11
NOUN INCORPORATION AND POLYSYNTHESIS

Michael Barrie and Éric Mathieu

1. Introduction

This chapter discusses the complex morphosyntax of polysynthetic languages of North America. We begin with a discussion of the kinds of concepts that are encoded morphologically in various languages of North America, including tense, aspect, agreement, causation, noun incorporation (NI), and several other inflectional and derivational concepts. Many of these concepts are discussed in detail in other chapters in this volume, so we touch on these only briefly here. We do include an in-depth discussion of NI, however. We discuss the origin of the typological term *polysynthesis* and the kinds of analyses that have been proposed to account for it. Section 1 covers the origin of the notion of polysynthesis since Humboldt, how it has changed since the time of Humboldt, and how it is understood today. Section 2 discusses morphological aspects of polysynthesis, including the kinds of features that are expressed morphologically in polysynthetic languages. Section 3 discusses noun incorporation and how it varies in languages across North America. Section 4 discusses recent theoretical discussions of polysynthesis. Finally, Section 5 summarizes and discusses the outlook for future research.

2. Polysynthesis

The term *polysynthesis* was added to the repertoire of morphological typology by Humboldt (1825; 1836) to describe languages in which individual words typically contain several morphemes. This is the essence of polysynthesis – the tendency for a large number of morphemes to exist on a single word. In the Humboldtian tradition, languages occupy one of four typological categories, which are treated as ends of a spectrum (isolating versus incorporating, and inflecting versus agglutinating). Inflecting languages are also called fusional, and incorporating languages are also called polysynthetic. The notion of incorporation is discussed later in this chapter. For more details on the typological classification of language within the context of the languages of North America, the reader is referred to Liedtke (1997). We note, however, that polysynthetic languages are found in every continent in the world, and that not all languages indigenous to North America are polysynthetic. Indeed, many are not. This is an important point we come back to in the analysis of polysynthesis and noun incorporation.

Precise definitions of polysynthesis are hard to come by; however, Comrie (1989: 45) offers the following working definition:

> Polysynthesis, however, refers simply to the fact that, in a language of this type, it is possible to combine a large number of morphemes, be they lexical or grammatical, into a single word, often corresponding to a whole sentence in English.

Comrie does distinguish between combining lexical roots into a larger word structure (incorporation) versus combining functional morphology into a larger word structure (polysynthesis) but uses the term *polysynthesis* as a cover term for the two concepts. We will use the term *narrow polysynthesis* when required to refer to polysynthesis to the exclusion of incorporation. As we will see in Baker's discussion, incorporation and narrow polysynthesis are intimately linked in his Polysynthesis Parameter; however, as far back as Brinton (1886) the link between the two was noticed. We hasten to point out, however, that there are polysynthetic languages that do not have NI and that there are languages with NI that are not polysynthetic, a point touched on as far back as Sapir (1911: 250) with the following quote.

> In the first place so-called pronominal incorporation and noun incorporation stand in no necessary relation to each other.

We continue our discussion with some examples of polysynthesis. The following examples illustrate some extreme cases of polysynthesis in North Baffin Inuktitut [iku] (Eskimo-Aleut), (1a), Mohawk [moh] (Iroquoian), (1b), and Wichita [wic] (Caddoan), (1c), respectively.

(1) a. North Baffin Inuktitut

annulaksi-kkanni-nginna-jualu-gasu-lauqsima-guma-nngit-tsiaq-galuaq-tunga
imprison-again-really-a.lot-try-ever-want-NEG-EMPH-EMPH-1SG.INTR.DECL
'I would never ever even want to try to end up in jail ever again even for a bit.'
(Johns 2007: 564)

b. Mohawk

Tha'tewakatonnhatierónnion
tha'-te-wak-at-onnh-at-ier-onni-on
CONTR-DUC-1SG.PAT-SRFL-life-SRFL-do-DIST-STAT
'My life was really quite strange.'
(Mithun 2014: 5)

c. Wichita

kiya: ki-riwa:c-7aras-a-ri-kita-7a-hi: rik-s
EVID.AOR:3-big-meat-COLL.U-TR-top-come-ITER-IMPF
'by making many trips, he carried the large (quantity of) meat up into it [the tree]'
(Rood 1976: 75)

2.1. Classifying Polysynthesis

Mattissen (2017) builds on the distinction between incorporation and affixation introduced earlier to classify polysynthetic languages into distinct types. She offers the following definition of polysynthesis:

> Languages qualify as polysynthetic if they have complex, polymorphemic verbal units which necessarily integrate productively non-root bound morphemes with "lexical" and grammatical meanings, especially local ones, and optionally allow concatenation of lexical roots within a verbal wordform.
>
> (Mattissen 2017: 72)

She furthermore postulates the following parameters distinguishing subtypes of polysynthesis, which we review in succession. Note that we have adapted Mattissen's original wording of the parameters for the sake of space.

(2) Parameter 1: Word-Formational Type: The verbal complex allows one of the following options.

i. One lexical root and various affixes
ii. More than one lexical root and various affixes
iii. One lexical root, various affixes, and a small number of fossilized forms indicative of noun incorporation or verb serialization that may have once been productive

Examples of languages of the first type include Greenlandic [kal] and Navajo/Diné Bizaad [nav], and examples of the second type include Wichita and Nez Perce [nez]. Noun incorporation is discussed in detail later in this chapter, but we give examples here to illustrate the concept. As an example of the first type, Compton (2012) gives the following Inuktitut example. The only lexical root in this example is *iglu* ('house'). See Compton for discussion on this point.

(3) Inuktitut

iglu-liu-tuinna-ruma-junga
house-make-only-want-DECL.1SG
'I just want to make houses/igloos.'

(Compton 2012: 10)

For the second type, Mattissen notes that forms with two lexical roots include not only NI but also verb-root serialization and adverb incorporation. Here is an example from Lakota.

(4) Lakota

a-čhą́-kozA
LOC-wood-wave
'to swing clubs on someone'

(de Reuse 1994: 213)

As an example of the third type, Mattissen offers Maskoke [mus] (Muskogean). Consider the following examples.

(5) Maskoke

a.	***nok**-sómk-i:*	b.	*ca-**nók**-wa*
	throat-get.lost-part		1sg-neck-suf
	'hoarse'		'my neck'

(Haas 1941: 312)

The lexical root *nok* ('neck/throat') appears as a frozen form in a small number of Maskoke verb forms, but no longer undergoes productive incorporation.

(6) Parameter 2: Internal Organization: The order of the morphemes is dictated in one of the following ways.

i. The morphemes are ordered by a strict template.
ii. The morphemes are ordered by semantic scope, with no discernable template.
iii. The order of the morphemes is a combination of the above.[1]

Navajo/Diné Bizaad is an example of the first type. As this type of language follows a strict template, we show the template here (Young & Morgan 1987: 38).

(7) Position of verbal morphemes from left to right:

0	Direct object of postposition. Possessive prefix with nouns.
Ia	Null postposition
Ib	Adverbial – Thematic (‘postpositional stems’)
Ic	(Reflexive)
Id	(Reversionary)
Ie	(Semeliterative)
II	(Iterative)
III	(Distributive Plural)
IV	Direct Object Pronouns
V	Deictic Subject Pronouns
VIa	Adverbial – Thematic
VIb	Adverbial – Thematic
VIc	Transitional/Semelfactive Aspect markers
VII	Modal – Aspectival Conjugation markers
VIII	Subject Pronouns
IX	‘Classifier’
X	Stem

Greenlandic is an example of the second type. Mattissen gives the following minimal pair.

(8) Greenlandic

a. *Kaalat* *tiki-nngik-kallar-puq*
Kaalat arrive-NEG-yet/still-IND.3SG
‘Kaalat has not yet arrived.’

b. *Kaalat* *tikik-kallan-nngi-laq*
Kaalat arrive-yet/still-NEG-IND.3SG
‘Kaalat has still not arrived.’

(Mattissen 2017: 80–81, citing Fortescue 1984: 137)

As an example of the last type, Mattissen (2017) gives the following Southern Sierra Miwok [skd] (Utian) example, citing Broadbent (1964: 39–40). Observe the difference in order between the causative (CAUS) and the form for *ready* in the following examples. The difference in morpheme order relates to the difference in meaning. We infer from Mattissen’s discussion that the remainder of the affixes are ordered according to a template. We also refer to reader to Rice (2000) for an in-depth discussion of morpheme order and semantic scope in Athapaskan.

(9) Southern Sierra Miwok

a. *ʔetal-nuk’u-lumhu-’*
return-CAUS-ready-PRS.IMPF.3SG
‘He is ready to take him home.’ (lit: ‘He is ready to make him go home.’)

b. *ʔetla-lamhy-nuk’u-’*
return-ready-CAUS-PRS.IMPF.3SG
‘He is making him ready to return home.’

(Mattissen 2017: 81, citing Broadbent 1964: 39–40)

(10) Parameter 3: Participant Encoding: A polysynthetic language may encode participants in one of the following three ways.

i. Polypersonalism: encoding at least two participants on the verb
ii. Monopersonalism: encoding only one participant on the verb
iii. Apersonalism: encoding no participants on the verb

While polypersonalism is typically regarded as a hallmark property of polysynthetic languages, Mattissen suggests that it is not a necessary characteristic. Greenlandic and Mohawk are examples of polypersonal languages in which a maximum of two participants are encoded on the verb. Southern Tiwa permits up to three participants; see (11). Wintu [wnw] was an example of a monopersonal language. Agreement is discussed below and in Compton (this volume), but we give some relevant examples here. Southern Tiwa, as mentioned, is a polypersonal language. Here is a Southern Tiwa example that references three arguments.

(11) Southern Tiwa

ka-'u'u-wia-ban *ĩ-'ay*
1SG.AG.2SG.RECIP.3ANIM.SG.PAT-baby-give-PST 2SG-to
'I gave the baby to you.'

(Allen et al. 1984: 303)

Mattissen (2017, citing Harrington (1921), gives the following Chimariko [cid] (possibly Hokan) examples to illustrate monopersonality.

(12) Chimariko

a. *qh-uk'o-ʔna-n*
2PL.AG-talk-APPL-ASP
'You (guys) talked to him.'
b. *qha-k'o-ʔna-n*
2PL.PAT-talk-APPL-ASP
'He talked to you (guys).'

(Mattissen 2017: 70, citing Harrington 1921)

Finally, Haida [hai] (isolate, possibly Dene–Yeniseian) is an example of an apersonal language. Mattissen (2017), citing Swanton (1911), gives the following example.

(13) Haida

Gien *l'* *L-gī'gî'l-gAn*
then 3SG shave.of.man-swim-landward-PST
'Then he swam landward.'

(Mattissen 2017: 70, citing Swanton 1911: 255)

(14) Parameter 4: Evolutionary Path: The structure of the verb form [what we call here the *verbal complex*] is historically derived in one of the three following ways.

i. Onion type: verbal complex is not expandable and consists of a central core in which morphemes are added to the outside
ii. Sandwich type: verbal complex is internally expandable
iii. Burdock type: verbal complex is expandable, and formed by the coalescence of adjacent free forms

The onion type languages include Navajo, Blackfoot, Wichita, and Cherokee. Many examples can be seen in this and other chapters. Here is a Mohawk example, repeated from (1b).

(15) Mohawk

Tha'tewakatonnhatierónnion
tha'-te-wak-at-onnh-at-ier-onni-on
CONTR-DUC-1SG.PAT-SRFL-life-SRFL-do-DIST-STAT
'My life was really quite strange.'

(Mithun 2014)

The sandwich type languages include Greenlandic, Washo, and Nez Perce. An example of this type is shown for North Baffin Inuktitut in (1a), repeated here as (16). Observe that adverbial and other typically optional material can be freely added to the verbal complex. This contrasts with the Mohawk example in (15). Although the Mohawk example contains many concepts, it cannot be expanded as the Greenlandic example can. For instance, to express the idea of 'wanting to do something' in Mohawk, two separate verbal complexes must be used.

(16) Greenlandic

annulaksi-kkanni-nginna-jualu-gasu-lauqsima-guma-nngit-tsiaq-galuaq-tunga
imprison-again-really-a.lot-try-ever-want-NEG-EMPH-EMPH-1SG.INTR.DECL
'I would never ever even want to try to end up in jail ever again even for a bit.'

(Johns 2007)

The burdock type languages include Muskogean, Klamath, and Takelma. Mattissen provides the following Klamath example, which is quite telling of the evolutionary pathway she suggests. Observe specifically the historical transition of *nannwi* 'as soon as' from a free form to a bound form (note the timeline of the sources: 1890 and 1964). This example underscores Mattissen's treatment of this parameter as a categorization of polysynthetic properties as a historical process.

(17) Klamanth

a. . . . qtanc'an nannwi sq'ol-lG-o:t-a-k
fall.asleep as.soon.as SG.lie.down-while-IND-EMPH
'(He) fell asleep as soon as he lay down.'

(Gatschet 1890: 113)

b. qtan-c'n-nannwi-ank
sleep-just.do.and.no.more-right.away/at.once-PST.PTCL
'having gone right to sleep.'

(Mattissen 2017, citing Barker 1964: 158)

In brief, no standardly accepted definition of polysynthesis exists because the division of languages into discrete categories is far from straightforward. The legacy of the Humboldtian tradition holds that polysynthesis is the extreme end of a spectrum along which languages may vary. Mattissen's investigation has revealed that polysynthetic languages exhibit a great deal of internal variation. In §4 we will revisit the issue of whether polysynthesis constitutes a unitary phenomenon when we explore Baker's Polysynthesis Parameter, but for now we will discuss some of the empirical properties associated with polysynthetic languages. We begin with an investigation of the various kinds of affixal morphology found on verbs followed by a discussion of noun incorporation.

2.2. Affixal Morphology

Polysynthetic languages encode an extremely wide variety of concepts on their verbs, as suggested by the examples in (1). Common, if not nearly universal concepts encoded on verbs include agreement, tense/aspect, mood, and applicatives. Other less common concepts include iteration, location, distributivity, pluractionality, evidentiality, and illocutionary force, just to name a few. We begin with a discussion of the common features, followed by a description of some of the less common features.

Agreement is a hallmark of polysynthetic languages, though see the discussion of Mattissen's Parameter 3 in §2.1. (See also Compton, this volume, for more discussion on agreement in the languages of North America.) Baker's Polysynthesis Parameter is motivated by the idea that all arguments are morphologically referenced on the verb. Languages vary tremendously in how arguments are referenced on the verb. Iroquoian languages reference only human arguments and are restricted to a maximum of two referents (Lounsbury 1949; Lounsbury 1953; Abbott 2000; Barrie 2015b). Algonquian languages also reference only two arguments but do so in a complex way involving the use of *theme signs* (Oxford, this volume). Southern Tiwa (Tanoan) references up to three arguments. Consider the following Southern Tiwa example. The agreement prefix *tam* references the subject (first person), the direct object, which is also incorporated, and the indirect object.

(18) Southern Tiwa

a. *'Uide tam-musa-wia-ban*
child 1SG.AG:3PL.TH:3SG.RECIP-cat-give-PST
'I gave the cats to the child.'

b. *Kam-musa-wia-ban*
1SG.AG:3PL.TH:2SG.RECIP-cat-give-PST
'I gave the cats to you.'

(Rosen 1990: 670, ex (3) and (10b), respectively)

The expression of person and number is sometimes expressed by distinct morphemes. Although agreement in Iroquoian often exhibits a great deal of portmanteau morphology, in first and second person, number agreement is expressed by separate and distinct morphemes. Consider the following Seneca examples. The first two examples show that person and number are separate. The last two examples illustrate portmanteau morphology.[2] See Barrie and Uchihara (this volume) for the full paradigm of agreement morphology in Iroquoian languages.

(19) Seneca

a. *sni:awiʔ*
s-ni-awi-ʔ
2-DU-carry-HAB
'You two are carrying something.'

b. *ʔakwátheʔthaʔ*
ʔa-**k-wa**-theʔt-haʔ
EXCL-**1-PL**-pound-HAB
'We (excl.pl) are pounding something.'

c. ***shako**-yɛt-haˀ*
3SG.M.AG:3SG.F.PAT-hit-HAB
'He's hitting her.'

d. ***hakʌ**-yɛt-haˀ*
3SG.M.AG:3PL.PAT-hit-HAB
'He's hitting them.'

(Chafe 1960: 225 and 230)

Algonquian languages show this more clearly, as the person and number affixes are not adjacent. Consider the following Ojibwe examples. Note that there is allomorphy in the form of the plural marker; see Rhodes (1976) and Oxford (this volume) for discussion.

(20) Ojibwe

a. *gwi:nizi*
g-w:in-izi-**mw**
2-dirty-TH.VAI-**PL**
'You are dirty.'

b. *gwi:nizimi*
g-wi:n-izi-**min**
2-dirty-TH.VAI-**PL**
'We (INCL) are dirty.'

c. *nwi:nizimi*
n-wi:n-izi-**min**
1-dirty-TH.VAI-**PL**
'We (EXCL) are dirty.'

(Rhodes 1976: 82)

Many polysynthetic languages mark reflexives morphologically on the verb rather than with a reflexive pronominal (such as *myself* in English). Mohawk exhibits both reflexives and middle voice (called *semireflexive* in Iroquoianist literature). Consider the following examples. The reflexive is used in typical situations expressing reflexivity. The middle voice is used with verbs of grooming and inherently reflexive events, among others. Lounsbury (1949), as far as we know, was the first to note the similarity between the Iroquoian middle voice and Romance SE.

(21) Mohawk

a. *wahontatié:nawa'se'*
wa-hon-**atat**-ienawa's-e'
FACT-3PL.AG-**REFL**-help-PUNC
'They helped themselves.'

b. *k-**at**-konhs-óhare-s*
1SG-**MID**-face-wash-HAB
'I wash my face.'

(Mithun 2006: 202, 205)

Garifuna [cab] marks reflexives both synthetically on the verb and analytically with a separate but etymologically related pronoun.

(22) Garifuna

a. *w-aséfuru-b-on gurúyara*
1.PL-save-FUT-3.F canoe
'We are going to save the canoe.'

b. *n-asáfura-**gu**-nya* *n-ún-**gwa***
1.SG-save-**REFL**-PROG 1.SG-to-**REFL**
'I am saving myself.'

(Haurholm-Larsen 2016: 118)

Upriver Halkomelem [hur] has an optional reflexive marker on the verb. It is not required to give rise to a reflexive interpretation, but if it is present a reflexive meaning holds (Wiltschko 2004: 108).

(23) Upriver Halkomelem

a. *q'óy-**thet*** *te* *swíyeqe*
kill-**REFL** DET man
'The man killed himself.'

b. *q'óy-t-es* *te* *swíyeqe*
kill-TRANS-3ERG DET man
= 'The man killed himself.'
= 'The man killed him.' (where he ≠ the man)

(Wiltschko 2004: 108)

Iteration or repetition is another property encoded by verbal morphology in some polysynthetic languages. Consider the following Upper Necaxa Totonac [tku] data (Beck 2008: 32).

(24) Upper Necaxa Totonac

a. *namín*
na-min-Ø
FUT-come-IMPF
'He will come.'

b. *namimpalá*
na-min-**pala**-Ø
FUT-come-**RPT**-IMPF
'S/he will come again.'

(Beck 2008: 32)

Polysynthetic languages typically have valency changing morphology of one sort or another. Causatives and benefactives are typically found in grammatical descriptions of many polysynthetic languages. We illustrate with an example of a causative from Nuu-chah-nulth.

(25) Nuu-chah-nulth

haʔuk̓aps
haʔuk -**'ap** -s
he.eats -**CAUS** -1SG
'I make him eat.' 'I serve him a meal.'

(Nakayama 2001: 123, ex (330))

Caballero (2014) notes that Choguita Rarámuri exhibits valence stem allomorphy. Table 11.1 shows some of her data (p. 734).

Tense, aspect, and mood (TAM) are also commonly expressed morphologically in North American languages. Iroquoian languages have complex TAM systems, which are described in this volume (Barrie & Uchihara). Choctaw [cho] has a series of TAM suffixes. Broadwell (2006: 169ff.) gives the following examples, showing irrealis mood (IRR), past tense (PST), and non-past tense (TNS). The reader is referred to Broadwell (2006) for more details.

Table 11.1 Valence Stem Allomorphy in Choguita Rarámuri

Intransitive	*Transitive*	*Applicative*	*Gloss*
suwí	suwá	suwé	'run out'
wirí	wirá	wiré	'stand'
uku	–	uké	'rain'

(26) Choctaw

a. *Ob-**aachi-h***
rain-**IRR-TNS**
'It's going to rain.'

b. *Ip-**aachi-tok***
eat-**IRR-PST**
'He was going to eat.'

c. *John-at* *Mary* *pisa-**tok***
John-NOM Mary see-**PST**
'John saw Mary.'

(Broadwell 2006: 169ff.)

Direction and location are commonly expressed in polysynthetic languages. Central Pomo has an extensive array of locative suffixes to express a variety of location and direction types. Consider the following forms for the verb *run* (Mithun 2010: 687).

(27) Central Pomo suffixes

čá-w	'run' (one)
čá-:la-w	'run down'
čá-:qač'	'run up (as up a hill)'
čá-č'	'run away'
čá-way	'run against hither, as when a whirlwind came up to you'
čá-:'w-an	'run around here and there'
čá-mli-w	'run around it (a tree, rock, house, pole etc.)'
čá-mač'	'run northward'
čá-:q'	'run by, over (along on the level), southward'
čá-m	'run over, on, across (as bridge)'

Jany (2017), citing Jany (2009: 135), gives the following example with combined directional markers in the extinct language Chimariko [cid].

(28) *ye-čuču-**tap**-mu-n* *hiṭiytew* *y-u'cu?-**tamu**-n*
1SG.AG-?-**dir(out)**-DIR(towards.there)-ASP fence 1SG.AG-?-**DIR**-ASP
'I dodged, I jumped over the fence.'

(Jany 2017, 279) [Chimariko]

Iroquoian languages also exhibit locative prefixes (called *translocative* and *cislocative*), which express movement (see Barrie & Uchihara, this volume, for more details).

Distributivity and pluractionality are expressed morphologically in several languages of North America. Pluractionality is somewhat vaguely defined. It refers to some plurality of actions, either in number of participants, number of events, place of events, or the like (Lasersohn 1995; Newman 1980: 13n23). Here are two examples from Onondaga, where the term *distributivity* is used to refer to this concept.

(29) Onondaga

a. *wa?gne:nohgwayęthwáhę?*

wa?-	k-	nenohkw-	a-	yęthwa	**-hę**:	-?
FACT-	1SG.AG-	potato-	JOIN-	plant	**-DIST**	-PUNC

'I planted several potatoes.'

b. *hagáedǫnyǫk*

ha-	káetǫ	**-nyǫ**	-k
3.SG.M.AG-	tell.stories	**-DIST**	-HAB

'He tells many stories.'

(Barrie 2015b)

Some languages exhibit verbal root suppletion to express pluractionality. Consider the following Navajo data (Young & Morgan 2000). This is not simple number agreement, as these forms indicate that event of going or walking takes place in a group.

(30) 'go, walk'

-yá-	'go.SG'
-'ash-	'go.DU'
-ááł-	'go.PL'

Instrumental affixes have two functions. On the one hand, they can function as part of a bipartite root (a root composed of two identifiable parts, both of which are necessary for a well-formed word), indicating how an action is undertaken. On the other hand, they can function as an applicative, introducing an instrumental argument into the event. Consider first the following Karuk data (Macaulay 1993). These exemplify bipartite roots with an instrumental component.

(31) a. *im 'involving fire or heat'
impat 'to become broken due to heat'
imcak 'to get burnt'
imcax 'to be hot'
impuk 'to be warm'
imnis 'to cook'

b. *ʔak 'with the hand'
ʔdkiO 'to handle a soft mass'
ʔaknup 'to thump'
ʔakrap 'to slap'
ʔaktuv 'to pluck at'
ʔakxarap 'to scratch'

Consider now the following Muskogee [mus] data, which show an instrumental affix used as an applicative to introduce an additional instrumental argument (Martin 2011: 192–193). Martin notes that 'binoculars' (INSTR-see-INF) can appear with the non-subject case clitic (NON.SUBJ.CASE).

(32) Muskogee

a. *Bill* *sókha-n* *hi:c-ís*
Bill hog-NON.SUBJ.CASE see-IND
'Bill is looking at a hog.'

b. *Bill* *sókha-n* ***ís-****hi:c-ís*
Bill hog-NON.SUBJ.CASE **INSTR**-see-IND
'Bill is looking at a hog (with something).'

c. *Bill* *is-hic-íta* *sókha-n* ***ís-****hi:c-ís*
Bill INSTR-see-INF hog-NON.SUBJ.CASE **INSTR**-see-IND
'Bill is looking at a hog with binoculars.'

(Martin 2011: 192–193)

Many polysynthetic languages can incorporate evidential, epistemic, and evaluative morphology. Mithun (2016) gives the following Yup'ik examples illustrating scope interactions in the last two examples.

(33) Yup'ik

a. *Quyayuumiitrepuyugnargua*
quya-yuumi-ite-llru-**yugnarqe**-u-a
thankful-yearn-NEG-PAST-**probably**-INTR.IND-1SG
'I guess I didn't want to be thankful.'

b. *Taiciqsugnarqnillruuq*
tai-ciq-**yugnarqe**-ni-llru-u-q
come-FUT-**probably**-claim-PST-INTR.IND-3SG
'He said he would probably come.'

c. *Taiciqnillruyugnarquq*
tai-ciq-ni-llru-**yugnarqe**-u-q
come-FUT-claim-PAST-**probably**-INTR.IND-3SG
'He probably said he would come.'

(Mithun 2016: 151)

In some polysynthetic languages the lexical root is not identified by a single morpheme but is discontinuous. Consider the following Western Apache [apw] examples.

(34) Western Apache

a. *k'enádadihidléh*
k'e-ná-**da**-Ø-d-(h)-id-d-**léh**
TH-ITER-**PL**-3.OBJ-TH-PEG?-1NONSG.SUBJ-TH-**SFO.IT**
'We (more than two) plant it usually.'

b. *k'edishłēē*
k'e-Ø-**d**-Ø-sh-Ø-**lēē**
TH-3.OBJ-**TH**-CM-1.SUBJ-CL-**SFO.IMPERF**
'I am planting it.'

(de Reuse 2017: 528f.)

The meaning of plant here arises from the combination of the two thematic elements, *k'e* and *d*/*da* along with the element marked SFO (slender flexible object), which varies with respect to aspect. De Reuse states that "[the thematic elements (TH)] function somewhat like the *cran-* and *boysen-* in *cranberry* and *boysenberry*". From this, we infer that these morphemes cannot appear on their own.

Finally, polysynthetic languages may possess adverbial elements that modify the predicate. These can be either an incorporated adverb or an affix on the verb. In some cases, it may not be easy to distinguish between the two possibilities, although we do not discuss possible diagnostics here. The following Plains Cree example and subsequent Inuktitut example are relatively straightforward, though. Consider the Plains Cree example first.

(35) *sakih* *-iso* ***-si*** *-hkaso* *-ski* *-w* [Plains Cree]
love -REFL **-DIM** -pretend -HAB -3SG.IND
'He's in the habit of pretending to love himself a little bit.'

(Dahlstrom 1991: 135, ex (24))

The gloss suggests that *si-*, which gives rise to the meaning of *a little bit*, is an affix, possibly the head of a functional projection in or around the *v*P layer. Consider again the Inuktitut example in (1a), repeated here as (36).

(36) *annulaksi-**kkanni-nginna-jualu**-gasu-**lauqsima**-guma-nngit-tsiaq-galuaq-tunga*
imprison-**again-really-a.lot**-try-**ever**-want-NEG-EMPH-EMPH-1SG.INTR.DECL
'I would never ever even want to try to end up in jail ever again even for a bit.'

Here, a number of adverbial elements appear inside the verbal complex. In (36), the gloss suggests that these may be incorporated lexical elements (see the next section for incorporation). We come back to this point in the conclusion. This contrasts with (35), where the putative adverbial element, glossed as DIM, does not appear to be a lexical root, but rather a functional element.

3. Noun Incorporation

Noun incorporation (NI) in North American languages has been discussed in the literature since at least Kleinschmidt (1852; see also Cuoq 1866; Brinton 1886; Kroeber 1909; Sapir 1911). Debates as to the proper characterization and analysis of NI have figured prominently for over 100 years (Kroeber 1910; Sapir 1911). Debates on the analysis continue to this day (Sadock 1980; 1986; Mithun 1984; 1986; Baker 1988; 1996; 2009; 2014; Rosen 1989; Baker et al. 2005; Barrie 2015c; Barrie & Mathieu 2016). While we touch on these debates, the goal of this section is to describe the variety of NI constructions found in the languages of North America.

Defining the term *noun incorporation* is not straightforward, and disagreements as to what does and does not count as noun incorporation span a century. We eschew an in-depth discussion of this dissent and, indeed, a precise definition of noun incorporation in favor of a brief discussion on the consensus of the set of properties that most researchers take to characterize noun incorporation. We discuss various morphological, syntactic, and semantic properties of noun incorporation.

Before getting to the details of NI, we very briefly touch on one issue in the debates on NI, which can be traced back to Kroeber (1910) and Sapir (1911). For a relatively modern debate on this matter, the reader is referred to Mithun (1984; 1986) and Sadock (1986). The issue centers on the identity of the incorporated element. Given the label noun incorporation, it stands to reason the incorporated element should be a noun. In Onondaga (and Northern Iroquoian in general) this is reasonably clear as many incorporated forms contain nominalizers; see (39). In Salish, it is less clear. Wiltschko (2009) argues that the incorporated element is a bare lexical root and not a noun. Does it still count as noun incorporation? As mentioned, we do not take a stand on these issues, but rather present the facts as known and leave it to the reader to consult the references cited here for more details.

Noun incorporation prototypically consists of a verbal compound consisting of a verbal root and a nominal root. Often, the incorporated noun is morphologically impoverished compared to its unincorporated counterpart. Consider the following Onondaga example. *Nakt* 'bed' in (37b) is a reduced version of *ka-nakt-aʔ* in (37a).

(37) Onondaga

a. *waʔkhnínú: neʔ ganakdaʔ*
waʔ- k- hninu- ː́ neʔ ka-nakt-aʔ
FACT- 1.SG- buy- PUNC NE NOM.PREF-bed-SUF
'I bought the/a bed.'

b. *waʔgenakdahnínú:*
waʔ- k- **nakt-** hninu- ː́
FACT- 1.SG.AG- **bed-** buy- PUNC
'I bought a bed.'

(Gloria Williams, Nora Carrier, speakers)

Languages vary in how much morphological material may appear on the incorporated noun. Salish languages typically allow only a bare root as an incorporated noun. Consider the following Halkomelem example. Wiltschko shows that nothing other than the lexical root can appear in NI constructions. Note in this example that the incorporated form for *dish* is a suppletive form of the freestanding root for *dish*.

(38) *th'éxw-**wíl**-t-es te **ló:thel*** [Halkomelem]
wash-**dish**-TR-3SG DET **dish**
'He washed the dish.'

(Wiltschko 2009: 211)

Northern Iroquoian languages can incorporate bare nominal roots or nominalized verbal roots, in which an overt nominalizer is present (see Barrie & Uchihara, this volume, for further information on NI in general for Iroquoian). Consider the following Onondaga example, in which a verbal root appears with a nominalizer and is then incorporated into the larger verbal complex.

(39) *agatgų́ʔtshé:hwih* [Onondaga]
ak- [**atkų-ʔtshR**]- ohw -ih
1.SG.PAT- [**be.poisonous-NZLR**]- put.in.water -STAT
'I have poisoned it with liquid poison.'

(Woodbury 2003: 278)

Finally, Algonquian languages can incorporate much larger structures (see Barrie & Mathieu 2016 for extended discussion). Consider the following Ojibwe example. The incorporated noun, contained in square brackets, is internally complex. See Compton (2013) for similar effects in Inuit.

(40) *gii-naajibakwezhgane* [Ojibwe]
gii- naad -i -[**bakwezhi-ge-an**] -e
PST- fetch -EPEN -[**cut-VAI-NZLR**] -VAI
'He/she went after some bread.'

(Barrie & Mathieu 2016: ex (19a))

Noun incorporation also provides a trigger for root allomorphy in some languages. Consider the following Halkomelem data (Wiltschko 2009, citing Galloway 1980).

(41) a. nominal suffixes
-as -face
-tses -hand
-awtx -building
-ilep -ground
-elcep -firewood
-als -fruit/round
-(e)wi:l(s) -dishes

b. regular nouns
s'ó:thes face
cháléx hand
lálém house
téméxw earth, land
siyólh firewood
sth'í:m berry, fruit
ló:thel dish

Some of the incorporated forms (nominal suffixes) resemble the non-incorporated forms (regular nouns), but in most cases they represent full suppletion.

Another property of noun incorporation that varies is the interaction between noun incorporation, on the one hand, and argument structure and agreement on the other. Rosen (1989) identifies two kinds of noun incorporation: classifier and compounding. This distinction still informs investigations into noun incorporation to this day. In short, classifier incorporation does not affect

the argument structure of the verb, while compound incorporation does. Thus, classifier incorporation permits an incorporated noun that is linked with a non-incorporated full nominal. The full DP is virtually always more specific than the incorporated noun. Thus, if the direct object is incorporated, a full nominal direct object can still appear. Rosen discusses several aspects of noun incorporation that fall out from this contrast, but we focus only on this aspect here. See Barrie (2015c) for more recent discussion. See also Mithun &andCorbett (1999) for a discussion on the lexical aspects of noun incorporation and its effect on transitivity. Consider the following Mohawk example. Observe that the incorporated noun *tsy* ('fish') is doubled by a full nominal phrase ('eight bullheads').

(42)	*Tohka*	*niyohserá:ke*	*tsi nahe'*	*sha'té:ku*	*nikú:ti*
	several	so.it.year.numbers	so it.goes	eight	of.them
		rabahbót	*wa-hu-**tsy**-ahní:nu*	*ki*	*rake'níha*.
		bullhead	FACT-3SG.M-**fish**-bought	this	my.father

'Several years ago, my father bought eight bullheads.' [Mohawk]

(Mithun 1984: 870)

By contrast, compound noun incorporation involves the suppression of an argument by incorporation. Once the object is incorporated, a full nominal that is linked with the incorporated noun cannot appear. Rosen discusses only Polynesian languages in the context of compound noun incorporation; however, de Reuse's (1994: 234) discussion of noun incorporation in Lakota [lkt] suggests it has the same properties as Rosen's compound noun incorporation. Since de Reuse does not specifically mention Rosen's work, a full comparison cannot be made. Nevertheless, consider the following example. Despite the orthographic space between the noun and the verb, *look.for*, de Reuse contends this is an example of a "syntactic compound". De Reuse also notes in the same example that the full form for 'child' is *hokšíla* and appears with an article.

(43)	***hokší** okìle*		*pi*	*škhé?*	[Lakota]
	child ST.S0.A0.poss-look.for		PL	QUOT-DECL	

'. . . they looked for the child (seriously) . . .'

(de Reuse 1994: 234)

De Reuse goes on to note (p. 219) that, unlike Iroquoian languages, Lakota does not strand determiners or modifiers. Stranding is a hallmark property of classifier incorporation, suggesting Lakota is not a classifier incorporating language. As de Reuse notes, however, further research is needed into the syntactic properties of noun incorporation in Lakota.

4. On the Analysis of Polysynthesis

This section reviews some of the major treatments of polysynthesis in the literature, presenting the outlook for future research. We present Baker's (1996) macroparametric approach, couched within a generative framework. We also present Mithun's (1983) functional approach to polysynthesis. We end by touching on parameter hierarchies as proposed by Roberts (2016).

Baker (1996) offers a comprehensive Polysynthesis Parameter that distinguishes polysynthetic languages such as Mohawk from non-polysynthetic ones, such as English. This theory is couched within a general framework that makes use of macroparameters, which has, of course, come under much scrutiny recently (Boeckx 2011; Kayne 2013; Roberts 2016). An updated version of the Polysynthesis Parameter is offered in Baker et al. (2005), but we present only Baker's original (1996) theory here. This macroparameter is captured by the Morphological Visibility Condition (MVC).

(44) MVC: A phrase X is visible for theta role assignment from a head Y only if it is coindexed with a morpheme in the word containing Y via:

i. an agreement relationship, or
ii. a movement relationship
Yes: Mohawk, Nahuatl, Rembarrnga. . .
No: English, French, Chichewa. . .

In short, for Baker, in a language such as English, the verb assigns its theta roles to the relevant arguments, which are separate words. In a language such as Mohawk, however, the verb assigns its theta roles to *morphemes* inside the verb. Thus, the polysynthetic nature of Mohawk, Nahuatl, and other such languages falls out from the fact that all theta roles are assigned word-internally, necessitating several morphemes in the verb.

The explanatory adequacy of the macroparametric approach lies in its ability to account for a large number of properties. To show that the Polysynthesis Parameter is explanatorily adequate, Baker shows that it accounts for a large number of properties beyond noun incorporation and rich agreement. He offers the following list of properties of polysynthetic languages in the macroparametric sense. That is, the following properties are argued to fall out from the MVC.

(45) a. syntactic noun incorporation
b. obligatory object agreement
c. free pro-drop
d. free word order
e. no NP reflexives
f. no true quantifiers
g. obligatory *wh*-movement
h. noun agrees with R arguments
i. no true determiners
j. noun agrees with possessor
k. restricted morphological causative
l. noun incorporation or agreement in PP
m. CP arguments only if nominal
n. no infinitives

Baker, by and large, shows that the properties in (45) generally hold in the languages he investigates. While he investigated Mohawk in depth to confirm these properties, he relied on published sources for the other languages he analyzed. Those languages of North America include Nahuatl, Tanoan languages, and Wichita. While a short survey chapter is no place to examine all the properties above, we do discuss a few here. The first two properties were addressed directly with the MVC. In addition to the MVC, Baker also assumes that heads do not assign case to argument positions. Thus, no full NP can appear in argument position without violating the case filter. As such, all overt NPs are adjoined clause-peripherally, along the lines of Jelinek (1984). As adjuncts, the overt NPs can be freely ordered or omitted if recoverable from the discourse, accounting for properties c and d. Furthermore, since reflexives and quantifiers must appear in argument position for proper interpretation at LF, Baker contends that they cannot appear in polysynthetic languages. The Garifuna data in (22) are of interest here, as this language appears to have overt pronominal reflexive pronouns. Finally, since *wh*-phrases must leave a variable in argument position for proper interpretation at LF, it follows that *wh*-movement is obligatory in polysynthetic languages.

We leave the discussion of Baker's Polysynthesis Parameter here. Although this proposal has had its share of criticism, as is natural for any bold proposal, (Spencer 1995; Kaiser 1996; MacSwan 1998; Nordlinger & Saulwick 2002; Haugen 2016),[3] it continues to inform our theoretical understanding of polysynthesis. We briefly mention some of the criticism here. These critiques

all target the list of polysynthetic properties in (45). According to the Polysynthesis Parameter, a polysynthetic language should exhibit all the properties in this list. Kaiser (1996) argues that while Ainu is a typical polysynthetic language, it lacks crucial properties in (45). Specifically, word order in Ainu is much more rigid than in Mohawk, *wh*-phrases remain in situ, and morphological causatives can be formed from unergatives. Likewise, MacSwan (1998) and Haugen (2016) argue that Southeast Puebla Nahuatl and Classical Nahuatl, respectively, both fairly typical polysynthetic languages, also lack the same free word order that Mohawk has. He also argues that it has non-referential quantified NPs (i.e., true quantifiers). Nordlinger and Saulwick (2002) show that Rembarrnga has infinitives. Finally, Spencer (1995) argues that the incorporation non-objects (such as adverbs, obliques such as instruments and temporal expressions). Spencer's arguments do not impinge on the Polysynthesis Parameter per se, but are problematic for Baker's syntactic analysis of NI.

As mentioned earlier, Baker et al. (2005) update the approach above to take into account cross-linguistic variation in the availability of agreement with noun incorporation. Specifically, they discuss noun incorporation in Southern Tiwa, in which agreement is obligatory with the incorporated noun and compare it with Mapudungun [arn], where agreement is impossible with the incorporated noun. Finally, Roberts (2010) proposes a novel analysis of head movement, briefly addressing the issue of noun incorporation and the properties of polysynthesis in (45). We leave the reader to explore these references.

We move next to Mithun's (1983) discussion of the functional properties of polysynthesis. She notes that polysynthetic properties of languages typically exist alongside analytic counterparts. For instance, noun incorporation is often not an obligatory process but is optional. Consider the pair of sentences in example (37) again, repeated here as example (46).

(46) [Onondaga]

a. *waʔkhnínú: neʔ ganakdaʔ*

waʔ-	k-	hninu-	ˈ:	neʔ	ka-nakt-aʔ
FACT-	1.SG-	buy-	PUNC	NE	NOM.PREF-bed-SUF

'I bought the/a bed.'

b. *waʔgenakdahnínú:*

waʔ-	k-	**nakt-**	hninu-	ˈ:
FACT-	1.SG.AG-	**bed-**	buy-	PUNC

'I bought a bed.'

(Gloria Williams, Nora Carrier, speakers)

She also notes that synthetic causatives and locatives exist alongside their analytic counterparts. The same observation has been made by Nakayama (2001) for Nuu-chah-nulth. Both of these authors contend that polysynthesis plays a functional role in languages where they are found. Note that this contrasts with the formal analysis Baker proposed; nevertheless, the two are not entirely incompatible. Specifically, Mithun and Nakayama propose that polysynthesis gives rise to several functional possibilities not found in non-polysynthetic languages (or at least not found to the same degree). The items in Table 11.2 are extracted from Mithun (1983).

Table 11.2 Functional Properties of Polysynthesis

Property	*Functional Effect*
Agreement	Word order based on information structure rather than grammatical role
Causative	Expression of a single event
Instrumental and Locative	To background instrument or location in discourse
Noun Incorporation	To background discourse participant or to name a recurring or habitual activity

We cover only a couple of the properties discussed by Mithun, starting with causatives. Mithun offers the following Lakota examples.

(47) [Lakota]

a. *Sab-wá-ye*
black-1SG-CAUS
'I blackened it.'

b. *Sápa* *wa-káye*.
black 1SG-make
'I made it black.'

(Mithun 1983: 224, ex (9))

Mithun reports that a Lakota speaker would use the first sentence to refer to the event of polishing a shoe and would use the second sentence to refer to an event of hanging a kettle too close to a fire, the result of which is that the kettle became black. She relates this to the event structure of the two constructions. The synthetic causative in (47a) refers to a single event (the act of polishing the shoe), while the analytic causative in (47b) refers to two events (placing the kettle near the fire, and the kettle becoming black).

Turning to noun incorporation, Mithun argues that the noun in the incorporated construction loses its referential status (though this is disputed by Baker et al. 2005) and, together with the verb, names a habitual activity or, in Mithun (1984), an institutionalized activity. She gives the following Comanche examples.

(48) [Comanche]

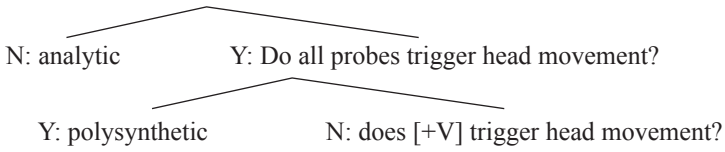
a. *wana-roh-peti*
cloth-by.force-throw
'to gamble'

b. *waa-hima*
cedar.tree-take
'to celebrate Christmas'

(Mithun 1984: 855)

Finally, Roberts (2016) and earlier work offers a novel approach to understanding cross-linguistic variation. He proposes that parameters are structured in hierarchies, rather than being all or nothing. In short, his proposal reconciles the problems raised by the fact that a strict macroparametric approach has trouble dealing with exceptions, and that denying any kind of parameterization leaves well-known Greenbergian generalizations a mystery (such as the strong correlation between OV order and postpositions). While this research program is ongoing, he offers the following parameter hierarchy related to word structure. Only the portion of the hierarchy of interest to us is shown. The hierarchy refers to a *probe*, which is a theoretical device in generative syntax to trigger head movement – roughly, the movement of individual words in a sentence.

(49) Do some probes trigger head movement?



For Roberts, then polysynthesis results from specific parametric choices made at the top of the parameter hierarchy. Specifically, all heads trigger head movement in the sense of Roberts (2010). Few details are offered in the discussion, leaving the exact implementation of our understanding of polysynthesis, not to mention the variation found within polysynthetic languages, to future research. Crucially, Roberts's hierarchy, like Baker's Polysynthesis Parameter, seems to allow only two choices: polysynthetic/non-polysynthetic. Mattissen's discussion earlier in this chapter suggests that more choices are needed under the 'polysynthetic' node in (49). The difference between Baker's approach and Roberts's approach, then, is that Baker's Polysynthesis Parameter inherently does not afford any option for variation, whereas Roberts's microparametric approach does. Specifically, additional microparameters can be proposed that hang off of the 'polysynthetic' node in (49).

5. Summary and Outlook

This chapter began with a discussion on the definition of polysynthesis, of which no clear, precise definition can be found, the formal definition of Baker notwithstanding. Rather, it is merely a tendency for a high degree of morphological complexity on the verb. We have reviewed several morphosyntactic aspects of polysynthetic languages, dividing the discussion into affixal morphology and noun incorporation. We discussed several properties that can be encoded on the verb, some common, some rare. We also discussed general properties of noun incorporation in polysynthetic languages of North America.

In the third section we discussed some theoretical aspects of polysynthesis, including some of the analyses of Baker, Mithun, and Roberts. Baker's formal analysis is arguably the most well-known, although it is not without its problems. The crux of his Polysynthesis Parameter is the parametric choice between a verb assigning theta roles word-internally or word-externally. All other properties of polysynthetic languages fall out from this choice. As noted, though, some authors have described polysynthetic languages that deviate from the expectations of the Polysynthesis Parameter. Mithun's functional analysis contrasts the functional differences of synthetic and analytic constructions, although see Harley (2012) for a detailed discussion of the semantic properties of lexical decomposition. The remarks on Roberts's parameter hierarchies were sketchy, given the programmatic nature of this framework. Again, future studies should address the variation found among polysynthetic languages, rather than treating them as a monolithic entity. In this regard, Haugen's (2016) discussion of cross-linguistic variation in Uto-Aztecan, including his discussion of the historical development of the Uto-Aztecan languages would be an excellent place to apply a microparametric analysis along the lines Roberts has proposed.

We end this section with a brief discussion of some possible outlooks for future research. A notable property of polysynthetic languages is that it is the verbs that display such a high degree of morphological complexity. The nouns, while exhibiting some morphology, are virtually always more simple. Given the hypothesis that the extended nominal projection mirrors the extended verbal projection (Grimshaw 1990; Ogawa 2001; Megerdoomian 2008), this asymmetry calls for an explanation. We have roughly defined polysynthesis as extreme morphological complexity, either by the appearance of numerous functional affixes or the incorporation of lexical material into the verbal complex. One issue we touched on in this chapter is that it is not always clear whether a given morpheme is a functional affix or incorporated lexical material. This point was brought to light in the discussion on adverbial elements at the end of §2. An avenue for future research is developing diagnostics to distinguish between these two possibilities. Namely, are the adverbial elements in the Inuktitut example lexical or functional? Compton (2012; 2013) addresses these issues for Inuit; however, the question requires further examination for other polysynthetic languages. Finally, the last section discussed theoretical aspects of polysynthesis. It is still an open question whether polysynthesis can be defined formally, as Baker does. In other words, is there a macroparametric setting distinguishing polysynthetic languages from non-polysynthetic ones? Or is there a series of microparameters that is better able to capture the cross-linguistic variation?

Further Reading

For further reading of polysynthesis in general, the reader should consult the papers in Fortescue et al. (2017). Murasugi (2014) provides an excellent overview of many of the same concepts here from a different perspective. There are also several relevant survey articles on noun incorporation (Gerdts 1998; Massam 2009; Barrie 2015a).

Notes

1. Mattissen actually splits this category into two subgroups. We have conflated them here to keep the discussion brief.
2. Although Iroquoianists largely agree that the agreement morphology in Iroquoian is generally portmanteau, Chafe (1960) gives an attempt of full decomposition with significant allomorphy. See Barrie and Uchihara (this volume) and the other references cited here for more details.
3. One criticism of Baker (1996) we do not address here is Koenig and Michelson (2015). This is because Koenig and Michelson do not directly address the issue of polysynthesis, so it is out of place to discuss it in detail here. Nevertheless, they offer a strong and important critique of Baker (1996), both empirically and theoretically, and their discussion impinges a great deal on the study of polysynthesis. The core of their claim is that overt NPs are never selected by the verb but are rather syntactically adjoined to the verb. They claim that lexical words in Northern Iroquoian are "functionally complete", thus obviating the need for selection of any kind, lambda-abstraction, and phrase structure (be it X-Bar Theory or Bare Phrase Structure).

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