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Applications and innovations in typeface design for North American Indigenous languages

ABSTRACT

In this contribution, we draw attention to prevailing issues that many speakers of Indigenous North American languages face when typing their languages, and identify examples of typefaces that have been developed and harnessed by historically marginalized language communities. We offer an overview of the field of typeface design as it serves endangered and Indigenous languages in North America, and we identify a clear role for typeface designers in creating typefaces tailored to the needs of Indigenous languages and the communities who use them. While cross-platform consistency and reliability are basic requirements that readers and writers of dominant world languages rightly take for granted, they are still only sporadically implemented for Indigenous languages whose speakers and writing systems have been subjected to sustained oppression and marginalization. We see considerable innovation and promise in this field, and are encouraged by collaborations between type designers and members of Indigenous communities. Our goal is to identify enduring challenges and draw attention to positive innovations, applications and grounds for hope in the development of typefaces by and with speakers and writers of Indigenous languages in North America.

KEYWORDS

orthography
typeface design
Indigenous
language revitalization
typography
Unicode
endangered languages

1. The term ‘cultural genocide’ has been used by the Canadian government since 2015 to describe this violent history (Schwartz 2015). For more discussion on this term in an Indigenous Canadian context, see Wildcat (2015).
2. Indian residential schools and Indian boarding schools, as they are called in Canada and the United States, respectively, were state-endorsed and often church-run schools whose primary purpose was the abolition of Indigenous culture and language (Pine and Turin 2017). Many Indigenous children were separated from their families in order to be sent to these schools, where they were often physically, sexually and emotionally abused, and regularly subjected to vicious forms of physical punishment for speaking their ancestral languages (Truth and Reconciliation Commission of Canada 2015–16).
3. ‘Indigenous’ is intentionally written with a capital letter. For further context and rationale, see Campbell (2020) and Vowel (2016).

INTRODUCTION

Indigenous communities across the world are actively engaged in language reclamation and revitalization projects that provide urgently needed support to restore fluency and transmission of their ancestral and heritage languages. The writing systems (orthographies) used to represent these languages are as diverse as the languages themselves, and range from Latin-based alphabets, with distinct letters to express individual sounds, to syllabic writing systems such as those used for Cherokee and Cree.

As a direct consequence of colonization and the ensuing cultural genocide¹ enacted through the residential school system of the nineteenth and twentieth centuries in the United States and Canada,² all of the Indigenous³ languages spoken in North America are now endangered, and numerous revitalization projects are currently underway to generate new speakers and restore intergenerational language transmission (Pine and Turin 2017). As language revitalization projects engage ever more with digital tools, communities, activists and scholars are paying increased attention to how technology can support their strategic goals of breathing life into Indigenous languages again (Baldwin et al. 2016; Pine and Turin 2019).

An element of this process that remains regularly overlooked is the creation of typefaces and keyboards that accommodate the specialized glyphs and specific orthographic needs of Indigenous languages. Cross-platform typefaces and keyboards are foundational for language revitalization projects: they allow for everyday actions to take place in Indigenous languages, such as writing e-mails, searching and naming digital files, texting and social media activity, and they facilitate the creation, sharing and mobilization of language learning materials. For these reasons, we see a clear role for typeface designers in creating fonts tailored to the needs of Indigenous languages and the communities who use them. While this article offers only an overview of the field of typeface design as it serves endangered and Indigenous languages in North America, with occasional relevant illustrations from further afield, the issues and challenges that we outline here also have relevance for minority speech communities in Asia, Africa, South America and beyond. In this contribution, our goal is to draw attention to prevailing issues that many speakers of Indigenous North American languages face when typing their languages, and to identify examples of typefaces that have been developed and harnessed by historically marginalized language communities.

TERMINOLOGICAL CLARITY

At the outset, it is necessary to identify and describe the principal terms used in this article and to disambiguate between a script, an orthography and the discipline of typeface design. A script, or writing system, refers to the means used to express a language visually. A script can be an alphabet (characters expressing individual sounds, as used for English), a syllabic system (characters that express individual syllables, as used in the Japanese Kana script), as well as other representational systems. Orthography refers to writing conventions that are implemented when using a script, such as capitalization, or the set of letters from a script used by a particular language. In contrast, typeface design speaks to the means of representing and rendering an orthography through the design of glyphs. A glyph is a specific representation of a character, while a character is the symbol that represents a letter in an alphabet or a syllable in a syllabic writing system. For example, the lowercase letter ‘a’ is a

character, while the representations of it in *Times New Roman* 'a' (Morison and Lardent 1932) and *Helvetica* 'a' (Miedinger 1957) demonstrate two different glyphs.

The orthography of English, which uses a Latin-based script, includes 26 characters/letters (including their allographs, or alternate representations, such as upper and lowercase versions), along with graphemes, or meaningful units, such as digits and punctuation. Other languages that are based on the same underlying Latin system, for example, German, include additional diacritics (accents and similar additional marks), such as the umlaut (the two dots that appear above letters). To illustrate these terms in context, we note that the German orthography determines that the umlaut can only be placed above the letters 'a', 'o' and 'u', while elements of typeface design motivate the decision to align the outer edges of the two dots of the umlaut with the inner edges of vertical strokes above the character which it modifies, as demonstrated in Figure 1. In short, while orthography determines where the diacritic must be placed in order for the glyph to be phonologically and semantically meaningful, typeface design determines design elements that focus on aesthetics and legibility.

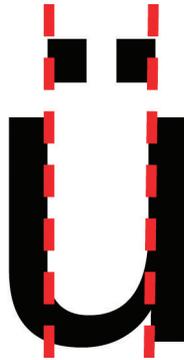


Figure 1: Alignment (indicated using dashed red lines) of the outer edges of the umlaut with the inner edges of the vertical strokes of the 'u' glyph. The example is demonstrated using Helvetica (Miedinger 1957).

In addition, for the purpose of this survey article and in the interest of clarity, 'typeface' is used to refer to the overall visual design of a set of characters (an example of a typeface would be *Times New Roman*), while 'font' is used to refer to the computer file for a typeface.

While typefaces covering a wide range of aesthetic sensibilities with flawless formatting of diacritics and other key orthographical features are easy to come by for many of the world's most widely spoken majority languages, the same palette of choices is not available for all languages, particularly minority and endangered languages, many of whose orthographies include less widely used characters and diacritics, or a combination of the two. An example of this combination is a diacritic placed above a character with an ascender, such as an apostrophe above a 'k', displayed in Figure 2; an uncommon feature in the orthographies of dominant languages. This particular combination is one that fewer standard and freely available typefaces support.

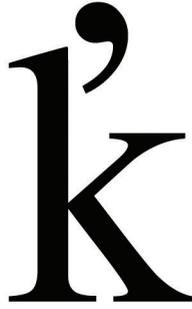


Figure 2: 'k' with an apostrophe, used in the orthographies of various Indigenous North American languages to represent a glottalized voiceless velar stop. Displayed in the First Nations Unicode typeface (University of British Columbia First Nations and Endangered Languages Program n.d.).

TYPEFACES FOR ENDANGERED LANGUAGES COMPARED WITH THOSE FOR MAJORITY LANGUAGES

Many aspects of digital typography, such as consistent formatting and the seamless integration of Unicode across operating systems (a key feature outlined and discussed later in the article), are taken for granted by speakers of many of the world's dominant languages. Of the more than 7000 languages spoken and signed by humans, twelve global languages together account for two-thirds of the world's population (Noack and Gamio 2015). Many of these majority languages, such as English, are well supported by hundreds or thousands of typefaces. In addition, Unicode compliance and interoperability are increasingly taken for granted by users. Speakers of minority languages served by minority scripts and orthographies are not afforded the same ease of use. This typographical abundance leaves users free to focus their attention on typeface aesthetics, with choices motivated more by visual appeal and less by whether the typeface actually supports the characters and diacritics of a given orthography. Aesthetic considerations remain a luxury that most speakers of the Indigenous languages spoken in North America regrettably still cannot afford, as many of these languages struggle to identify a handful of typefaces that accommodate the core needs of their orthographies. For speakers of such languages, visual 'look and feel' unfortunately often remains a secondary consideration, outweighed by the central importance of correct formatting and Unicode compliance.

This article outlines central features of a number of orthographies of Indigenous North American languages, with sections covering the importance of reliable typefaces for endangered languages, the process of adapting orthographies for digital use, common challenges in developing typefaces for Indigenous languages, and finally, a concluding section that reviews typefaces currently in use along with a few relevant case studies on a subset of these.

INDIGENOUS ORTHOGRAPHIES

A wide range of orthographies are used to represent the Indigenous languages spoken in what are now the United States and Canada, including visually striking alphabets and beautifully designed syllabaries.

The aesthetics of an orthography are strongly influenced by the visual sensibilities and intellectual lineage of their creators as well as the norms and tools available at the time of creation. Most orthographies of Indigenous North American languages were created by Indigenous community members, linguists or missionaries, or through a collaboration between these groups.

Two examples of orthographies developed by members of Indigenous communities are the Cherokee syllabary and the Saanich alphabet. The Cherokee⁴ syllabary, or *Tsalagi Gawonihisdi*, the Cherokee name for the language, was created in the early 1800s and disseminated in 1821 by the Cherokee scholar, Sequoyia. The syllabary was quick to catch on and within two years, almost every member of the Cherokee Nation was literate (Isaacs 2019: 16). The syllabary is read left to right and contains 85 characters, each of which represent a syllable worth of sound (Gillam 2002: 414).

The Saanich,⁵ or *SENĆOŦEN*, alphabet was created by Dave Elliot in 1978 and was heavily influenced by the typewriters available to Elliot at the time. As the Saanich language became progressively more endangered, Elliot designed an alphabet to create written records, document the language and protect its future vitality (WSÁNEĆ School Board n.d.). Elliot initially experimented with the English alphabet to represent his native language, as well as the International Phonetic Alphabet, or IPA (International Phonetic Association 1999), but found that these caused confusion and required too many characters to convey a single Saanich sound. Instead, he developed his own unique alphabet in which a single character represented a single sound (WSÁNEĆ School Board n.d.). The characters were designed with an English typewriter, and Elliot used slashes and dashes to amend English characters, and in the process, create new ones (Jackson n.d.). All Saanich characters are uppercase, and derived from English characters (such as the letters 'S' or 'T') which are then modified with dashes running through the letter, thus forming a set of uniquely Saanich characters to express sounds that are not found in English (Jackson n.d.).

As these creative interventions and adaptations show, orthographies created by members of Indigenous communities vary greatly in aesthetics and are the result of dexterous problem-solving on the part of the creators to design and then deliver an orthography that fits the unique needs of their language. Sample text of both languages can be found in Figure 3.

In contrast, orthographies created by non-Indigenous linguists tend to resemble one another and many privilege uniformity. Most are somewhat or entirely phonetic, and are derived from either the North American Phonetic Alphabet (NAPA) (Pullum and Ladusaw 1996) or the IPA. These representational systems are often characterized by a rich set of diacritics and the inclusion of Greek-based characters. For example, the Heiltsuk language,⁶ or *Haitzaqvla*, includes a number of characters based on NAPA. Its alphabet includes Latin-based consonants and vowels, as well as lambdas, a glottal stop symbol (ʔ) and diacritics such as hačeks (v-shaped diacritics placed above characters), dots placed below consonants, acute accents and apostrophes placed above consonants to indicate glottalization (Rath 1986). Sample text of Heiltsuk is displayed in Figure 4.

Many of the orthographies created by missionaries across the Canadian North are syllabic, and based on the Cree⁷ syllabics. Cree syllabics were developed by James Evans, a Methodist missionary working in what is now known as Manitoba, with input from community members and other missionaries;

4. Cherokee is an Iroquoian language spoken in the southeastern United States, as well as in what is now Oklahoma as a direct consequence of the shameful history of forced relocation of Cherokee citizens by the United States government between 1830 and 1850, known as the Trail of Tears (Justice 2006: 55).
5. Saanich is a Salishan language spoken in southern Vancouver Island, British Columbia, Canada, whose traditional area covers much of the surrounding Salish Sea (First Peoples' Map of B.C. 2020).
6. Heiltsuk is a Wakashan language spoken on the central coast of British Columbia (First Peoples' Map of B.C. 2020).
7. The Cree languages form a dialect continuum that spans much of central Canada (Canadian Heritage n.d.; Education, Culture and Employment n.d.; Statistics Canada 2017) with the syllabics originally being used in the East (Saskatchewan Indigenous Cultural Centre n.d.).

8. Inuktitut is an Inuit language spoken in northeastern Canada (Inuktitut Tusaalanga n.d.c).
9. Spoken primarily in northern Canada (Leer 2006: 428).
10. Blackfoot is spoken in part of Montana, Alberta and surrounding regions (Campbell 2013: 66).
11. Plains Cree is spoken across a large territory spanning parts of Saskatchewan, Alberta and British Columbia in Canada (Language Map of British Columbia n.d.; Saskatchewan Indigenous Cultural Centre n.d.).

CHEROKEE

RJGP

SAANICH

TKOMO

Figure 3: Example text of Cherokee and Saanich words, both meaning ‘raspberries’ (*‘RJGP’* n.d.; *‘TKOMO’* n.d.), using the Aboriginal Serif typeface (Harvey 2007).

HEILTSUK

ᐱbᓄáći

Figure 4: Example text of a Heiltsuk word meaning ‘door frame’ (*‘ᐱbᓄáći’* n.d.). Displayed using the Aboriginal Serif typeface (Harvey 2007).

and the system gained popularity beginning in the 1840s (Lewis and Dorais 2003: 280–85). Syllabics that are similar in form and function are now used across the Canadian North, both for the various Cree languages, Inuktitut,⁸ for some Na-Dene languages⁹ and for Blackfoot¹⁰ or *Siksiká* (Campbell 2013: 233; Indigenous Languages of Manitoba Inc. 2018, Yinka Déné Language Institute n.d.). These syllabics are read left to right, with the shape of the character indicating the consonant at the beginning of the syllable, and the direction of the rotation of the character (namely: facing upwards, downwards, left or right) indicating the vowel that follows (Inuktitut Tusaalanga n.d.a). Sample text from the Plains Cree,¹¹ or *nēhiyawēwin*, dialect is displayed in Figure 5.

12. Ojibwe is spoken in regions surrounding the Great Lakes (Hermes and King 2013).



Figure 6: ‘I’ vs. barred ‘I’ characters displayed in Times New Roman (Morison and Lardent 1932).

English with apparently similar English characters), thus endangering specific phonological elements of languages that are already critically endangered. Speakers of Indigenous languages have indicated the importance of maintaining the phonology of their language, and not letting their speech and writing become Latinized or Anglicized. Jennifer Wemigwans, assistant professor at the University of Toronto, articulated this very challenge when discussing her own experiences raising her son in Ojibwe,¹² or *Anishinaabemowin*, ‘I killed the language because I was using English pronunciations to make out the sounds of the word’ (Moran 2019).

In order to use a language in everyday and increasingly digital life, speakers and writers must be able to e-mail, text and communicate on social media in their language. Typefaces/fonts and keyboards need to support these activities, not only on desktop computers but also on mobile operating systems, and characters must render consistently for all users through consistent encoding, a topic we discuss in the following section. Supporting and provisioning languages to be integrated into all aspects of social and professional life results in well-rounded language health (Walsh 2018), and typeface design should help – and certainly not hinder – this goal.

ADAPTING ORTHOGRAPHIES FOR DIGITAL USE

In addition to addressing the visual identity of a typeface, there are two crucial components of designing a functioning font for the digital age: Unicode compliance and a keyboard system to support input in different operating systems. Unicode is a standard followed by many underlying font encodings, including UTF-8, UTF-16 and UTF-32. These encodings allow characters of global writing systems to be reliably displayed across platforms and allow for non-disruptive font changes, as the unique identity of each character is consistently communicated (Gillam 2002; Unicode 2019). Keyboards are an essential component of digital language use as they help users to type in their chosen language. By keyboards, we do not refer to the physical object attached or connected to a screen and processor, but rather the software that encodes and communicates how physical keys map on to digital characters. By activating different freely downloadable keyboards, a single keystroke generates different characters. In addition, users can produce a range of characters within a single keyboard by combining keystrokes, most commonly involving the ‘SHIFT’, ‘CONTROL’, ‘OPTION’ or ‘COMMAND’ keys. The easy inputting of characters is dependent

on the development of a keyboard, and each orthography has specific needs. Depending on how many characters and diacritics there are in total, as well as punctuation rules and capitalization standards in a language (some have only capital letters, such as Saanich, while others have only lowercase letters, as in the Lushootseed language discussed later in the article, while others have both), more character options can become available by using combining keys.

Unicode is fundamental for the accessibility of typed material, as Gillam explains:

As computer use became more widespread in various parts of the world, alternative methods of representing characters in computers arose for representing other languages. This proliferation led to the situation we have today, where generally three or four different encoding schemes are available for every language and writing system in use today. [...] Unicode does away with this chaos. It allows all of the same languages and characters to be represented using only one encoding scheme. Every character has its own unique, unambiguous value.

(2002: 8–9)

When fonts are not programmed with a Unicode-compliant encoding, they become less adaptive to moves between platforms (e.g. between an Apple Mac and a Windows PC) and risk breaking down when a user chooses to switch fonts for stylistic reasons or shares a document with another user who does not have the same font installed on their computer. While Unicode compliant fonts are, and have for some time been, the standard and most widely available fonts for many majority languages such as English, this is not the case for many endangered Indigenous languages in North America, and for non-majority languages in other world regions. While non-Unicode compliant fonts were often created before the mass introduction of Unicode-compliant encodings as an inventive and necessary way to make typing possible in minority languages, their continued use makes inter-operability more difficult. An extreme example of these difficulties is provided in Figure 7, which displays the Nepali¹³ word for 'Mount Everest', typed in the non-Unicode font *Preeti*, a common typeface used for the Devanagari script in Nepal. We then offer the same text, copied and converted to the Unicode-compliant font *Mangal*, a Devanagari typeface that also includes Latin-based characters. As the example shows, the characters render incorrectly in the Unicode font, as no underlying code agreement exists that consistently identifies each character from the *Preeti* source. A font-specific encoding, such as *Preeti*, only indicates which keys on the keyboard are used to type the characters. The result is that users cannot easily switch between fonts – in the way that we all expect to, for example, from *Palatino* to *Helvetica* – without engaging in a series of complex substitutions, conversions and technical operations. Pine and Turin further demonstrate these challenges using the example of the *Heiltsuk Doulos* font, used to type in Heiltsuk, which is not Unicode compliant:

The Heiltsuk Doulos font was created to deliberately disregard 8-bit encoding ISO 8859 – 1's stipulation that 10101001 should render as ©, and instead render this sequence as ħ [...] Without the required font installed, 10101001 will appear as © and be illegible to users.

(2018: 28)

13. Nepali is the official language of Nepal with around 24.5 million speakers in Nepal, surrounding regions and diaspora populations (Ethnologue: Languages of the World 2019).

14. The Squamish language is spoken in the region surrounding Howe Sound, British Columbia, Canada (First Peoples' Map of B.C. 2020).

सगरमाथा
; u/dfyf

Figure 7: The Nepali word for 'Mount Everest' displayed in the non-Unicode font Preeti (Mishra n.d.) above, with the same text copied and rendered in Mangal (Joshi 2001) below. This illustrates how non-Unicode fonts are unable to render characters consistently when switching between different fonts, even fonts that have been designed for the same language.

Next, we present another example that involves different negative consequences for not utilizing Unicode fonts. A number of languages have characters comprising a diacritic underlining a letter, such as 'ḳ', which is used, among other languages, in the Squamish,¹⁴ or *Sk̓w̓x̓w̓ú7mesh*, language to indicate a voiceless uvular stop (Kwi Awt Stelmexw 2016). When typing, and for ease of function, users may opt to make use of the underline function in their word-processing software instead of using a typeface that includes a (Unicode-compliant) underline diacritic, as the latter can be more difficult to locate and input. To the viewer's eye, the result looks the same, irrespective of the path taken to get there. The difference becomes apparent, however, when one copies and pastes a word with a letter that has been underlined using word-processing formatting into a different system, such as an online search engine, as the underlining is immediately lost. In contrast, a properly encoded 'ḳ' can be copied, pasted, searched for and moved across different operating systems, all the while retaining its visual distinctiveness and unique orthographic meaning.

The ability to correctly represent the orthography of an Indigenous language across platforms is particularly salient for digital documentation and archiving. As Pine and Turin note, 'making documentation available via the Internet ensures that living speakers are afforded a way of engaging with the material that contributes to the goals of language revitalization' (2017). This is reflective of an important trend in the field of language documentation and revitalization towards the creation of digital dictionaries, archives and learning materials, see Baldwin et al. (2016), Davis (2017), Hermes and King (2013) and Burge et al. (2020). Given that online dictionaries and word lists of Indigenous languages in North America are some of the resources most used by speakers and learners, it is crucial that orthographies render correctly in online spaces through Unicode compliant fonts.

COMMON TYPOGRAPHIC CHALLENGES FOR INDIGENOUS LANGUAGES IN NORTH AMERICA

Users typing in Indigenous North American languages can face a number of challenges, including finding typefaces/fonts that contain all of the necessary characters, kern correctly and format diacritics consistently and properly. The primary challenge, and certainly the most important for one's ability to type, is finding a typeface that includes all of the necessary characters and diacritics needed to represent the orthography, preferably without also including unnecessary characters, and that then renders these characters consistently across different software applications and operating systems. As we have outlined above, because many of the Indigenous orthographies used by languages spoken and written in North America include specialized characters and diacritics, it can be difficult for users to identify typefaces that have all of the necessary glyphs. Oftentimes, a typeface will have some, perhaps even most, of the necessary glyphs, but will be missing a few. This can cause users to substitute characters, which can result in a sub-optimal solution, as outlined in Figure 6 previously.

Figure 8 demonstrates the difficulty that users may face identifying typefaces that accommodate language-specific needs. The figure shows the name of a Salishan language spoken in British Columbia, Canada, *ʔayʔajuθəm*, typed using a number of fonts that come pre-installed with Microsoft Office 2013 (Microsoft Support 2017). As the figure shows, many of the typefaces are missing some – but not all – of the glyphs needed to type the name of this language. For syllabic languages, the selection of typefaces is even more limited, as their orthographic roots are not as widespread as Latin-based orthographies and the possible inventory of compliant typefaces is thus even more constrained. An additional challenge for typeface selection is that many of the older fonts that were specifically designed to include all the necessary glyphs for a specific language are not Unicode compliant, and, therefore, not well-suited to wider use in the increasingly digital age. Based on our own long-term fieldwork and research partnerships, non-Unicode font-specific encodings are still quite widely used in Indigenous communities across North America and Asia.

Many Indigenous languages use diacritics to indicate anything from vowel length to consonant glottalization. Regularly occurring diacritics include, but are not limited to, macrons (a horizontal line above a character), acute accents, apostrophes either above or following consonants and hačeks (pronounced 'haa-check'). Some characters may have multiple diacritics that are stacked or co-located beside one another. The primary challenge for orthographies that make use of diacritics is locating typefaces that first include all of the necessary glyphs and then format them correctly in different software packages. Even with a typeface that includes all of the necessary diacritics, common formatting issues include diacritics colliding with one another or with the main character, as well as errors in the positioning and placement of diacritics. For example, the alphabets of some Indigenous languages include a character comprised of a 'c' with a stacked haček and apostrophe. Although the typeface *Helvetica* includes all of the necessary components for this character, when typed, the diacritics render incorrectly, creating an unsightly overlap as shown in Figure 9.

Kerning issues (spacing between pairs of characters) are a recurring typographic challenge. Issues primarily arise for orthographies with superscript

Arial

ᠠᠶᠢᠨᠠᠵᠤᠮ

Comic Sans

ᠠᠶᠢᠨᠠᠵᠤᠮ

Georgia

ᠠᠶᠢᠨᠠᠵᠤᠮ

Impact

ᠠᠶᠢᠨᠠᠵᠤᠮ

Palatino

ᠠᠶᠢᠨᠠᠵᠤᠮ

Trebuchet

ᠠᠶᠢᠨᠠᠵᠤᠮ

Verdana

ᠠᠶᠢᠨᠠᠵᠤᠮ

Figure 8: Users are often constrained in their typeface choices for North American Indigenous languages because most typefaces do not include all of the necessary glyphs to represent their orthography. This figure shows a selection of pre-downloaded fonts on Microsoft Office 2013 (Microsoft Support 2017). Empty squares/rectangles – often referred to as tofu by frustrated users – represent missing glyphs. Each of the typefaces used are listed above the sample text (Carter 1993, 1996; Connare 1994, 1996; Lee 1965; Nicholas and Saunders 1982; Zapf 1949).

characters, as kerning for such orthographies appears to be a somewhat neglected feature. Some superscript characters, such as the superscript ‘w’ common in many orthographies in the Pacific Northwest of North America, can be rather wide and occupy a great deal of visual space, as shown in Figure 10. Kerning issues can, at times, be so severe that word boundaries become difficult to locate, particularly in text with a small point size. This becomes even more problematic when we remember that members of an Indigenous language community may be second language learners/speakers, and that ambiguous word boundaries pose genuine visual obstacles to effective



Figure 9: 'c' with a stacked haček and apostrophe, displayed with correct formatting on the left in Aboriginal Sans and incorrectly on the right in Helvetica, showing a diacritic overlapping another diacritic and the main character (Harvey 2007; Miedinger 1957).

ʔəstag^wəx^w čəx^w ʔu.

Figure 10: Kerning issues as a result of the superscript 'w'. Substantial negative space, or unoccupied space around a subject, surrounds the superscript 'w', leading to much unused space within a word, as seen in 'ʔəstag^wəx^w' in the above figure. This word-internal unused space makes it more difficult to locate word boundaries, especially during fast reading or when reading text with a small point size, as a single word appears to be divided into multiple parts, potentially manifesting as separate words. The sample text is a Lushootseed phrase meaning 'are you hungry?' ('ʔəstag^wəx^w čəx^w ʔu.' n.d.). Displayed in Aboriginal Serif (Harvey 2007).

language learning. Readability challenges, or challenges relating to the ease of reading a block of text, on account of unsuitable typefaces are all too common for North American Indigenous languages, and these issues serve as a troubling reminder of how typefaces inadequately designed for particular languages can inadvertently hinder language revitalization and mobilization.

Canada 150 is an example of a typeface that suffers from many of the issues outlined above. The release of this government-sponsored sans-serif typeface – celebrated at the time by many newspapers and followers of typography (CBC News 2015; Stinson 2015) – commemorated the 150th 'anniversary' of Canada, although this period of national celebration was perceived very differently by Indigenous communities who have long lived in what became Canada (Kassam 2017). *Canada 150* was publicly lauded as containing the necessary characters and diacritics to type in English, French and all of Canada's Indigenous languages. Unfortunately, the typeface fell short and a convoluted downloading process made it less accessible for interested users than many commercial fonts.

To begin, gaining access to *Canada 150* involved filling out an online application in which the applicant had to specify what the typeface would be used

15. Lakota is spoken in the Plains region of the United States and Canada (Campbell 2013: 924).
16. Lushootseed is spoken in the Puget Sound region of Washington State in the United States (Lushootseed Language Department n.d.a).
17. Shuswap is spoken in the Interior of British Columbia, Canada (First Peoples' Map of B.C. 2020).

for. Once an application had been received and subsequently approved, the Government of Canada sent the applicant a link to download the font. For any additional uses of the typeface, other than the use specifically identified in the original application, a new application would have to be submitted. Co-author Schillo initially completed the application in autumn of 2017 to use the typeface for a university course in which she was enrolled. In her application, she stated that she would use the typeface in a presentation about typography for endangered languages, and within a few days was sent a link to download the font. On using the typeface, she noticed that multiple characters were missing and that numerous diacritics did not render correctly. Upon discovering this, Schillo planned to write a blog post, including relevant graphics, discussing these shortcomings, to which end she submitted another application outlining the planned use. It has now been approximately eighteen months since she submitted the second application and, as of writing, the Government of Canada has not responded to the application. Additional issues have been flagged by various designers including aspects of the production and rollout of *Canada 150*, see Daubs (2016).

Canada 150 serves as a high-profile let-down: much promise, significant media attention, and yet a poorly designed and arguably colonial product. With missing characters and non-functional diacritics, the typeface is ill-suited to the needs of some First Nations languages – languages, we should add, that have been spoken on the lands that would become Canada for thousands of years before English and French were brought to the region by settlers – despite its promised use for all First Nations languages. The typeface offered by the Government of Canada did not deliver, and the cumbersome application process to use the typeface did not help, creating unnecessary access barriers for rural Indigenous communities in Canada, who in many cases still have limited and expensive internet access (Hyslop 2019). It is revealing that in our informal environmental scan of the typefaces currently used by First Nations communities in western Canada to mobilize their languages, not a single community member has identified *Canada 150*.

NOTABLE TYPEFACES FOR INDIGENOUS LANGUAGES IN NORTH AMERICA

One of our goals for this article has been to identify typefaces being used by various language communities, and to learn more about the creation of said typefaces. As established earlier, identifying typefaces that accommodate the orthographies of Indigenous languages can be a daunting task involving a great deal of trial and error. To that end, we reviewed typefaces recommended by the language departments of six different nations/tribes, territorial governments and language schools. The languages we chose are significant for their range of orthographic styles, diacritics and unique characters. Most of the orthographies are Latin-based, while two – Cherokee and Inuktitut – are syllabic and share no characters with Latin-based alphabets. Example text of each language can be found in Figure 11 for reference. Additionally, a chart is provided to show which diacritics/characters appear in the orthographies that do not appear in English, displayed in Figure 12.

The languages reviewed are Cherokee, Heiltsuk, Inuktitut, Lakota¹⁵ (or *Lakhótiyapi*), Lushootseed¹⁶ (or *dx^wlǎšucid* in the Tulalip dialect) and Shuswap¹⁷ (or *Secwepemctsin*). The typefaces recommended for Heiltsuk, Inuktitut, Lakota, Lushootseed and Shuswap are all free.

CHEROKEE

W P ᵒ ᵓ ᵔ ᵕ ᵖ ᵑ

HEILTSUK

mámñíʔa

INUKTITUT

ᐱ ᑲ ᓂ ᓃ ᓄ ᓅ ᓆ ᓇ ᓈ ᓉ ᓊ ᓋ ᓌ ᓍ ᓎ ᓏ ᓐ ᓑ ᓒ ᓓ ᓔ ᓕ

LAKOTA

šaglóǵaŋ

LUSHOOTSEED

ᓄix^wačiči? ʔi ti ču?

SHUSWAP

neku7pll7úpekst

Figure 11: Sample text from the languages surveyed. The words displayed are all numbers, with the following translations: Cherokee '20', Heiltsuk '9', Inuktitut '6', Lakota '8', Lushootseed '31' and Shuswap '80' ('W P ᵒ ᵓ ᵔ ᵕ ᵖ ᵑ' n.d.; 'mámñíʔa' n.d.; Inuktitut Tusaalanga n.d.b; 'šaglóǵaŋ' n.d.; 'ᓄix^wačiči? ʔi ti ču?' n.d.; 'neku7pll7úpekst' 2016). All are displayed in Aboriginal Serif (Harvey 2007).

Information about typefaces recommended for Cherokee was found on the language webpage of the Cherokee Nation, which provides download links for suggested fonts. These include: *Noto Sans Cherokee*, *Aboriginal Sans*, *Aboriginal Serif*, *Digohweli*, *Plantagenet Cherokee*, *Everson Mono*, *Fonts by Chung-deh Tien*, *Code 2000*, *Marin*, *MPH 2B Damase*, *Explora*, *Tsali Tsalagi*,

	Cherokee	Heiltsuk	Inuktitut	Lakota	Lushootseed	Shuswap
Acute accent		●		●		●
Apostrophe (over char.)		●			●	●
Apostrophe (after char.)				●		●
Dot (under char.)		●				
Eng				●		
Glottal stop		●			●	
Haček		●		●	●	
Stacked haček & apostrophe					●	
'h' with stroke		●				
Barred 'l'		●			●	
Lambda		●				
Barred lambda		●			●	
Superscript 'w'					●	
'7'						●
Syllabics	●		●			

Figure 12: Chart displaying the various diacritics, characters and orthographic styles used by each language that do not appear in the English alphabet, and are thus not supported by all typefaces that support English (Lakota Language Consortium n.d.; Lushootseed Language Department n.d.b; Rath 1986; Simpcw First Nation n.d.; Inuktit Tusaalanga n.d.a; Cherokee Nation n.d.b). It is important to point out that there are multiple Unicode characters or character combinations that can achieve the characters outlined above. While our analysis does not cover this aspect, different language communities can and do opt for different approaches to typing the same character.

Anowelisgv, *Donisiladv* and *Tsulehisanvhi* (Cherokee Nation n.d.a). Most, but not all, of the typefaces listed are free of cost. *Plantagenet Cherokee*, produced by the type foundry Tiro Typeworks, is free for those involved with Cherokee language projects (Tiro Typeworks n.d.). The link for the site is: <https://language.cherokee.org/fonts-and-keyboards/ Cherokee-fonts/>.

Recommended typefaces for Heiltsuk are discussed on a website hosted by the University of British Columbia (UBC) as part of a collaborative

partnership between the Heiltsuk Cultural Education Centre, the Bella Bella Community School and UBC's First Nations and Endangered Languages Program in which co-author Turin is involved. This site recommends *Times New Roman* as the most reliable Unicode typeface, while acknowledging that non-Unicode, language-specific typefaces (such as *Heiltsuk Doulos*) are still in circulation. Working from the assumption that all users already have access to *Times New Roman*, download links for typefaces are not made available on the site, although keyboard input files and help videos for Mac, PC and Chrome are provided (Heiltsuk Language & Culture Mobilization n.d.). The link for the site is: <https://heiltsuk.arts.ubc.ca/keyboard/>.

Recommended Inuktitut typefaces were found on the 'Computer Tools' page of the Government of Nunavut website, which includes a variety of resources for using Inuktitut digitally. The webpage recommends one typeface: *Pigiarniq*. The font is available for download on another Government of Nunavut webpage (Culture and Heritage Department n.d.). The link for the site is: <https://www.gov.nu.ca/culture-and-heritage/information/computer-tools>.

Recommended Lakota typefaces were found on the website for Red Cloud Indian School, a group of Catholic schools located on Pine Ridge Reservation in South Dakota which host Lakota language classes. The recommended typefaces are *Charis*, *Gentium* and *Andika*, all of which can be directly downloaded from the site (Red Cloud Indian School n.d.). The link for the site is: <https://www.redcloudschool.org/page.aspx?pid=629>.

Suggested Lushootseed typefaces were found on the website of the Tulalip Tribes, where *LushootseedSchool*, *LushootseedSulad* and *Andika* are listed as recommended typefaces. *LushootseedSchool/Sulad* can be directly downloaded from the website, while a link is provided to the SIL website to download *Andika* (Lushootseed Language Department n.d.c). The link for the site is: <https://tulaliplushootseed.com/software-and-fonts/>.

Recommended Shuswap typefaces were found on the website of Chief Atahm School, a Shuswap language immersion school, located in British Columbia, Canada. The website recommends a single typeface: *Aboriginal Sans*. A link to download the font directly is not provided (Chief Atahm School n.d.). The web link is: <http://www.chiefatahm.com/> with typeface information provided on the homepage.

Despite substantial differences between the orthographies of the languages reviewed, some commonalities have been identified between the typefaces recommended by these various Indigenous nations and departments. A few typefaces were recommended by multiple groups, such as *Aboriginal Sans* and *Aboriginal Serif*, which were endorsed by the Cherokee Nation and by Chief Atahm School. Similarly, *Andika* was recommended by both Red Cloud Indian School and the Tulalip Tribes. All of these typefaces are examples of what graphic designer Juliet Shen describes as 'pan-Indigenous fonts', that is, typefaces developed to include characters to accommodate as many languages as possible (Shen 2010: 22).

Developed to represent Indigenous North American orthographies, *Aboriginal Sans* and *Aboriginal Serif* were released by the First Peoples' Cultural Council, 'a First Nations-run Crown Corporation with a mandate to support the revitalization of Indigenous languages, arts, culture and heritage in British Columbia, Canada' (First Peoples' Cultural Council n.d.).

Along with a few of the other typefaces that appear on these lists – such as *Doulos*, *Charis* and *Gentium* – *Andika* was developed by SIL International (formerly the Summer Institute of Linguistics) to accommodate a wide range

of Indigenous languages spoken across the world. SIL International is a Christian-faith, US-based organization geared towards language development. While SIL has rebranded significantly in recent years, it was launched in 1934 as a missionary organization and one of its primary goals is still the translation of Christian scripture into the languages of the world (Svelmoe 2009), making some secular scholars uncomfortable or unwilling to use SIL tools and technologies. In contrast to the typefaces with missing characters, discussed earlier in the article, typefaces such as *Aboriginal Sans/Serif* and the various SIL typefaces are designed specifically to provide as many characters and diacritics as possible.

A number of the typefaces listed above were designed specifically for the Indigenous languages they accommodate, such as *Pigiarniq*, *LushootseedSchool/Sulad* and many of the typefaces recommended by the Cherokee Nation. *Pigiarniq* – designed for Inuktitut – and *Plantagenet Cherokee* – designed for Cherokee – were both produced by Tiro Typeworks.

In the following section, we review the aesthetics of a few of the typefaces and identify information about their creators. The typefaces we investigate include those made and distributed by SIL International, representing comprehensive pan-Indigenous typefaces, and *LushootseedSchool/Sulad*, an example of a typeface tailored to a specific language.

COMPARING TYPEFACES AND PURPOSES

We begin our review with the typefaces released by SIL International – *Andika*, *Charis*, *Doulos* and *Gentium* – used by communities with a range of orthographic needs. *Andika* is a sans-serif typeface with regular, bold, italic and bold-italic fonts which provides all characters and diacritics necessary to type in extended Latin characters (SIL International n.d.a). *Charis* is a serif typeface with regular, bold, italic and bold-italic fonts able to accommodate characters in Latin- and Cyrillic-based orthographies (SIL International n.d.b). *Doulos* is a serif typeface with glyphs for typing Latin- and Cyrillic-based orthographies as well as IPA, and only includes a regular weight font (SIL International n.d.c). *Gentium* is a serif typeface accommodating Latin-, Cyrillic- and Greek-based orthographies and has regular and italic fonts (SIL International n.d.d). This information is displayed in the chart in Figure 13. All of these fonts are Unicode compliant and are released with an SIL Open Font License, allowing the use, modification and further distribution of the fonts (Spalinger and Gaultney 2007). This licence permits communities to use glyphs from the typefaces to construct a font tailored to the specific needs of their orthography, and at the same time exclude glyphs that are not needed, offering a streamlined and simplified pathway to deployment and use.

The typefaces distributed by SIL International offer a variety of aesthetic choices, shown in Figure 14, particularly for serif fonts. Contrasting stroke weights are evident in *Doulos*, while *Charis*, a transitional serif, has heavier strokes overall, contributing to a darker appearance on the page and screen. In contrast, *Gentium* is an old-style serif which provides a lighter option, with soft curves in its characters. *Andika* is the only sans-serif typeface of the four. As shown in the overview of typefaces used by various language communities, the SIL typefaces remain popular throughout North America. Example text is offered in Figure 14, which displays the name of the typeface alongside the word ‘?ay?ajuθəm’, as a comparison to the typefaces shown in Figure 8.

	Andika	Charis	Doulos	Gentium
Regular	●	●	●	●
Bold	●	●		
<i>Italic</i>	●	●		●
<i>Bold-italic</i>	●	●		

Figure 13: The weights and styles available for each of the SIL International typefaces.

Victory Gaultney, the designer of *Gentium*, and co-designer of *Andika*, has outlined various aspects of his design process for *Gentium*. *Gentium* was an early typeface (released in 2001) explicitly designed for the purpose of correctly formatting a variety of languages with different orthographies based on different scripts. *Gentium* was created to capture elements of cursive design while at the same time maintaining legibility, or the ability to distinguish between different glyphs, through strokes of medium thickness with minimal weight contrast (Gaultney 2002: 4–5). The distinctiveness of characters was emphasized in the design process, with aspects such as bowl width (the closed circular parts of glyphs found on characters such as ‘b’) customized for each glyph to help make them more recognizable (Gaultney 2002: 10). Multiple versions of some diacritics are provided, allowing them to function at different heights, thus taking away the risk of glyphs colliding (as seen in Figure 9) and supporting combinations of diacritics to be stacked. *Gentium* also includes kerned pairs of characters, thereby increasing readability (in contrast to the issue outlined in Figure 10) (Gaultney 2002: 9). Simultaneously, Gaultney stressed the importance of uniformity in the visual identity of the typeface across scripts (2002: 11–18).

Gaultney has discussed the power of an elegantly designed typeface. Describing responses to poorly formatted fonts, Gaultney said, ‘publishers would hesitate to do work in unusual languages because the available fonts were so poor. Academics had to do their own thing because the industry did not support their needs’ (Gaultney 2003). *Gentium* provides an option that is not only functional but aesthetically pleasing, encouraging publishers and others to extend their services to languages with minority scripts and orthographies. With this, Gaultney also noted that the uniform design of *Gentium* makes publishers more open to publishing multilingual content (Gaultney 2003).

Finally, Gaultney outlines his reasons for permitting SIL to freely distribute the font rather than disseminating it commercially. A principal goal of the typeface was to provide an option for speakers of languages poorly served by the commercial market who have limited options when selecting typefaces.

Andika ṽayṽaṽuṽəṽ

Charis ṽayṽaṽuṽəṽ

Doulos ṽayṽaṽuṽəṽ

Gentium ṽayṽaṽuṽəṽ

Figure 14: Sample text from each of the four typefaces produced by SIL International displayed in the regular weight (SIL International 1997, 1992; Gaultney 2001, Gaultney and Olsen n.d.).

To combat this deficiency, Gaultney chose to provide *Gentium* free of charge through SIL's established digital networks (Gaultney 2003).

In contrast, both *LushootseedSchool* and *LushootseedSulad* were commissioned by the Tulalip Tribes located in Washington State and were designed by Juliet Shen, a Seattle-based graphic designer. The typefaces were custom-built for teaching children how to write, and are, therefore, sans-serif, as serifs can confuse learners about which aspects are elements of the letter versus features of the design (Shen 2010: 22). The typefaces differ in only one letter, the barred 'l'. The barred 'l' in *LushootseedSchool* is styled to look like the handwritten version, in order for it to be used for writing instruction, while the barred 'l' in *LushootseedSulad* portrays the typed form (Shen 2010: 26). Both typefaces only contain the necessary glyphs for typing in Lushootseed, meaning that they cannot be used to type in English.

Shen incorporated elements of the formline wood-carving art style of the Pacific Northwest in the width, x-height (height of the lowercase 'x', which, in turn, is reflective of the relative heights of all lowercase glyphs) of the glyphs and curves of the strokes so that the typeface can be effortlessly incorporated into the visual identity of the Tulalip Tribes (Shen 2010: 23–25). When representatives from the Tulalip Tribes expressed their desire for the typeface to be visually similar to their handwritten orthography, Shen designed the superscript 'w' to look this way. The result is a larger aperture, or enclosed part of

ʔəsʈiçtˠx^w səpləl tiʔəʔ.

ʔəsʌiçtˠx^w səpləl tiʔəʔ.

Figure 15: LushootseedSulad (top) and LushootseedSchool (bottom) (Shen 2009) displaying characters from a Lushootseed phrase meaning ‘this is a slice of bread’ (‘ʔəsʈiçtˠx^w səpləl tiʔəʔ.’ n.d.).

the glyph, meaning that more negative space is contained within the glyph, as opposed to it spilling out around the sides (Shen 2010: 26). This customization, paired with a number of other adjustments and modifications that help to increase readability and legibility, make for a typeface with notably better visual weight than many other typefaces that accommodate Lushootseed.

Shen also designed the two typefaces on a six-line grid so as to accommodate the stacked apostrophe and haček over the ‘c’ (Shen 2010: 27). These design innovations help the language and the typefaces to function seamlessly and work in tandem. The overall result is that the orthography and typeface appear to have been designed in a coordinated manner. This is in contrast to the more forced visual impression of a language that is displayed using a typeface containing all of the necessary characters, but which does not format elegantly and feels aesthetically disconnected. Sample text typed in *LushootseedSulad* and *LushootseedSchool* are offered in Figure 15.

In outlining her design process, Shen stressed the role of collaboration, particularly in the case of the superscript ‘w’ in which the design concept was the result of effective communication with speakers and educators who requested that glyphs be made to look like the handwritten versions of characters (Shen 2010: 22–28). This kind of reciprocal partnership is indicative of a wider movement in the field of language revitalization towards building collaborative projects between community members and outsiders with specific skills, knowledge or networks that can be harnessed towards community goals, see Davis (2017), Harrison et al. (2019), Leonard and Hayes (2010) and Pine and Turin (2017).

CONCLUSION

Typeface designers have an opportunity – and we would tentatively argue a responsibility – to engage in respectful and supportive partnerships with historically under-represented and marginalized communities. We acknowledge that typeface design is difficult work, subject to complex market demands and sustained economic pressures. Under any conditions, a well-functioning and visually pleasing typeface is a considerable achievement. The stakes are higher still when the anticipated users are members of historically marginalized

communities, who have in many cases been poorly served by most typefaces and let down by many that come preinstalled on consumer operating systems.

While cross-platform consistency and reliability are basic requirements that readers and writers of dominant world languages rightly take for granted, they are still only sporadically implemented for Indigenous languages whose speakers and writing systems have been subjected to sustained oppression and marginalization. We see considerable innovation and promise in this field, and are encouraged by collaborations between type designers and members of Indigenous communities. Our goal in this contribution has been to identify enduring challenges and draw attention to positive innovations, applications and grounds for hope in the development of typefaces by and with speakers and writers of Indigenous languages in North America.

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REFERENCES

- ‘**RJGP**’ (n.d.), ‘**RJGP**’, Cherokee-English Dictionary Online Database, <http://www.cherokeedictionary.net/?noresults=true>. Accessed 4 August 2019.
- ‘**Wpᵒᵒ.ᵒ**’ (n.d.), ‘**Wpᵒᵒ.ᵒ**’, Cherokee-English Dictionary Online Database, <http://www.cherokeedictionary.net/>. Accessed 30 July 2019.
- ‘**ᑦᑎᑕᑦᑕᑦᑕᑦᑕᑦᑕ**’ (n.d.), Plains Cree Dictionary, Algonquian Dictionaries Project, <http://dictionary.plainscree.atlas-ling.ca/#/help>. Accessed 15 August 2019.
- ‘**ʔəsłıçtxʷ səpləl tiʔəʔ.**’ (n.d.), ‘Lushootseed: The language of Puget Sound’, The Tulalip Tribes of Washington, <https://tulaliplushootseed.com/phrase/s/%ca%94%c9%99s%c9%acic%cc%93tx%ca%b7-s%c9%99pl%c9%99l-ti%ca%94%c9%99ca%94/>. Accessed 19 August 2019.
- ‘**ʔəstagʷəxʷ čəxʷ ʔu.**’ (n.d.), ‘Lushootseed: The language of Puget Sound’, The Tulalip Tribes of Washington, <https://tulaliplushootseed.com/phrase/s/%ca%94%c9%99stag%ca%b7%c9%99x%ca%b7-c%c9%99x%ca%b7-%ca%94u/>. Accessed 19 August 2019.
- ‘**ʔixʷaçiʔ ʔi ti čuʔ**’ (2015), ‘Lushootseed: The language of Puget Sound’, The Tulalip Tribes of Washington, 27 August, <https://tulaliplushootseed.com/encyclopedia/%c9%acix%ca%b7aci%ca%94-%ca%94i-ti-c%cc%93u%ca%94/>. Accessed 30 July 2019.
- ‘**mámñiʔa**’ (n.d.), ‘Online Hł̥zaq̣v dictionary’, Mother Tongues Dictionaries, <https://mothertongues.org/heiltsuk/#/search>. Accessed 30 July 2019.
- ‘**šaglóǰanʔ**’ (n.d.), New Lakota Dictionary Online, Lakota Language Consortium, <https://www.lakotadictionary.org/phpBB3/nldo.php>. Accessed 30 July 2019.
- ‘**TKOMO**’ (2016), First Voices SENĆOŦEN, First Peoples’ Cultural Council, 27 July, <https://www.firstvoices.com/explore/FV/sections/Data/THE%20SEN%C4%86O%C5%A6EN%20LANGUAGE/SEN%C4%86O%C5%A6EN/SEN%C4%86O%C5%A6EN/learn/words/c00d81bb-9ea2-4e42-b7da-c70bed06cd01>. Accessed 4 August 2019.

- WSÁNEĆ School Board (n.d.), 'History of the SENĆOŦEN language', <https://wsanecschoolboard.ca/sencoten-language/>. Accessed 1 August 2019.
- 'Ābñāci' (n.d.), 'Online Hítzaqv dictionary', Mother Tongues Dictionaries, <https://mothertongues.org/heiltsuk/#/search>. Accessed 15 August 2019.
- Baldwin, Daryl, Costa, David J. and Troy, Douglas (2016), 'Myaamiaataweenki eekincikoonihkiinki eeyoonki aapisaataweenki: A Miami language digital tool for language reclamation', *Language Documentation and Conservation*, 10:1, pp. 394–410.
- Burge, Éedaa Heather, Jill Meserve, Kaasteen, Mallory Story, Yat Tootéen, Will Geiger, Chalyee and Twitchell, X'unei Lance (2020), 'Tlingit online dictionary', Juneau, AK: University of Alaska Southeast and Goldbelt Heritage Foundation, <http://tlingitlanguage.com/resources/dictionary-2/>. Accessed 5 February 2020.
- Campbell, George L. (2013), *Compendium of the World's Languages*, 3rd ed., Abingdon: Routledge.
- Campbell, Tara (2020), 'A copy editor's education in Indigenous style', *The Tyee*, 17 January, <https://thetyee.ca/News/2020/01/17/Copy-Editor-Indigenous-Style/>. Accessed 4 February 2019.
- Canadian Heritage (n.d.), 'Indigenous languages in Canada', Ottawa: Government of Canada, https://www.itk.ca/wp-content/uploads/2017/06/TableauFiP_EN.pdf. Accessed 4 June 2019.
- Carter, Matthew (1993), *Georgia* (typeface), Redmond, WA: Microsoft Corporation.
- (1996), *Verdana* (typeface), Redmond, WA: Microsoft Corporation.
- CBC News (2015), 'New Canada 150 typeface supports English, French, Indigenous languages', Canadian Broadcast Corporation, 18 December, <https://www.cbc.ca/news/canada/ottawa/canada-150-typeface-supports-english-french-indigenous-languages-1.3372468>. Accessed 16 August 2017.
- Cherokee Nation (n.d.a), 'Fonts and keyboards', <https://language.cherokee.org/fonts-and-keyboards/>. Accessed 30 July 2019.
- (n.d.b), 'Syllabary and numbers', <https://language.cherokee.org/posters/syllabary-and-numbers/>. Accessed 30 July 2019.
- Chief Atahm School (n.d.), 'T'selc'wétqen Clleq'mel'ten/Chief Atahm School', <http://www.chiefatahm.com/>. Accessed 30 July 2019.
- Connare, Vincent (1994), *Comic Sans* (typeface), Redmond, WA: Microsoft Corporation.
- (1996), *Trebuchet* (typeface), Redmond, WA: Microsoft Corporation.
- Culture and Heritage Department (n.d.), 'Computer tools', Government of Nunavut, <https://www.gov.nu.ca/culture-and-heritage/information/computer-tools>. Accessed 30 July 2019.
- Daubs, Katie (2016), 'Designers fume over free font for Canada's 150th birthday', *The Star*, 12 January, <https://www.thestar.com/news/insight/2016/01/12/designers-fume-over-free-font-for-canadas-150th-birthday.html>. Accessed 19 August 2017.
- Davis, Jennifer L. (2017), 'Resisting rhetorics of language endangerment: Reclamation through Indigenous language survivance', *Language Documentation and Description*, 14:1, pp. 37–58.
- Education, Culture and Employment (n.d.), 'Official languages overview', Government of Northwest Territories, <https://www.ece.gov.nt.ca/en/services/secretariat-des-langues-autochtones/official-languages-overview>. Accessed 4 June 2019.

- Ethnologue: Languages of the World 22nd Edition (2019), 'Nepali', SIL International, 21 February, <https://www-ethnologue-com.ezproxy.library.ubc.ca/language/np>. Accessed 30 January 2020.
- First Peoples' Cultural Council (n.d.), 'About us', <http://www.fpcc.ca/about-us/>. Accessed 4 August 2019.
- First Peoples' Map of B.C. (2020), *First Peoples' Map of B.C.* First Peoples Cultural Council, <https://maps.fpcc.ca/>. Accessed 5 February 2020.
- Gaultney, Victor and Olsen, Annie (n.d.), *Andika* (typeface), Dallas: SIL International.
- Gaultney, Victor (2001), *Gentium* (typeface), Dallas: SIL International.
- (2002), *Gentium: A Typeface for the Nations*, Reading: University of Reading.
- (2003), interviewed by Lorna, *Gentium: Providing Type to the World*, SIL International, 5 November, <https://software.sil.org/gentium/gentium-providing-type-to-the-world/>. Accessed 4 February 2020.
- Gillam, Richard (2002), *Unicode Demystified*, Boston: Addison-Wesley Professional.
- Harrison, K. David, Lillehaugen, Brook Danielle, Fahringer, Jeremy and Lopez, Felipe H. (2019), 'Zapotec language activism and talking dictionaries', in I. Kosem, T. Z. Kuhn, M. Correia, J. P. Ferreira, M. Jansen, I. Pereira, J. Kallas, M. Jakubiček, S. Krek, and C. Tiberius (eds), *Electronic Lexicography in the 21st Century: Smart Lexicography: Proceedings of eLex 2019 Conference*, Brno: Lexical Computing, pp. 31–50.
- Harvey, Chris (2007), *Aboriginal Serif/Sans* (typeface), Brentwood Bay: First Peoples' Cultural Council.
- Heiltsuk Language & Culture Mobilization Partnership (2019), 'Keyboard', University of British Columbia, 9 February, <https://heiltsuk.arts.ubc.ca/keyboard/>. Accessed 30 July 2019.
- Hermes, Mary and King, Kendall A. (2013), 'Ojibwe language revitalization, multimedia technology, and family language learning', *Language Learning & Technology*, 17:1, pp. 125–44.
- Hyslop, Katie (2019), 'Closing BC's Indigenous internet gap', *The Tyee*, 12 December, <https://thetyee.ca/News/2019/12/12/Closing-BC-Indigenous-Internet-Gap/>. Accessed 30 January 2020.
- Indigenous Languages of Manitoba Inc. (2018), 'Dene syllabics alphabet', YouTube, 3 May, <https://www.youtube.com/watch?v=CMqX3qZkkXk>. Accessed 8 September 2019.
- International Phonetic Organization (1999), *Handbook of the International Phonetic Association: A Guide to the Use of the International Phonetic Alphabet*, Cambridge: Cambridge University Press.
- Inuktut Tusaalanga (n.d.a), 'How to read syllabics', Piruvik Centre, <https://tusaalanga.ca/node/2516>. Accessed 30 July 2019.
- (n.d.b), 'Inuktitut glossary', Piruvik Centre, <https://tusaalanga.ca/glossary/english?l=s>. Accessed 30 July 2019.
- (n.d.c), 'What is Inuktitut?', Piruvik Centre, <https://tusaalanga.ca/node/2502>. Accessed 5 February 2020.
- Isaacs, Sandra Muse (2019), *Eastern Cherokee Stories: A Living Oral Tradition and Its Cultural Continuance*, Norman, OK: University of Oklahoma Press.
- Jackson, Lisa (n.d.), *Typewriter*, Canada: First Peoples' Cultural Council.
- Joshi, Raghunath (2001), *Mangal* (typeface), Redmond, WA: Microsoft Corporation.

- Noack, Rick and Gamio, Lazaro (2015), 'The world's languages, in 7 maps and charts', *Washington Post*, 23 April, <https://www.washingtonpost.com/news/worldviews/wp/2015/04/23/the-worlds-languages-in-7-maps-and-charts/>. Accessed 14 August 2019.
- Pine, Aidan and Turin, Mark (2017), 'Language revitalization', Oxford: Oxford University Press and Oxford Research Encyclopedia, <https://oxfordre.com/linguistics/view/10.1093/acrefore/9780199384655.001.0001/acrefore-9780199384655-e-8#>. Accessed 3 June 2019.
- (2018), 'Seeing the Heiltsuk orthography from font encoding through to Unicode: A case study using convertextract', in C. Soria, L. Besacier and L. Pretorius (eds), *Proceedings of the LREC 2018 Workshop 'CCURL 2018 – Sustaining Knowledge Diversity in the Digital Age'*, Paris: European Language Resources Association, 12 May, pp. 27–30.
- (2019), 'Using technology to help revitalize indigenous languages', OUP Blog, 24 June, <https://blog.oup.com/2019/06/using-technology-help-revitalize-indigenous-languages/>. Accessed 30 July 2019.
- Pullum, Geoffrey K. and Ladusaw, William A. (1996), *Phonetic Symbol Guide*, 2nd ed., Chicago, IL: University of Chicago Press.
- Rath, John (1986), 'Alphabet chart', illus. Shirl Hall, Heiltsuk Cultural Education Centre, <https://heiltsuk.arts.ubc.ca/alphabet-chart-john-rath/>. Accessed 30 July 2019.
- Red Cloud Indian School (n.d.), 'Lakota language program resources', <https://www.redcloudschool.org/page.aspx?pid=629>. Accessed 30 July 2019.
- Saskatchewan Indigenous Cultural Centre (n.d.), 'Plains Cree history', <https://sicc.sk.ca/plains-cree-history/>. Accessed 20 August 2019.
- Schwartz, Daniel (2015), *Truth and Reconciliation Commission: By the Numbers*, Canadian Broadcasting Corporation, 2 June, <https://www.cbc.ca/news/indigenous/truth-and-reconciliation-commission-by-the-numbers-1.3096185>. Accessed 30 January 2020.
- Shen, Juliet (2009), *LushootseedSulad/School* (typeface), Tulalip: Tulalip Tribes of Washington.
- (2010), 'Aesthetic innovation in Indigenous typefaces: Designing a Lushootseed (dx*lašucid) font', *Glimpse*, 7:1, pp. 20–29.
- SIL International (n.d.a), 'Andika', <https://software.sil.org/andika/>. Accessed 4 August 2019.
- (n.d.b), 'Charis', SIL International, <https://software.sil.org/charis/>. Accessed 4 August 2019.
- (n.d.c), 'Doulos', SIL International, <https://software.sil.org/doulos/>. Accessed 4 August 2019.
- (n.d.d), 'Gentium', SIL International, <https://software.sil.org/gentium/>. Accessed 4 August 2019.
- (1992), *Doulos* (typeface), Dallas: SIL International.
- (1997), *Charis* (typeface), Dallas: SIL International.
- Simpw First Nation (n.d.), 'Our language', <https://www.simpw.com/our-language.htm>. Accessed 30 July 2019.
- Spalinger, Nicolas and Gaultney, Victor (2007), 'SIL open font license (OFL)', SIL International, 26 February, https://scripts.sil.org/cms/scripts/page.php?site_id=nrsi&item_id=OFL. Accessed 4 August 2019.
- Statistics Canada (2017), 'The Aboriginal languages of First Nations people, Métis and Inuit', Ottawa: Government of Canada, 25 October, <https://www12.statcan.gc.ca/census-recensement/2016/as-sa/98-200-x/2016022/98-200-x2016022-eng.cfm>. Accessed 4 June 2019.

- Stinson, Liz (2015), 'Canada's new typeface unifies the country's many languages', *Wired Magazine*, 10 December, <https://www.wired.com/2015/12/canadas-new-typeface-unifies-the-countrys-many-languages/>. Accessed 19 August 2019.
- Svelmoe, William L. (2009), "'We do not want to masquerade as linguists": A short history of SIL and the academy', *Language*, 85:3, pp. 629–35.
- Tiro Typeworks (n.d.), 'Purchase Plantagenet Cherokee license', http://www.tiro.com/Plantagenet/plantagenet_cherokee_purchase.html. Accessed 15 August 2017.
- Truth and Reconciliation Commission of Canada (2015–16), 'Reports', University of Manitoba: National Centre for Truth and Reconciliation, <http://nctr.ca/reports.php>. Accessed 15 August 2019.
- Unicode (2019), 'The Unicode® standard: A technical introduction', Unicode, 22 August, <https://www.unicode.org/standard/principles.html>. Accessed 29 January 2020.
- University of British Columbia First Nations and Endangered Languages Program (n.d.), *First Nations Unicode* (typeface), Vancouver: University of British Columbia First Nations and Endangered Languages Program.
- Vowel, Chelsea (2016), 'Just don't call us late for supper: Names for Indigenous peoples', in C. Vowel (ed.), *Indigenous Writes: A Guide to First Nations, Métis & Inuit Issues in Canada*, Winnipeg: Portage & Main Press, pp. 15–20.
- Walsh, Michael (2018), 'Language is like food: Links between language revitalization and health and well-being', in L. Hinton, L. Huss, and G. Roche. (eds), *The Routledge Handbook of Language Revitalization*, New York: Routledge, pp. 5–12.
- Wildcat, Matthew (2015), 'Fearing social and cultural death: Genocide and elimination in settler colonial Canada – An Indigenous perspective', *Journal of Genocide Research*, 17:4, pp. 391–409.
- Yinka Déné Language Institute (n.d.), 'Déné syllabics', <https://ydli.org/dakinfol/dulktop.htm>. Accessed 8 September 2019.
- Zapf, Hermann (1949), *Palatino* (typeface), Frankfurt am Main: Stempel.

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