-versa. This is an expected consequence of the dominance of K'iche', along with the tendency for diffussion of prosodic features in contact situations (as with e.g. the loss of contrastive pitch accent in some Basque varieties under influence from Spanish and French, Elordieta & Hualde 2014; see also Thomason 2001).

Our prediction, then, is that tonal contrasts will soon be lost on final long vowels. If penultimate accent survives at all in words like [ˈwá.qən] 'my leg', it will most likely persist as simple stress shift rather than a phonetically complex accent built from distinct stress and tonal components. For speakers who retain penultimate tone, vowels in stressed tonal penults should be systematically realized with higher and/or less variable pitch peaks than non-tonal short vowels in stressed final syllables. Speakers who have lost the tonal distinction would show no such contrast, realizing stress with similar pitch correlates in all positions (essentially as in K'iche', Nielsen 2005, Henderson 2012a, Baird 2014). This pattern of prosodic attrition would be consistent with past findings that obsolescent languages may show early shifts in phonetic structure prior to the collapse of a contrastive phonological distinction (Campbell & Muntzel 1989, Babel 2009).

Finally, the phonetic documentation of Uspanteko prosody will enable us to contribute our particular research expertise to the Mayan linguists already working to preserve and describe the language. The local language authorities in Guatemala (*Comunidades Lingüísticas)* are staffed by professional linguists who dedicate their time to various linguistic and cultural projects: the writing of dictionaries, grammars, and specialized lexicons; the recording of oral histories; the preservation of indigenous music and dance traditions; and so on. Though quite skilled, these linguists typically lack any training in phonetics, much less in phonetic documentation and analysis. This is not to say that Mayan linguists are uninterested in phonetics, only that Guatemalan linguistic education lacks a robust phonetics component. Furthermore, even those linguists with some phonetics background are usually unable to afford the high-quality recording equipment required for phonetics research. These native-speaker linguists are quite capable of morpho-syntactic, lexical, and phonological documentation. For phonetic documentation, they will need the help of linguists from resource-rich countries like the United States. Our project provides just this type of support, both through the proposed research activities as well as through a significant training component, which will increase local capacity to do phonetic research. Our proposal thus dovetails nicely with the documentation work already underway on the language.

2 Proposed work

2.1 Documentation goals

We propose to document the acoustic realization of stress and tone in Uspanteko in a range of prosodic contexts, in both elicited and narrative speech, across a demographically diverse population of speakers. More specifically, we will measure the extent to which pitch, duration, intensity, voice quality, and vowel centralization cue stress and contrastive pitch accent in the language, and how the weighting of these measures may shift with differences in phonological context, or along demographic dimensions like age, gender, and location of speaker residence.

Though a large number of recordings of spoken Uspanteko are already available online at the *Archive of the Indigenous Languages of Latin America*, these recordings are not in general appropriate for phonetic research. The audio quality of the recordings is uneven, and often too poor for sensitive acoustic measures like intensity and spectral tilt. Furthermore, phonetic research on prosody requires particularly careful control of both recording conditions and the structure of

the items being elicited (Turk et al. 2006, Himmelmann 2006, Himmelmann & Ladd 2008, Jun & Fletcher 2014). For these reasons we believe that the collection of additional recordings is absolutely crucial to the goal of documenting the phonetics of Uspanteko prosody. (See attached Budget Justification for equipment details.)

In Bennett & Henderson 2013 and a more recent pilot study (§2.6) we investigated the realization of tone in non-focal discourse contexts. For example, we would elicit the word 'corn' by asking a question like 'Who bought corn at the market yesterday?'. This would prompt a response like '*Diego* bought corn at the market yesterday', with focus prosody drawn away from the target item 'corn'. (The relatively low literacy rates in Guatemala force us to use non-orthographic elicitation techniques.) While this method has its virtues, it leaves open the possibility that pitch on the target items was affected by post-focal pitch compression, deaccentuation, or rephrasing, as is commonly found in post-focal contexts cross-linguistically (e.g. the papers in Jun 2014). We would like to build on our previous work by investigating the acoustic cues to stress and tone in a wider array of prosodic contexts, including broad focus ('out-of-the blue' productions), non-focused question-answer pairs (as just illustrated), narrow focus, and contrastive focus.

(5) a. Broad focus: *X saw a dog yesterday*.
b. Non-focused Q-A pairs: A: *Who saw X yesterday?* / B: *John saw X yesterday*.
c. Narrow focus: A: *What did John see yesterday?* / B: *John saw X yesterday*.
d. Contrastive focus: *John didn't see Y yesterday, he saw X yesterday*.

Focal prosody interacts with the expression of word-level stress and tone in many languages, and so a careful study of Uspanteko accent must take such factors into account.

We will also compare the realization of stress and pitch on items occurring under broad focus in both phrase-final and phrase-medial positions. This will allow us to gauge the extent to which the phonetics of stress and tone are affected by phrase-final lengthening and phrase-final pitch contours. A typical comparison pair would be *Xril Tek íntz'i'* 'Diego saw my dog' vs. *Xril Tek íntz'i' li tilmit kab'jiir* 'Diego saw my dog in town the day before yesterday'.

Apart from structured elicitation, we will gather a large quantity of free narrative and conversational data. This is for two reasons. First, we would like to ensure that the phonetic and phonological generalizations we extract from elicitation data also hold of more naturalistic speech. Second, and perhaps more importantly, recording narrative and conversational speech is a crucial component of any serious documentation effort. These recordings will also be of greater utility for the Comunidad Lingüística Uspanteka (CLU), which is primarily engaged in the task of documenting morpho-syntax and micro-regional lexical and grammatical variation.

Narrative data will be collected by asking speakers to recount stories that are shared in their community. We will also ask speakers to tell us short narratives about their daily activities or personal history, though given the history of violence in the Guatemalan highlands we shy away from recording personal histories unless speakers suggest the idea themselves. This will ensure that we are able to document a broad range of word-level prosodic patterns in a variety of naturally occuring phrase-level prosodic contexts. Conversational data will be collected by recording short conversations between our native-speaker colleagues (see below) and the community speakers we are working with to collect our audio data.

To process the free narrative data, we will pay local Uspanteko linguists to transcribe the recordings. Joint training sessions for the transcribers will be held to promote consistency across texts. Both PIs have previously hired linguists who speak Kaqchikel (a related Mayan language) to

transcribe texts, with great success. Apart from engaging the expertise of these native-speaker linguists, paying for transcription services allows us to support the work of local linguists more generally. Wages across Guatemala are quite low—the minimum wage is just $1.09/hour, usually less in actual practice—and even better-paid skilled workers often struggle to make ends meet, supplementing their income with farming or additional employment. As a consequence, native-speaker linguists are sometimes compelled to leave their posts at Guatemalan language academies for purely economic reasons. Paying Uspanteko-speaking linguists for transcription thus has a dual benefit for the CLU, supporting their work both practically and financially.

Even with skilled native-speaker transcriptions, analyzing large amounts of free narrative speech can be quite time-consuming. One of the PIs (Bennett) has been developing forced alignment tools to expedite the phonetic analysis of another Mayan language (Kaqchikel). Forced alignment tools partially automate the process of time-aligning a transcript with an audio recording, with fairly high segment-level accuracy (see DiCanio et al. 2013). The forced alignment resources that Bennett has been developing for Kaqchikel should be straightforwardly transferable to Uspanteko narrative data once basic transcriptions are completed.

The demographic side of the project will investigate how factors like age, gender, and home community affect the phonetic realization of stress and tone. We are especially interested in age graded differences in the phonetics of stress and pitch accent. If, as we suspect, the tonal contrast is disappearing in Uspanteko communities, we expect to see an apparent-time effect. Younger speakers should have smaller pitch differences between tonal and non-tonal vowels, possibly neutralizing the contrast entirely. If lexical tone is also cued by phonetic features like duration or voice quality, we would also expect to see a correlation between age and the reliability of these secondary cues. If so, such findings would confirm our hypothesis that prosodic attrition is occurring at a relatively early stage in the obsolescence of Uspanteko.

We plan to further document the extent to which the phonetic correlates of stress and tone show geographical variation. As mentioned above, the social status of Uspanteko ranges from marginal (in more urban towns like San Miguel Uspantán), stable (in semi-urban towns like La Lagunita), to strong or even dominant (in more rural towns like Las Pacayas). We expect that the structural effects of language contact and language attrition will be strongest in more urban areas. Concomitantly, we expect that phonetic cues to phonemic lexical tone will be most robust in outer rural areas where Uspanteko remains the primary community language.

We propose to pay local linguists from the CLU to accompany us on data-gathering trips to small Uspanteko-speaking communities like Las Pacayas. Linguists at CLU have previously expressed their willingness to participate in such trips, particularly since many of them grew up in the small towns we intend to work in. Having native Uspanteko speakers assist in data collection is important for several reasons. It can be difficult, or even dangerous to travel to small Guatemalan towns without pre-existing social contacts. Having a native Uspanteko-speaking collaborator from the CLU provides a strong public indication that our project has been locally vetted, and that our work has a valuable community focus. Furthermore, older rural speakers, especially women, may be monolingual in Uspanteko. Even speakers who control some Spanish or K'iche' (which PI Henderson also speaks) may have limited conversational skills in those two languages. This would make it difficult to communicate with some participants. The collaboration of native Uspanteko speakers is thus invaluable for the overall goal of the project.

2.2 Training goals

In addition to the documentation goals, our project includes a significant training component that can be broken down into three parts. First, in each year of the project we will host a multiday workshop in Guatemala on a topic related to that year's work plan. For instance, the first year's workshop will focus on basic phonetics, the recording of archival quality audio, and the use of ubiquitous analytic tools like Praat (phonetic analysis software). The second year will focus on controlled elicitation and data analysis. Participants will learn how to conduct a series of simple experiments to document a language's vowel inventory and prosodic characteristics. Finally, the third year's workshop will focus on forced alignment and phonetic analysis in corpora of naturally occuring speech. All three workshops will be targeted at native-speaker linguists working in Guatemala. With the funds we have requested to support participation and by advertising through the Academia de Lenguas Mayas de Guatemala (ALMG), we expect to draw up to 20-30 linguists representing a variety of different Mayan languages. The broad goal is to provide the seeds for novel, high quality phonetic descriptions of Mayan languages more generally.

While the first training component looks to broadly increase local capacity in phonetic research, the second component provides in-depth training for a single individual. We have included funds to recruit and hire a Guatemalan linguist to work on the project. We will hire a linguist who is a native-speaker of a Mayan language, ideally Uspanteko, but any native-speaker linguist who is interested in the project and using their acquired skills to analyze their own language would be considered. In particular, we will target students of linguistics in Guatemala or technical staff at ALMG. The hire would participate as a colleague in all aspects of data collection and analysis, but would be specifically tasked with leading the analysis of demographic data in line with the descriptive questions discussed in section 2.3, and writing the resulting paper. We are commited to providing a positive learning experience for the person who assumes this position through extensive mentoring. The position would be advertised through ALMG, local linguistic academies, and our personal and professional contacts in Guatemalan universities.

Finally, our proposal includes opportunities for further training and research experience for US students. Most importantly, we have included two years of funding for a graduate assistant to help build annotated corpora from the raw data we collect. We expect research activities to produce a large amount of transcribed text which we will annotate morphologically and phonologically. The graduate research assistant will be recruited from the University of Arizona's Human Language Technology Program, and will be tasked with using the interlinearly glossed XML corpus of Uspanteko in Palmer 2009 to bootstrap the (semi-)automatic annotation of our texts. This graduate RA will also play a central role in mining this corpus for data and preparing a phonetic description of Uspanteko for publication. We have also included provisions for hiring undergraduate students to code data, and expect such coding to involve a non-trivial training component related to phonetic analysis and the sound structure of Uspanteko and Mayan languages more generally. Undergraduates will be actively encouraged to make use of our recordings for their own research projects, e.g. a senior capstone study on the phonetics of consonant clusters in the narrative data set. We expect to actively mentor undergraduates throughout the development of such projects, ideally to the point of single-authored or joint journal publications.

2.3 Descriptive questions

A primary descriptive goal of this project is to uncover the phonetic cues to stress in Uspanteko. Word-level stress is both audible and phonologically active in Uspanteko; for example, phonemic

long vowels are restricted to final stressed syllables, and stress conditions the occurrence of a widespread syncope process (Bennett & Henderson 2013). However, the phonetic differences that correlate with the distinction between stressed and unstressed syllables are currently unknown.

We plan to investigate pitch, vowel length, vowel intensity, voice quality, and vowel dispersion as possible indices of word-level stress (see Beckman 1986, Sluijter & van Heuven 1996, Gordon 2002, Cutler 2005 and section 2.7). Of primary interest is the interaction of these cues with more global phonological properties of the language. Most of these cues are already recruited for the expression of other lexical contrasts. Pitch is phonemic in Uspanteko, as is vowel length. Vowel length is partly cued by the centralization of short vowels, at least impressionistically. As in many Mayan languages, voice quality is a cue for the plain vs. glottalized contrast among stop consonants ('glottalized' consonants vary between implosives and ejectives, depending on a range of factors; see e.g. Shosted 2009). It has been argued that languages avoid cuing stress along phonetic dimensions that are already recruited to express phonemic contrasts (e.g. Berinstein 1979, Nakai et al. 2012, Baird 2014). Intensity would then appear to be the only remaining means of expressing stress in Uspanteko, but intensity is typically a weak and unreliable perceptual cue to stress placement across languages (Cutler 2005). If it turns out that intensity is the most robust correlate of stress in Uspanteko, contra the typological tendencies observed to date, we plan to expand our analysis to include other syllable-level cues such as consonant duration or overall syllable duration (Turk et al. 2006). The interaction of stress with the phonemic system of Uspanteko thus presents some fascinating descriptive and theoretical questions.

A secondary question regarding the realization of stress is whether and how such cues change under different high-level prosodic conditions. Campbell & Beckman (1997) find, contra Sluijter & van Heuven 1996, that spectral tilt in English is a reflex of phrase-level intonational prominence rather than an indpendent cue to word-level stress (see also Ortega-Llebaria & Prieto 2010 on Spanish and Catalan). Work in this vein underscores the need for additional phonetic research on the interaction of stress and phrasal context across a range of typologically diverse languages.

There are also several open questions regarding the phonetic manifestation of lexical tone in Uspanteko. Fundamental frequency is obviously relevant, but what properties of the pitch contour signal the lexical tone contrast? Pitch height may be a cue to lexical tone, but so might the magnitude of the pitch rise or fall within the accented syllable (as in Japanese; Beckman 1986, Sugiyama 2008), the alignment of the f0 maximum within the stressed syllable, or the overall pitch contour of the word (as in Swedish; Bruce 1977, Ladd 2008). Phonation type may play a secondary role in cuing tonal contrasts, as in other languages (e.g. Yucatec Maya, Frazier 2009; Cantonese, Yu & Lam 2014). Duration is another possible factor. It has been reported, for example, that vowel length interacts with lexical tone in Thai (Gandour 1977; see also Zhang 2001, Gordon 2002, Xu & Sun 2002, Faytak & Yu 2011). On the other hand, in Japanese and Basque, two lexical pitch accent languages, it has been shown that lexical tone has no reliable effect on vowel duration (Beckman 1986, Elordieta & Hualde 2014). Here too we might reasonably expect that the functional phonemic roles played by phonation and vowel duration in Uspanteko might affect the extent to which those parameters correlate with tonal distinctions at the word-level.

As with stress, the realization of lexical pitch might vary with phrasal position in Uspanteko. K'ichean languages have robust phrase-final intonational melodies (Berinstein 1991, Nielsen 2005, Baird 2014), and the realization of lexical tone may depend on its proximity to these phrasal tones. Cross-linguistically, 'tonal crowding' at phrase edges is resolved by both pitch changes and segmental adjustments (Gordon 2000, Ladd 2008, Jun & Fletcher 2014, Jun 2014). Our project

will help uncover how Uspanteko accommodates the co-production of lexical and phrasal tone.

Lastly, we would like to know how the phonetics of stress and tone are affected by demographic factors, most crucially age and town of origin. Given our hypothesis that the tonal system of Uspanteko is undergoing prosodic attrition, we expect to find either (i) that younger speakers and speakers from K'iche'-dominant towns produce tonal distinctions of a smaller magnitude than older speakers and speakers from Uspanteko-dominant towns; (ii) that such speakers produce tonal distinctions with greater within-category variance along the phonetic dimensions relevant for cuing the tonal contrast; or (iii) that such speakers use a different set of phonetic dimensions for the production of tone than Uspanteko-dominant speakers. Any of these outcomes would be consistent with past work on subphonemic segmental variation in obsolescing languages (e.g. Babel 2009).

2.4 Theoretical and analytical questions

As emphasized above, one of our primary research questions is the extent to which phonological contrast affects the phonetics of stress and lexical tone in Uspanteko. This issue connects to a larger debate over which aspects of subphonemic patterning are purely mechanical byproducts of articulation, and which are learned, grammatical patterns. For example, the results of Berinstein (1979), Nakai et al. (2012) indicate that the phonetics of stress are conditioned by language-specific phonological properties. This suggests that some stress cues are under active speaker control, and not simply the automatic consequence of more 'forceful' articulation (see also Hayes 1995). In contrast, Myers & Hansen (2007) and others have speculated that utterance-final lengthening is a purely mechanical 'slow-down' effect that arises from the anticipation of pause (cf. again Nakai et al. 2012). Our study of Uspanteko will allow us to test the effect of phonemic vowel length on *both* stress and final lengthening, since we plan to investigate the production of words with both long and short vowels, in both phrase-medial and pre-pausal position.

We are also interested in using phrasal prosody to test different phonological analyses of the lexical tone system. Bennett & Henderson (2013) differ from most other authors in assuming that tone is privative in Uspanteko, reflecting an [H]$\sim[\varnothing]$ contrast on the penultimate vowel mora of each word: [...$\acute{\text{V}}_{\mu\mu}\text{C}_0$] or [...$\acute{\text{V}}_{\mu}\text{C}_0\text{V}_{\mu}\text{C}_0$] vs. no tone. This analysis predicts that putatively 'toneless' words might show greater pitch variation across phrasal contexts than high-toned words, which are phonologically specified for pitch (Remijsen & van Heuven 2005, Remijsen et al. 2014 report exactly this finding in Papiamentu; see also Hayes 1995:49-50, Jun & Fletcher 2014).

Apart from engaging with issues at the phonetics/phonology interface, this work will contribute to the literature on phonetic and phonological change in obsolescing languages. There is little existing work on prosodic attrition in obsolescent languages. Furthermore, the path of change that we expect Uspanteko will follow—tonal loss, with the preservation of penultimate tone as morphologically-conditioned penultimate stress—provides a good test of past taxonomies of structural change in phonological obsolescence. For example, Babel (2009) observes that the abruptness of sound change in obsolescent languages depends on the degree of similarity between the feature undergoing change and its closest phonological correspondent in the majority contact language. The similarity between final stress in K'iche' and final stress in Uspanteko (with or without lexical tone) may facilitate the loss of the tonal contrast on final long vowels. K'iche' has no correspondent to the morphologically-governed patterns of penult stress and tone found in Uspanteko; this difference may help preserve penultimate tone, even as its phonetic cues may be weakening. Though the preceding discussion is largely speculative, it is clear that our study would make a valuable contribution to the theory and description of phonological obsolesence.

2.5 Timetable

We propose a three-year timetable for this grant. Years 1 and 2 would be committed to structured elicitation with Uspanteko speakers. Year 1 would focus on the prosody of words in phrase-medial, broad focus contexts. As with all stages of the study, we would aim to record speakers of various ages in several towns (at least Las Pacayas, La Lagunita, and San Miguel Uspantán). These recordings could be accomplished in a single month-long trip to the region.

Year 2 would expand the empirical base of the recordings to include words in a wider array of prosodic contexts. The overall structure of data collection would be the same as in Year 1; the only difference would be the content of the elicitation materials. These recordings could also be completed during a month-long trip to Uspantán. We anticipate that Year 2 would be partially dedicated to preparing the results of Year 1 for publication (§4.3). The collection of narrative texts would also begin in Year 2, concurrent with the collection of additional elicitation data.

Year 3 would focus on the further collection and analysis of spontaneous speech in narratives and conversational contexts. We dedicate a full year to this portion of the project because of the tremendous amount of labor involved in collecting, annotating and analyzing such a corpus. As with Years 1 and 2, the fieldwork portion of Year 3 should take about one month. We would also dedicate time during Year 3 to publishing the results of research during Year 2 on the interaction of pitch, stress, and higher prosodic context.

As discussed in section 2.2, a multiday training workshop on phonetic analysis would be held in Guatemala for each of the three years of the grant.

2.6 Work already completed

In summer of 2014 PIs Bennett and Henderson completed a pilot study on the acoustics of stress and lexical tone in Uspanteko. In collaboration with the CLU, the PIs spent a week working with 13 speakers of Uspanteko and recorded over 15 hours of structured elicitation on word-level prosody. Eleven of the 13 speakers were recorded in San Miguel Uspantán, and 2 speakers were recorded independently in Antigua. The experiment had a list of 100 target words, repeated twice, producing over 2500 items for pilot analysis.

This pilot study had four goals. First, we wanted to vet our wordlist with a wide range of speakers to ensure that all of the items were easily intelligible and showed minimal influence from K'iche' (even the Méndez 2007 dictionary has words that some of our consultants identify as being unambiguously K'iche'). Second, we wanted to check our elicitation paradigm with a fairly large number of speakers. Third, we wanted to re-cement our relationship with the CLU, as the core staff and board of directors had been replaced since our last visit to their offices. Finally, we wanted to begin identifying the basic phonetic correlates of stress and tone in Uspanteko, prior to taking any higher-level prosodic or demographic factors into account.

Target words were selected to ensure a diversity of vowel types. For each of the five vowel qualities [a e i o u], we recorded examples of short stressed vowels without tone [ˈV], short stressed vowels bearing tone [ˈV́], and short unstressed vowels [V̆]. For long vowels, we recorded tokens of stressed toneless [ˈVː] and stressed tonal [ˈV́ː] for each vowel quality (there are no unstressed phonemic long vowels in Uspanteko). A major constraint on our word list was familiarity. Each item needed to be commonly used, in both Spanish and Uspanteko, to ensure that our verbal prompts would be easy for our consultants to respond to.

The methodology employed in this pilot study was the same question-answer paradigm used by Bennett & Henderson 2013, as this has proven to be an effective technique for eliciting target

words in a non-focal context, using only verbal prompts (see §2.1). In some cases consultants found the question-answer technique too difficult (see Himmelmann & Ladd 2008). With these consultants, we used a modified translation task: we would offer a prompt like "It was *Maria* who bought flour the day before yesterday" (in Spanish), and the consultant would respond with the corresponding phrase in Uspanteko (the target word here is 'flour'). Responses to this translation task were qualitatively the same as responses to our question-answer task. These techniques are much the same as the methodology proposed for the elicitation portion of this grant (Years 1, 2).

Transcription and analysis of these recordings is still underway, but aggregated pitch contours for 3 speakers in the pilot study (792 vowel tokens) are given in Fig. 2. In this data set all stressed vowels, tonal or not, have higher pitch than unstressed vowels. Stressed tonal short vowels [ˈV́] have a higher pitch peak than stressed, but non-tonal short vowels [ˈV]. Furthermore, tonal short vowels have a different overall pitch contour than non-tonal short vowels. A difference in contour shape can also be observed within the long vowels: tonal long vowels [ˈV́ː] have earlier pitch peaks than non-tonal long vowels [ˈV́ː], and begin at a higher pitch level. These observations are largely speculative at this point, but they provide a starting point for the exploration of systematic phonetic differences between Uspanteko words with different word-level prosodic profiles.

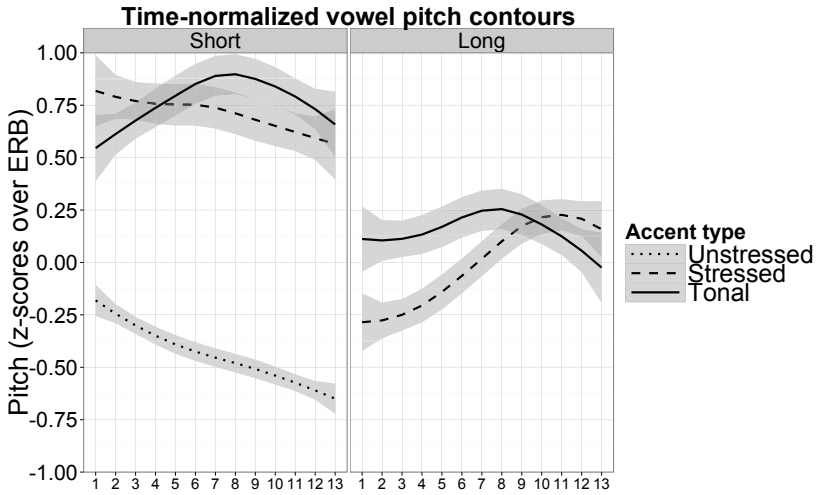

Figure 2: Average speaker- and time-normalized pitch tracks for five vowel types in Uspanteko

2.7 Design of the elicitation component

Year 1 research will focus on eliciting and recording words in phrase-medial broad focus contexts. Factors to be considered as possible determinants of word-level pitch include tone, vowel length, stress, vowel position (final/non-final syllable), vowel height (low/mid/high), and the quality of the post-vocalic consonant (sonorant/obstruent). To fully explore these factors we anticipate using a word list of approximately 75 distinct items. If each item is repeated 3 times during elicitation, we will collect roughly 225 word tokens per speaker. Based on our past experience eliciting lexical items from Uspanteko speakers using this paradigm, we believe this is an appropriate number of experimental items. Items will be selected from Can Pixabaj 2006 and Méndez 2007 and checked with our primary Uspanteko consultants. We will control for other conditioning factors (e.g. glottalization on adjacent stops) as they arise in the course of stimulus design. Though the frame sentence may vary across items, we will ensure that the syllable count and accentual profile of the frame sentence remains constant. Given our goal of working with a demographically diverse speaker population, we intend to collect recordings from at least four speakers (2 male, 2 female)

in each town that we work in. Within each town we will attempt to recruit speakers from within a wide age range (18 and upward, the age of majority in Guatemala).

The dependent measures for the analysis will include pitch (pitch at vowel onset, midpoint, and offset; pitch at syllable offset (for voiced codas); maximum/minimum pitch; location of the pitch maximum/minimum), vowel duration, voice quality (spectral tilt; jitter/shimmer), vowel intensity (intensity integrated over time), and vowel quality (steady-state F1/F2 values). We will also investigate the relative timing of non-modal phonation and pitch peaks, given that such timing relations are known to vary cross-linguistically (Silverman 1997, Frazier 2013).

In Year 2 we will expand the elicitation project begun in Year 1 to include a wider array of sentential and pragmatic contexts (section 2.1). The stimulus set will be a reduced version of the stimulus set used in Year 1, focusing primarily on tone, vowel length, stress, and vowel position. This reduction is necessary given that each item will appear in five different sentential contexts: broad focus (medial), broad focus (final), non-focused Q-A pair, narrow focus, and contrastive focus. We anticipate collecting approximately 250 items (16 items x 5 contexts x 3 repetitions) from each speaker, with speakers again being recruited from a broad demographic base.

3 Personnel

Both PIs have significant prior fieldwork experience in Guatemala, including past fieldwork on Uspanteko. PI Bennett has been working on Mayan languages since 2010, and began his fieldwork in Guatemala in March 2011. He is a phonologist by training, with particular expertise in prosody and the phonetics-phonology interface. His research on Mayan has focused on the prosody of languages in the K'ichean branch (Bennett 2010, 2012, Bennett & Henderson 2013, 2014). His current Mayan-related research includes an overview paper on the phonetics and phonology of Mayan languages, to be published in *Language & Linguistic Compass*, and the construction of a publicly-available, phonetically-annotated corpus of spontaneous speech in Kaqchikel, based on field recordings collected in 2013 in collaboration with the Comunidad Lingüística Kaqchikel. He is a conversational speaker of Kaqchikel and a proficient speaker of Spanish. In 2014 Bennett organized the first *Workshop on the Sound Systems of Mexico and Central America* (SSMCA), a conference dedicated to the phonetics and phonology of indigenous languages of that region.

Bennett also has on-site fieldwork experience in Ireland for an NSF-funded project documenting the articulatory phonetics of secondary palatalization contrasts in the Irish language (see §3.1). Other major publications include work on the prosody of Huariapano (Panoan, extinct) (Bennett 2013), and work on the syntax-prosody interface in Irish (Bennett et al. to appear).

Henderson has been working in Guatemala for almost a decade. He has published major work on several K'ichean-branch Mayan languages, all based on original fieldwork in Guatemala (e.g. Henderson 2007, 2012a,b, Bennett & Henderson 2013). Two of these publications (Henderson 2012a, Bennett & Henderson 2013) deal with the prosody of K'ichean-branch Mayan languages, the latter with Uspanteko specifically. While Henderson has done extensive work in semantics, he has maintained an active research program in Mayan prosody, with both single-authored publications and joint work with PI Bennett. The current proposal fits within this research program and grows out of prior work with PI Bennett.

Henderson's current work on Mayan includes an overview paper on the semantics of Mayan languages, to be published in *Language & Linguistic Compass*, as well as research on the semantic structure of plural reference and degree-denoting expressions, in Mayan and cross-linguistically. He is a fluent speaker of Kaqchikel and a conversational speaker of K'iche', as well as a proficient

speaker of Spanish. Henderson has extensive contacts throughout the Guatemalan highlands, and in the past has worked closely with the Comunidad Lingüística Kaqchikel (the official Kaqchikel language authority) and other native-speaker linguists (Ajsivinac Sian & Henderson 2011).

Bennett has pre-existing IRB approval at Yale for fieldwork on Mayan languages in Guatemala. This research proposal falls under those existing protocols. Similarly, Henderson has received IRB approval at Wayne State University for the research activities proposed here. He is currently in the process of transferring IRB approval to the University of Arizona where he will take up a new appointment in August 2015. Henderson has every expectation that this process will be successful.

3.1 Prior and Current NSF Support (during past 5 years)

Bennett is currently co-PI on NSF award #BCS-1423772 (*Collaborative research: An ultrasound investigation of Irish palatalization*; Amount: $42,802; Award period: 9/01/14-2/28/17). This grant supports the documentation and analysis of secondary palatalization contrasts in Irish using ultrasound imaging. Fieldwork related to the grant will be conducted in Ireland over a three-year period. The Intellectual Merits of the project are several. There is no published imaging data of consonant articulations in Irish, and in fact the production of secondary dorsal contrasts is not well-understood for any language. The data gathered under this grant will allow the researchers to address questions about the typology of secondary articulations and about the effects of phonological contrast on articulatory patterning. The project is also comprehensive enough in terms of speaker and dialect diversity to be of great descriptive value. The Broader Impacts of this project lie in making the results available to linguists and to non-linguists who are learning or are interested in Irish. Results of the project will be shared through a public-facing website, released by the end of Summer 2015. The project will also lead to training of graduate and undergraduate students in all aspects of the work. Results related to this grant so far include one data collection trip to Northwestern Ireland (May 2015), as well as the training of multiple undergraduate and graduate students at Yale and UC Santa Cruz in the design and analysis of ultrasound research.

4 Project impact

4.1 Intellectual merit

The proposed project has the potential to contribute to several poorly-understood areas in linguistic description and theory. Hybrid word-prosodic systems like Uspanteko are typologically rare, and not especially well-documented. To date there have been few targeted studies on the prosody of Mayan languages, especially in the domain of phonetics; this is true for Central American languages more generally. This project will therefore make a substantial contribution to the literature on prosodic typology. The proposed project will also address important questions about the relationship between phonemic contrast and phonetic patterning. This issue remains a lively topic in contemporary linguistic theorizing (Steriade 2009, Nakai et al. 2012, among many others).

The demographic aspect of the project has two important dimensions. First, it will represent a major addition to research on the socio-phonetics of Mayan languages, as existing work in this area is quite minimal. It will also contribute to the literature on phonological obsolesence. Prosodic attrition is not well-studied, and Uspanteko provides an opportunity to investigate this particular dimension of language loss. Given the close genetic relationship between Uspanteko and K'iche', we will also have the chance to investigate the way in which linguistic similarity between majority and minority languages in contact conditions patterns of phonological attrition.

4.2 Broader impacts

This project has four broader impacts. First, it will substantially expand the descriptive record of Uspanteko, particularly in the realm of phonetics and phonology. This is a pressing task, as Uspanteko is poised to disappear within a few generations. Existing descriptions of Uspanteko differ in their characterization of the prosodic system, and focus on the phonological distribution of stress and tone in isolated words. Since the prosodic system of Uspanteko is one of the key features that distinguishes it from other Mayan languages, more detailed documentation of Uspanteko prosody will be vital for any future revitalization or renewal efforts, providing a benefit to society.

Second, the project will broaden participation of under-represented indigenous groups in linguistic research, and will enhance infrastructure for research and education. There have been few fine-grained phonetic descriptions of any Mayan language. This is due in part, to a lack of local access to technology (e.g. high-quality microphones) and technical expertise (e.g. the ability to use tools like Praat to analyze sound files). Our project begins to address these historical inequities by holding a series of workshops on phonetic documentation for Guatemalan linguists and providing more in-depth training for a native-speaker linguist who would then be able to share their acquired expertise within their local community as well as within the country more broadly. In particular, we expect our workshops to be attended by members of various branches of the ALMG, which will help establish new connections between our home institutions and local Guatemalan ones.

Third, the results of our project will be broadly disseminated to enhance scientific understanding. Our project will collect a large corpus of spontaneous speech, including community narratives. These recordings will be useful for researchers working on the documentation of Uspanteko cultural praxis, or the morpho-syntax and lexicon of the Uspanteko language. These are the domains that native-speaker linguists at the CLU are most interested in documenting, and our research will be of clear secondary use for their efforts. We will share all recordings with both the CLU and the larger linguistic research community (see the attached Data Management Plan).

Fourth, the pursuit of our core scientific goals will occur concurrently with teaching and training programs for several populations. Along with the extensive training activities in Guatemala discussed above, targeting professional linguists working in governmental and non-governmental organizations, our grant includes training and research opportunities at both the graduate and undergraduate level for students in the U.S. The project will employ a graduate student in human language technology who will gain experience developing technologies for low-resource languages, as well as a group of undergraduates who will receive hands-on experience in experimental and field phonetics and the development of independent research projects.

4.3 Publication outcomes

We expect to submit at least 4 articles for publication as a direct result of this project: a phonetic description of the basic word-level prosody of Uspanteko (sent to *Phonology*, *Laboratory Phonology* or *Journal of the Acoustical Society of America*); a description of the interaction of word-level prosody with phrasal context (sent to *Journal of Phonetics*); a phonetic description of the segmental and prosodic phonology of Uspanteko (sent to *Journal of the International Phonetic Association*); and an analysis of demographic effects on the realization of stress and tone (sent to *International Journal of American Linguistics*). These publications are in addition to the publicly-shared corpus of recordings and annotations that will be produced by the project. All publications on Uspanteko will be shared with the CLU, even articles that do not result directly from the work associated with this grant.

Project-relevant websites

- Comunidad Lingüística Uspanteka:
  http://uspanteka.org.gt
- Academia de Lenguas Mayas de Guatemala:
  http://www.almg.org.gt
- Proyecto Lingüístico Francisco Marroquín:
  http://www.plfm.org
- Fundación Cholsamaj:
  http://www.cholsamaj.org
- Archive of the Indigenous Languages of Latin America:
  http://ailla.utexas.org
- Wuqu' Kawoq/Maya Health Alliance:
  http://www.wuqukawoq.org
- Form and Analysis in Mayan Linguistics:
  http://mayanfamli.wordpress.com
- Workshop on the Sound Systems of Mexico and Central America:
  http://pantheon.yale.edu/~rtb27/ssmca.html

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Zec, Draga & Elizabeth Zsiga. 2010. Interaction of tone and stress in Standard Serbian. In Wayles Browne, Adam Cooper, Alison Fisher, Esra Kesici & Nikola Predolac (eds.), *Formal approaches to Slavic linguistics (FASL) 18*, 536–555. Ann Arbor, MI: Michigan Slavic Publications.
Zhang, Jie. 2001. *The effects of duration and sonority on contour tone distribution*: University of California, Los Angeles dissertation.

Biographical sketch: Ryan Bennett

Professional preparation

New York University	Linguistics	BA, 2007
	Philosophy	BA, 2007
University of California, Santa Cruz	Linguistics	MA, 2009
	Linguistics	PhD, 2012

Appointments

2012-present	Assistant Professor, Yale University
2011	Graduate student instructor, University of California, Santa Cruz
2009–2010	Research Assistant, University of California, Santa Cruz
2008–2011	Teaching Assistant, University of California, Santa Cruz

Products

PRODUCTS RELATED TO PROJECT

Bennett, Ryan. To appear (expected 2015). "Mayan phonology". Accepted at *Language & Linguistic Compass*.
http://pantheon.yale.edu/~rtb27/pdfs/Bennett2015_Mayan_phonology.pdf

Bennett, Ryan. To appear (expected 2015). "Review of Sun Ah-Jun (ed.) (2014). *Prosodic typology II: the phonology of intonation and phrasing*". Accepted at *Phonology.*
http://pantheon.yale.edu/~rtb27/pdfs/Bennett_Review_of_Prosodic_Typology_II.pdf

Bennett, Ryan, and Robert Henderson. 2013. "Accent in Uspanteko". *Natural Language and Linguistic Theory* 31(3): 589-645.
http://dx.doi.org/10.1007/S11049-013-9196-6

OTHER

Bennett, Ryan. 2013. "The uniqueness of metrical structure: rhythmic phonotactics in Huariapano". *Phonology* 30(3): 355-398.
http://dx.doi.org/10.1017/S0952675713000195

Bennett, Ryan, Jaye Padgett, Grant McGuire, and Máire Ní Chiosáin. Submitted (*Journal of the International Phonetic Association*). "An ultrasound study of Connemara Irish palatalization and velarization".
http://pantheon.yale.edu/~rtb27/pdfs/Bennett_ etal_Irish_palatals_submitted.pdf

Synergistic activities

2015	Received Quaker PYM Indian Committee Grant "Translating Mozilla Firefox and the Android OS into Kaqchikel". Co-applicant with Juan Ajsvinac Sian.
2014	Organized the *Workshop on the Sound Systems of Mexico and Central America*, April 4-6 2014 at Yale University.
2013-present	Developing a public, phonetically-annotated corpus of spoken Kaqchikel (Mayan)

Collaborators and other affiliations

COLLABORATORS (n=8)

Coon, Jessica	McGill University
Elfner, Emily	University of British Columbia
Harizanov, Boris	Stanford University
Henderson, Robert	University of Arizona
McCloskey, James	University of California, Santa Cruz
McGuire, Grant	University of California, Santa Cruz
Ní Chiosáin, Máire	University College Dublin
Padgett, Jaye	University of California, Santa Cruz

CO-EDITORS (n=5)

Emily Gasser	Swarthmore College
Dolly Goldenberg	Yale University
Ryan Kasak	Yale University
Patrick Patterson	No affiliation
Rikker Dockum	Yale University

GRADUATE ADVISORS (n=4)

Ito, Junko	University of California, Santa Cruz
McGuire, Grant	University of California, Santa Cruz
Padgett, Jaye	University of California, Santa Cruz
Mester, Armin	University of California, Santa Cruz
McCloskey, James	University of California, Santa Cruz

POSTGRADUATE-SCHOLAR SPONSOR (n=1)

Kevin Tang	Yale University

Biographical sketch: Robert Henderson

Professional preparation

University of Texas, Austin	Linguistics / Latin American Studies	BA, 2007
University of California, Santa Cruz	Linguistics	MA, 2009
	Linguistics	PhD, 2012

Appointments

8/2015-	Assistant Professor, University of Arizona
8/2013-5/2015	Assistant Professor, Wayne State University
9/2012-8/2013	Postdoctoral Fellow, McGill University

Products

PRODUCTS RELATED TO PROJECT

Bennett, Ryan, and Robert Henderson. 2013. "Accent in Uspanteko". *Natural Language and Linguistic Theory* 31(3): 589-645. http://dx.doi.org/10.1007/S11049-013-9196-6

Henderson, Robert. 2012. "Morphological alternations at the intonational phrase edge: The case of K'ichee'". *Natural Language and Linguistic Theory*. 30(3), 741-789. http://dx.doi.org/10.1007/S11049-012-9170-8

OTHER

Henderson, Robert. 2014. "Dependent indefinites and their post-suppositions". *Semantics & Pragmatics*. 7(6), 1-58. http://dx.doi.org/10.3765/sp.7.6

Henderson, Brent, and Robert Henderson, Peter Rohloff. 2014. "More than Words: Towards a Development-Based Approach to Language Revitalization". *Language Documentation & Conservation*. 8, 75-91. http://scholarspace.manoa.hawaii.edu/bitstream/handle/10125/4611/henderson.pdf?sequence=5

AnderBois, Scott, and Adrian Brasoveanu, and Robert Henderson. 2013. "At-issue proposals and appositive impositions in discourse". *Journal of Semantics*. http://dx.doi.org/10.1093/jos/fft014

Synergistic activities

2010-present Advisory board of Wuqu' Kawoq | Maya Health Alliance
Planned and oversaw the organization's Mayan language documentation and revitalization initiatives.

2010-present Co-founder/organizer, FAMLi conference
Founded and organized three iterations of the Form and Analysis in Mayan Linguistics conference.

2007-2010 Co-founder and board member of Wuqu' Kawoq | Maya Health Alliance
Helped deliver linguistically responsible medical care in Guatemala by operating in indigenous languages and supporting indigenous practitioners.

Collaborators and other affiliations

COLLABORATORS

AnderBois, Scott	Brown University
Bennett, Ryan	Yale University
Brasoveanu, Adrian	University of California, Santa Cruz
Coon, Jessica	McGill University
Gutzmann, Daniel	University of Frankfurt
Henderson, Brent	University of Florida
Rohloff, Peter	Brigham and Women's Hospital
Travis, Lisa	McGill University

GRADUATE AND POSTDOCTORAL ADVISORS

Aissen, Judith	University of California, Santa Cruz
Brasoveanu, Adrian	University of California, Santa Cruz
Farkas, Donka	University of California, Santa Cruz
Mester, Armin	University of California, Santa Cruz
Travis, Lisa	McGill University

SUMMARY PROPOSAL BUDGET

YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Yale University**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Ryan Bennett**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Ryan T Bennett - PI**	0.00	0.00	1.00	**9,087**	
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00	**9,087**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**1**) UNDERGRADUATE STUDENTS				**2,400**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**11,487**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**2,817**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**14,304**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**1,250**	
2. FOREIGN				**3,850**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **1,000**					
TOTAL NUMBER OF PARTICIPANTS (**10**) TOTAL PARTICIPANT COSTS				**1,000**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,500**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**2,700**	
3. CONSULTANT SERVICES				**5,500**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**13,531**	
TOTAL OTHER DIRECT COSTS				**23,231**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**43,635**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC On Campus (Rate: 66.5000, Base: 42635)**					
TOTAL INDIRECT COSTS (F&A)				**28,352**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**71,987**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**71,987**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Ryan Bennett**

ORG. REP. NAME*: **Jennifer Pomales**

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 2

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PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Yale University**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Ryan Bennett**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Ryan T Bennett - PI**	0.00	0.00	1.00	**9,359**	
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00	**9,359**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**1**) UNDERGRADUATE STUDENTS				**2,400**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**11,759**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**2,901**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**14,660**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**1,250**	
2. FOREIGN				**3,850**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **1,000**					
TOTAL NUMBER OF PARTICIPANTS (**10**) TOTAL PARTICIPANT COSTS				**1,000**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**2,000**	
3. CONSULTANT SERVICES				**5,500**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**13,384**	
TOTAL OTHER DIRECT COSTS				**20,884**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**41,644**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC On Campus (Rate: 66.5000, Base: 40644)**					
TOTAL INDIRECT COSTS (F&A)				**27,028**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**68,672**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**68,672**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Ryan Bennett**

ORG. REP. NAME*: **Jennifer Pomales**

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 3

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PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Yale University**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Ryan Bennett**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Ryan T Bennett - PI**	0.00	0.00	1.00	**9,640**	
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00	**9,640**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**1**) UNDERGRADUATE STUDENTS				**2,400**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**12,040**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**2,988**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**15,028**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**1,250**	
2. FOREIGN				**3,850**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **1,000**					
TOTAL NUMBER OF PARTICIPANTS (**10**) TOTAL PARTICIPANT COSTS				**1,000**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**1,100**	
3. CONSULTANT SERVICES				**5,500**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**13,341**	
TOTAL OTHER DIRECT COSTS				**19,941**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**41,069**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC On Campus (Rate: 66.5000, Base: 40070)**					
TOTAL INDIRECT COSTS (F&A)				**26,647**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**67,716**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**67,716**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Ryan Bennett**

ORG. REP. NAME*: **Jennifer Pomales**

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Yale University**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Ryan Bennett**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Ryan T Bennett - PI**	0.00	0.00	3.00	**28,086**	
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	3.00	**28,086**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**3**) UNDERGRADUATE STUDENTS				**7,200**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**35,286**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**8,706**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**43,992**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**3,750**	
2. FOREIGN				**11,550**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **3,000**					
TOTAL NUMBER OF PARTICIPANTS (**30**) TOTAL PARTICIPANT COSTS				**3,000**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,500**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**5,800**	
3. CONSULTANT SERVICES				**16,500**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**40,256**	
TOTAL OTHER DIRECT COSTS				**64,056**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**126,348**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				**82,027**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**208,375**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**208,375**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Ryan Bennett**

ORG. REP. NAME*: **Jennifer Pomales**

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

Budget Justification

Collaborative Research: Attrition in complex prosodic systems: tone and stress in Uspanteko (USP, Mayan)

A. Senior Project Personnel Salaries and Wages:

PI: Ryan Bennett, PhD: We are requesting summer support (1.0 summer) for the PI during each year of the project. As an Assistant Professor in the Dept. of Linguistics at Yale University, his research has focused on prosodic phonology from a crosslinguistic perspective and has generated major journal publications on languages as diverse as Huariapano (PNO, Panoan), Irish (GLE, Celtic), and Uspanteko (USP, Mayan). His expertise is in the phonetics and phonology of word-level prosody, and so he will support the project goals of experimentally confirming via fieldwork the phonetic correlates of tone, stress, and vowel length in Uspanteko, as well as situating the system that emerges in its crosslinguistic and theoretical contexts.

B. Other Personnel:

A total of $7200 is budgeted ($2400/year) to hire undergraduate research assistants to code data. We expect to record many hundreds of experimental items for each participant during the elicitation component of the project. These recordings must then be segmented and coded for various factors, such as lexical identity and condition. We estimate approximately 600 hours of coding for these recordings over the course of the project (approximately 200 hours/year).

Fringe Benefits: Fringe benefits are calculated at 31% for the PI.

C. Equipment: None

Travel: A total of $15,300 is budgeted for Bennett's travel expenses, both for fieldwork and to attend relevant workshops and conferences to present findings. As the project has a significant international component, the budget justification is further split into domestic and foreign travel (Costs are based on past expenses of similar nature); US GSA and www.orbitzforbusiness.net

a) **Domestic:** $1,250 is budgeted per year to attend a domestic conference or workshop to present research results. It would cover transportation (~$500), meals (~$227=$71 x 3.2 (days), lodging (~$372= ~$124 x 3 (nights), and conference registration (~$150). Possible conferences include the North East Linguistic Society meeting (NELS), the Congreso de Idiomas Indígenas de Latinoamérica (CILLA), or the conference on Laboratory Phonology (LabPhon).

b) **Foreign:** $1,250 is also budgeted per year to attend one international conference or workshop to present research results. Many conferences on Mesoamerican languages, such as Form and Analysis in Mayan Linguistics (FAMLi), typically take place in Mexico or Central America. It would be important to share results from this project with Latin American colleagues who often have trouble traveling to the United States. The requested funds would cover transportation (~$629), meals (~$142=$71 x 2 (days), lodging (~$299= ~$133 x 3 (nights), and conference registration (~$180).

The remaining $2,600 is budgeted to cover one month per year of fieldwork travel in Guatemala. The requested amount will cover transportation (~$800), housing (~$900=30 (days) x $30), meals (~$600 = 30 x $20), transportation within the country between fieldsites (~$300).

D. Participant Support Costs:

Subject Stipends: $1000 per year is budgeted to remunerate subject consultants/participants, for a total of $3000 over the course of the grant. We have historically paid subject participants $10/hour for elicitation and similar tasks. The budgeted amount will cover up to 100 hours of work per year.

E. Other Direct Costs:

Materials and Supplies: $1500 is budgeted for the following minor equipment purchases: For field recordings, we will purchase a high-quality portable solid-state recording device, e.g. the Zoom H6 Portable Recorder ($425). This will allow us to record field audio at high-fidelity settings (e.g. 48,000 kHz sampling rate, 24 bit resolution) in dependable digital media formats (as .wav files, saved to SD solid-state memory cards).

To record elicitation data, we will purchase a high-quality head-mounted cardioid microphone, e.g. Audio-Technica's ATM73A Cardioid Condenser Headworn Microphone ($175). Directional headset microphones are important for ensuring a good signal-to-noise ratio during the recording of elicitation sessions, and consistent mic-to-mouth distance across the duration of each such session.

To record conversational and narrative data, we will purchase a high-quality bidirectional table microphone, e.g. Audio-Technica's AT2050 Multi-pattern Condenser Mic ($300). Table top microphones are less obtrusive than head-mounted microphones, and are commonly used when attempting to record less formal speech.

We request $150 for miscellaneous accessories related to recording, e.g. XLR audio cables and SD solid-state memory cards for field recordings ($150).

Finally, we request $450 to purchase two 500GB solid state hard drives to back up data in the field, e.g. Samsung Electronics 840 EVO-Series 500GB ($450).

Publication/Documentation: $6000 is budgeted to cover the costs of open access publishing for the articles that result from project. Three of our main target journals, *Phonology*, *Journal of Phonetics*, and the *International Journal of American Linguistics*, charge $2700, $2000, and $1100, respectively to publish articles under an open access license. Publishing open access is important because the project's results will be interesting to scholars in Mexico and Guatemala who often do not have access to libraries with extensive journal subscriptions.

Consultant Services:

$4500 is budgeted to hire linguists at the Comunidad Lingüística Uspanteka to transcribe the free-running text that we will be collecting to study tone and stress in a variety of naturally occurring prosodic contexts. This figure is derived from an expected 25 hours of recordings, transcribed at a rate of 6 hours of labor per 1 hour of recorded text, assuming a pay rate of $30/hour.

Finally, $3000 is budgeted over the life of the grant to hire linguists at the Comunidad Lingüística Uspanteka to help make recordings in the more isolated Uspanteko-speaking communities. The estimated total is calculated at $100/day for thirty days.

Other:

$10,000 is budgeted to hire a graduate research assistant (10 hours/week) in Guatemala for three years for a total of $30,000 over the course of the grant. This position will be filled by a native speaker of a Mayan language with some linguistics background, for instance, a student in linguistics at a local university or technical staff at a branch of the Academia de Lenguas Mayas de Guatemala. This team member will aid in all areas of data collection and analysis, but will take primary responsibility for the analysis of demographic factors (age, gender, town of origin, etc.) as they affect the phonetic realization of tone and stress in Uspanteko.

Rent of facilities: $300 a year for a total of $900 is budgeted to rent quiet recording space at the

Comunidad Lingüística Uspanteka in San Miguel Uspantán.

Archival Services: We've coordinated archival planning with a language-oriented archival organization, the "University of Texas Libraries, Archive of the Indigenous Languages of Latin America" (AILLA), letter included in Supplementary Docs. Funds are budgeted for Data/Materials services and archiving by AILLA during each year of the project. (This figure was determined in consultation with the NSF program officers for DEL & Linguistics).

Indirect Costs:
Indirect cost rate is calculated at Yale University's DHHS negotiated rate of Modified Total Direct – on campus @ 66.5%, per agreement dated 3/14/14.

SUMMARY PROPOSAL BUDGET

YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
University of Arizona

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Robert Henderson

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Robert Henderson - none**	0.00	0.00	1.00	**7,777**	
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00	**7,777**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**7,777**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**2,699**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**10,476**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**1,250**	
2. FOREIGN				**3,850**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **1,000**					
2. TRAVEL **1,000**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**2,000**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**2,000**	
TOTAL OTHER DIRECT COSTS				**2,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**19,576**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (1/1/2016-6/30/2016) (Rate: 53.0000, Base: 8788) (Cont. on Comments Page)**					
TOTAL INDIRECT COSTS (F&A)				**9,360**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**28,936**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**28,936**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Robert Henderson

ORG. REP. NAME*
Tyler Roberts

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

**** I- Indirect Costs**
MTDC (7/1/2016-12/31/2016) (Rate: 53.5000, Base 8788)

SUMMARY PROPOSAL BUDGET

YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
University of Arizona

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Robert Henderson

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Robert Henderson - none**	0.00	0.00	1.00	**8,010**	
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00	**8,010**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**1**) GRADUATE STUDENTS				**16,480**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**24,490**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**5,071**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**29,561**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**2,500**	
2. FOREIGN				**5,100**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **1,000**					
2. TRAVEL **1,000**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**2,000**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**7,962**	
TOTAL OTHER DIRECT COSTS				**7,962**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**47,123**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 53.5000, Base: 39161)**					
TOTAL INDIRECT COSTS (F&A)				**20,951**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**68,074**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**68,074**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Robert Henderson

ORG. REP. NAME*
Tyler Roberts

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
University of Arizona

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Robert Henderson

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Robert Henderson - none**	0.00	0.00	1.00	**8,250**	
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	1.00	**8,250**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**1**) GRADUATE STUDENTS				**16,975**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**25,225**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**5,223**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**30,448**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**2,500**	
2. FOREIGN				**5,100**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **1,000**					
2. TRAVEL **1,000**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**2,000**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**8,439**	
TOTAL OTHER DIRECT COSTS				**8,439**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**48,487**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 53.5000, Base: 40048)**					
TOTAL INDIRECT COSTS (F&A)				**21,426**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**69,913**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**69,913**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Robert Henderson

ORG. REP. NAME*
Tyler Roberts

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
University of Arizona

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Robert Henderson

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Robert Henderson - none**	0.00	0.00	3.00	**24,037**	
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	3.00	**24,037**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**2**) GRADUATE STUDENTS				**33,455**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**57,492**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**12,993**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**70,485**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**6,250**	
2. FOREIGN				**14,050**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **3,000**					
2. TRAVEL **3,000**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**6,000**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**18,401**	
TOTAL OTHER DIRECT COSTS				**18,401**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**115,186**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				**51,737**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**166,923**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**166,923**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Robert Henderson

ORG. REP. NAME*
Tyler Roberts

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

Budget Justification

Collaborative Research: Attrition in complex prosodic systems: tone and stress in Uspanteko (USP, Mayan)

A. Senior Project Personnel Salaries and Wages:

Robert Henderson will serve as co-PI on this project. As an Assistant Professor of Linguistics at the University of Arizona, he has developed a research program built around sustained fieldwork on Mayan languages. This work has led to major journal publications on three different K'ichean-branch Mayan languages, including Kaqchikel (CAK), K'iche' (QUC), and Uspanteko (USP). In addition to his many years of fieldwork experience, Henderson brings to the project expertise on the phonology of Mayan languages, having worked previously on stress and accent in Uspanteko, as well as how higher-level prosodic structure affects stress placement in the closely related language K'iche'. His prior experience doing fieldwork-based prosodic phonology on K'ichean-branch Mayan languages makes his presence in this project crucial.

Henderson, and his collaborator Ryan Bennett of Yale University (PI, collaborative), are each committed for 1 month of fieldwork in Guatemala per year of the grant, and so 1 month of summer salary is requested per year for the life of the project. His compensation is calculated on the basis of one-ninth of his base academic salary, namely $7777 for the first year, with a 3% increase per year for a total of $24,038 over three years.

B. Other Personnel: $33,455 total is budgeted to hire a .25 FTE (10 hours a week) graduate research assistant for two years of the project. The first year's salary is set at 16,480 with a 3% increase into the final year. After a significant portion of the narrative texts have been collected and transcribed during year two, both the remainder of year two and all of year three will be focused on phonologically and morphologically annotating the resulting corpus. The graduate research assistant will be recruited from the University of Arizona's Human Language Technology Program, and will be tasked with using the interlinearly glossed XML corpus of Uspanteko in Palmer 2009 to bootstrap the (semi-)automatized annotation of our texts. This graduate assistant will also play a central role in mining this corpus for data and preparing a general phonetic description of Uspanteko for publication.

Additionally, a total of $2500 per year is budgeted for travel for Other Personnel to attend conferences and workshops to present research results. The total requested over 3 years is $7500. Other Personnel includes the above-mentioned graduate research assistant as well as the Guatemalan research assistant described in Bennett's budget. We expect the Other Personnel to attend at least two such events per year as coauthor with the PIs. This would include one of the events described below (under 'Travel') as well as a more computationally-oriented conference or workshop like the annual meeting of the Association for Computational Linguistics (ACL) or one of the many events held each year to showcase computational research on "low-resource languages". The requested funds would cover airfare, per diem, hotel, and conference registration.

C. Fringe Benefits: Fringe benefits at the University of Arizona are calcuated as $2492 the first year of the grant (at 34.7% for faculty). In the second and third year, fringe benefits rise to

$4716 per year with the addition of a graduate research assistant (at 34.7% for faculty and 13.9% for graduate students).

D. Equipment: None

E. Travel: A total of $5100 is per year is budgeted for Henderson's travel expenses, both for fieldwork and to attend relevant workshops and conferences to present findings. The total requested over all three years is $15,300. As the project has a significant international component, the budget justification is further split into domestic and foreign travel.

a) Domestic: $1250 is budgeted per year to attend a domestic conference or workshop to present research results. It would cover airfare, per diem, hotel, and conference registration. Possible conferences include the North East Linguistic Society meeting (NELS), the West Coast Conference on Formal Linguistics (WCCFL), or the conference on Laboratory Phonology (LabPhon).

b) Foreign: $1250 is also budgeted per year to attend one international conference or workshop to present research results. Many conferences on Mesoamerican languages, such as Form and Analysis in Mayan Linguistics (FAMLi), typically take place in Mexico or Central America. It would be important to share results from this project with Latin American colleagues who often have trouble traveling to the United States. The requested funds would cover airfare, per diem, hotel, and conference registration.

The remaining $2600 is budgeted to cover one month per year of fieldwork travel in Guatemala. The requested amount will cover airfare ($\sim$$800), as well as housing ($\sim$$900 = 30 (days) $\times$ $30), food ($\sim$$600 = 30 (days) $\times$ $20), and travel within the country between fieldwork sites ($\sim$ $300).

F. Participant Support Costs: $6,000 is budgeted over the life of the grant ($2000 a year) to help local Guatemalan linguists participate in our yearly workshops. The funds are divided into travel expenses and stipend so that will be able to attend.

G. Other Direct Costs: None

a) Materials and Supplies: None

b) Publication/Documentation: None

c) Consultant Services: None

d) Computer Services: None

e) Sub-awards: None

f) Other: None

a. Tuition: $12,401 total. University of Arizona graduate research assistants at less than .50 FTE must have half of their tuition covered. Graduate assistant tuition for a .25 FTE in 2017-2018 is projected to be $5962 and then $6439 in the final year of the grant (8% increase per year).

b. Rent of facilities: None

c. Workshop costs: A total of $6000 over the life of the grant is requested to hold

three Guatemalan workshops on the phonetic description and documentation of Mayan languages. The $4000 allotted for each workshop is budgeted as follows: $500 for renting conference space, $750 for supplies including handouts and training manuals, and $750 for coffee breaks and two working meals.

d. Etc: None

H. Total Direct Costs: $115,186. The first year total is $19,675, with a modified direct cost total of $17,675 subtracting $2000 in participant support costs. The second year total is $47,123, while modified total direct costs is $39,161. The difference is due to $2000 in participant support costs and $5962 in tuition remission. Direct costs in the final year total $48,487. The modified total is $40,048. The difference is due to $2000 in participant support costs and $6439 in tuition remission.

I. Indirect Costs: $51,737 in total. The indirect cost calcuation is complex. The first year of the grant—01/01/2016 to 12/31/2016—is split into two 6 month periods because the MTDC rate changes on 07/01/2016. Indirect costs for this first period are calculated at 53%. For the second period and subsequent years of the grant the indirect costs are caculated as 53.5% of the modified total direct costs.

J. Total Direct and Indirect Costs: $166,923

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Ryan Bennett	Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Collaborative Research: Attrition in complex prosodic systems: tone and stress in Uspanteko (USP, Mayan) (This proposal)

Source of Support: NSF

Total Award Amount: $ 208,375 Total Award Period Covered: 01/01/16 - 12/31/18

Location of Project: Yale University

Person-Months Per Year Committed to the Project. Cal: 0.00 Acad: 0.00 Sumr: 1.00

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Collaborative Research: An Ultrasound Investigation of Irish Palatilization

Source of Support: NSF

Total Award Amount: $ 42,803 Total Award Period Covered: 09/01/14 - 02/28/17

Location of Project: Yale University

Person-Months Per Year Committed to the Project. Cal: 0.00 Acad: 0.00 Sumr: 1.00

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Robert Henderson

Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title: Not Applicable

Source of Support:
Total Award Amount: $ 0 Total Award Period Covered: 01/01/00 - 01/01/00
Location of Project:
Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 0.00

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

 USE ADDITIONAL SHEETS AS NECESSARY

Yale University Department of Linguistics
Facilities and Resources:

Lab Space:
Available but not applicable to this proposal

Major Equipment:
Not Applicable to this proposal

Office Space:
Office space and administrative support is available.

No Facilities, Equipment, or Other Resources will be provided, nor are they necessary for the successful completion of the project.

Data Management Plan

Attrition in complex prosodic systems: tone and stress in Uspanteko (USP, Mayan)

Data management during fieldwork

Raw data collected during our fieldwork will consist of (i) audio in .wav format, recorded in mono at a 48 kHz sampling rate and 24 bit resolution; and (ii) written notes taken during recording sessions. We will have portable external hard drives on-site during each fieldwork trip, and will back up all audio data on the day that it is collected. Whenever reliable internet access is available, we will also back up our data to off-site servers using utilities like Dropbox and/or external server space at our home institutions.

The PIs will store digital data indefinitely on the portable hard drives mentioned above. The data will also be stored on separate servers at the PIs' home institutions. Finally, digital data and associated annotations will be publicly archived at the *Archive of the Indigenous Languages of Latin America* (AILLA; `ailla.utexas.org`). AILLA has confirmed their willingness to archive the material output of our proposed project (the agreement is included as a supplementary document). We will deposit digital materials with AILLA after the completion of each fieldwork trip, upon our return to the U.S.

Public data sharing

Results of this project will be shared in several ways. First, we will publicly share all audio recordings stemming from our field sessions, provided that our Uspanteko participants give free, prior, and informed consent for the sharing of such materials. All efforts will be made to anonymize data before it is shared: recordings will be associated with basic information about the speaker (initials, gender, age, town of residence), but no other personal information will be tied to the recordings. Speakers may nonetheless divulge personal information during recording; we will never share such recordings if we think that doing so could put the speakers at any kind of risk.

Second, we will share any and all annotations that we make in the process of analyzing audio data. These annotations will be in the Praat TextGrid format or the ELAN .eaf format. For spontaneous speech data, we will also share transcriptions as simple text and/or .xml files. All of these formats can be accessed and manipulated using widely-available no-cost software. Once completed, these audio annotations will be archived at AILLA alongside the associated audio files.

Third, while we do not plan to take extensive free-form fieldnotes, any such notes (including handwritten notes) will be converted to digital .pdf files upon return from Guatemala. The resulting PDFs will always be stored with the accompanying audio to preserve their linkage.

We will place absolutely no restrictions on the non-commercial use of our recordings, annotations, and transcriptions, other than those restrictions which are expressly noted in the AILLA use conditions, such as proper citation practices. Commercial use of our research materials will be absolutely prohibited, consistent with pre-existing AILLA policies. We allow for one exception to this restriction: if members of the Uspanteko community, such as the Comunidad Lingüística Uspanteka, request the right to use our recordings and/or annotations in the production of derivative, for-cost materials (e.g. a for-sale print version of our collected narratives), we will grant such rights provided that the resulting products fully respect the prior consent agreements established between us (the researchers) and our consultants.

We intend to place a temporary embargo on public access to our research materials. AILLA has several options for controlling access to archival materials. We plan on depositing our materials

under "Level 3: Time limit". Our fieldwork materials will be uploaded to AILLA as soon as possible (see above), but will not be publicly accessible until 24 months after the original date of depositing. The rationale for such an embargo is that it allows us time to analyze these materials and publish research results based on our work before those materials are made available to other researchers.

Lastly, the analytical results of this project will be shared through major journal publications. We have budgeted funds for the publication of papers under an open access license. This will ensure that the publications resulting from this project will be maximally accessible to researchers across the globe, most importantly Latin American scholars who may not have the financial means to access articles published in major for-profit journals.

The storage and data sharing plans discussed above are in full compliance with IRB requirements at our home institutions.

Timeline for archiving activities

- Year 1: Raw audio data will be deposited with AILLA shortly after completion of the first fieldwork trip (within two weeks). Annotations, transcriptions, and digitized fieldnotes will be shared with AILLA as they are completed. These materials will be under an 24-month access embargo, to expire in Year 3.
- Year 2: Raw audio data will be deposited with AILLA shortly after completion of the second fieldwork trip (within two weeks). Annotations, transcriptions, and digitized fieldnotes will be shared with AILLA as they are completed. These materials will be under an 24-month access embargo, to expire roughly 9 months after completion of the grant.

  The second archival website discussed above will be developed during Year 2; data collected in Year 2 will be posted as it becomes publicly available on AILLA.
- Year 3: Raw audio data will be deposited with AILLA shortly after completion of the third fieldwork trip (within two weeks). Annotations, transcriptions, and digitized fieldnotes will be shared with AILLA as they are completed. These materials will be under an 24-month access embargo, to expire roughly 21 months after completion of the grant.

  Data collected in Year 3 will be posted on the second archival website as it becomes publicly available on AILLA.

LLILAS BENSON
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Dr. Joan Maling
Linguistics Program Director
National Science Foundation

June 18, 2015

Dear Dr. Maling:

I am writing this letter to confirm the commitment of the Archive of the Indigenous Languages of Latin America to archive all primary and derivative data that will result from the proposed DEL project "Attrition in complex prosodic systems: tone and stress in Uspanteko (usp, Mayan)," organized and conducted by Ryan Bennett and Robert Henderson.

AILLA's primary mission is to preserve recordings and other materials in or about the indigenous languages of Latin America safely and permanently so that they will be available to scholars, educators, indigenous communities, and other interested people for generations to come. AILLA digitally maintains both archival and presentation/access formats of all materials and any corresponding documentation.

According to Bennett and Henderson, their proposed project will produce audio recordings, as well as derivative, annotated materials. They plan to submit these materials to AILLA incrementally after each of three field trips. The researchers have agreed to include a service fee of 8% of their direct costs for AILLA to help defray our costs for curation, ingestion, and maintenance of their collection. If the grant is awarded, I will work closely with the researchers to help them organize their collection according to AILLA's intake needs.

Sincerely,

Susan Smythe Kung, PhD
Archive Manager
Archive of the Indigenous Languages of Latin America
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