NP recursion over time: evidence from Indo-European – Supporting Material 1: Data Analysis

Manuel Widmer¹, Sandra Auderset², Johanna Nichols^{3,4}, Paul Widmer¹, and
Balthasar Bickel¹

¹University of Zürich

²University of California, Santa Barbara

³University of California, Berkeley

⁴Higher School of Economics, Moscow

Contents

1	Acknowledgments	4
2	Notational conventions and abbreviations	4
3	Coding Conventions	5
4	Albanian	7
4.1	Albanian	7
5	Anatolian	8
5.1	Hittite	8
5.2	Luwian	9
6	Armenian	11
6.1	Armenian, Classical	11
6.2	Armenian, Modern	12
7	Baltic	13
7.1	Latvian	13
7.2	Lithuanian, Modern	14
7.3	Lithuanian, Old	14

8 Celtic (Insular)	15
8.1 Breton, Middle	15
8.2 Breton, Modern	16
8.3 Irish, Old	16
8.4 Irish, Modern	17
8.5 Welsh, Middle	18
8.6 Welsh, Modern	19
9 Germanic	19
9.1 Afrikaans	19
9.2 English, Old	21
9.3 English, Middle	22
9.4 English, Modern	23
9.5 German, Old High	24
9.6 German, Middle High	25
9.7 Gothic	26
9.8 Icelandic	27
9.9 Old Norse	28
9.10 Old Saxon	29
9.11 Swedish	30
9.12 Swiss German	31
10 Greek	32
10.1 Greek, Ancient	32
10.2 Greek, Modern	33
11 Indo-Aryan	35
11.1 Hindi	35
11.2 Kashmiri	36
11.3 Maithili	37
11.4 Marathi	38
11.5 Nepali	38
11.6 Oriya	39
11.7 Pāli	41
11.8 Sinhala	42
11.9 Vedic Sanskrit	43
11.10 Vlax Romani	45
12 Iranian	46
12.1 Avestan	46
12.2 Persian, Middle	47
12.3 Persian, Modern	49
12.4 Northern Pashto	50
12.5 Ossetic	50

12.6 Southern Baluchi	52
13 Italic	53
13.1 French	53
13.2 Italian	53
13.3 Latin	54
13.4 Romanian	56
13.5 Sardinian	57
13.6 Spanish	58
14 Slavic	59
14.1 Bulgarian	59
14.2 Old Church Slavic	59
14.3 Russian	61
14.4 Upper Sorbian	62
15 Tocharian	63
15.1 Tocharian B	63

1 Acknowledgments

We are very grateful for the generous help offered by the following colleagues: Riaz Ahmed (Balochi), Tim Aufderheide (Indo-Aryan), Damián Blasi (Spanish), Elias Bounatirou (Old Russian), Laura Canedo (Spanish), Kamal Kumar Choudhary (Hindi), Sadananda Das (Oriya), Stefan Dedio (Welsh), Michael Erlach (Anatolian), David Erschler (Ossetic), Victor Friedman (Albanian), Mícheál Hoyne (Modern Irish), Carina Jahani (Balochi), Andra Kalnača (Latvian), Raikhan Kerner (Modern Russian, Old Russian), Agnes Korn (Balochi), Herve Le Bihan (Modern Breton), Martha Mariani (Spanish), Jurgis Pakerys (Lithuanian and Latvian), Elisa Papathanassiou (Modern Greek), Maneedipa Patnaik (Oriya), Netra P. Paudyal (Nepali), Salvatore Scarlata (Indo-Iranian), Narayan Sharma Gautam (Nepali), Sascha Völlmin (Modern Persian), Max Wahlström (Albanian), Alena Witzlack-Makarevich (Afrikaans), Sonja Wölke (Upper Sorbian), Guðrún Pórhallsdóttir (Icelandic).

2 Notational conventions and abbreviations

Where no reference is indicated, the examples and descriptions are based on native or near-native knowledge of the language by team members. Both the branches and the individual languages within the branches are ordered alphabetically. In examples, we only mark gender on nouns if there is gender agreement between a given noun and one of its dependents. In all other contexts, gender is not indicated.

Glosses

1	first person	F	feminine
2	second person	FUT	future
3	third person	GD	genitive-dative
ABL	ablative	GEN	genitive
ACC	accusative	IMP	imperative
ADJ	adjective	INDF	indefinite
ADJZ	adjectivizer	INF	infinitive
ADV	adverbial	INS	instrumental
AI	ablative-instrumental	INST	instrumental case
AOR	aorist	LNK	linker
ART	article	LOC	locative
CO	common (gender)	M	masculine
DAT	dative	MD	middle
DEF	definite	N	head
DEM	demonstrative	N	neuter
DISJ	disjunctive pronoun	N-H	head-marked NP
DL	dative-locative	NA	nominative-accusative
DU	dual	NEG	negative
EZ	<i>ezāfe</i> marker	NMLZ	nominalizer

NO	nominative-oblique	PREP	prepositional case
NOM	nominative	PROG	progressive
NP-A	adjectivizer-marked NP	PRS	present
NP-G	genitive-marked NP	PST	past
NP-P	adposition-marked NP	PTCL	particle
NP-Ø	embedding by juxtaposition	PTCP	participle
NT	neuter	QUOT	quotative
OBL	oblique	RCT	rectus (direct) case
PASS	passive	REL	relative
PL	plural	SG	singular
POSS	possessive		

3 Coding Conventions

For each language, we investigate the five types of signaling the dependency relation discussed in the main paper, determining the presence of the type and whether or not it allows recursive expansion. For a type to be coded as allowing recursion, it must be fully productive and allow recursive embedding of an NP into an NP (or, if one analyzes compounding as morphological incorporation, of an N into an N). We limit our attention to embedded nouns and do not include pronouns, numerals and other referential expressions. We also generally exclude from our purview constructions which only exist as borrowings and calques and have no currency of their own, such as the many Sanskrit *tadbhavas* and *tatsamas* that are commonly used in literary genres in most modern Indo-Aryan languages.

Our working definitions of the five types and their formal notations (disregarding linear order) in the data are as follows:

Genitives: **[[NP-G] N]**. The embedded NP is marked as a dependent by a case affix, attached to the entire phrase or to all or any constitutive stems of the phrase, typically the main noun stem. Genitives do not assign any further distributional properties nor do they act as independent syntactic entities.

Adpositions: **[[NP-P] N]**. The embedded NP is marked as a dependent by a syntactically independent unit that has an argument structure and belongs to a distinct part of speech. Typical effects of the marker's syntactic independence include case government (reflecting their argument structure) and stranding (reflecting their status as syntactic words).

Adjectivizers: **[[NP-A] N]**. The embedded NP is assigned a property that makes it behave distributionally like a modifying adjective, resulting in whatever effects adjectives may have in a language, e.g. agreement with the head noun. Adjectivizing markers can be phrasal or stem affixes.

Juxtaposition: **[[NP-Ø] N]**. The embedded NP is placed next to the head without any further marking (apart from secondary effects in morphophonology, stem alternations, sandhi,

stress shifts etc.). We do not distinguish between incorporated/compounded vs. formations (i.e. between [[[...] N-] N] vs. [[NP [...] N] N], respectively) nor between phonologically bound vs. phonologically free combinations, and annotate them invariably as [[NP-Ø] N].

Head-markers: [[NP] N-H]. The NP is embedded into an NP by means of a marker on the head of the higher NP. The marker can be a phrasal affix, a stem affix, or a syntactic co-constituent of the head. For justification, see the main paper, Section 3.1

In discussing juxtaposition phenomena, especially under the rubric of ‘compounding’, the literature sometimes talks of recursion when the operation of compounding is applied to a pre-established compound. Our interest here is more specifically in recursive embedding. Thus, a structure like [[*student*] *film award*], where *student* modifies the constituent *film award* as a whole and not the embedded constituent *film*, does not count as recursion according to our coding scheme.

Similarly, in exocentric structures (*bahuvrīhis*) such as Vedic Sanskrit *marútas rúkma-vakṣasas* [Marut.NOM.PL decoration-chest.ADJZ.NOM.PL] ‘Maruts (a class of gods) with decorations on their breasts’, it is in most cases the composite constituent as a whole that assumes the function of a modifier ([*marútas* [*rúkma-vakṣasas*]], [[*model-theoretical*] *syntax*]). Moreover, such expressions draw on constructional patterns where the second level of embedding admits various incorporated modifiers, often adverb-like in function (cf. Vedic Sanskrit *raghu-yā-man-* [rapid-go-NMLZ-] ‘with a rapid course’, English *white-washed wall*, *cross-sectional study*), and does not define the specific [[[NP] N] N] pattern that we are interested in. For these reasons we discard exocentric structures from our analysis.

4 Albanian

4.1 Albanian

We have sampled Gheg Albanian instead of Tosk Albanian as in Chang et al. (2015), because we had better access to these data. The branch lengths of the two varieties can be assumed to be very similar.

Albanian exhibits three of the surveyed NP structures, but their productivity and recursive abilities vary: genitives, adpositions and adjectivizers are both productive and allow NP recursion, while compounds are constrained with regard to recursion. There is no head-marking construction.

What we analyze as a genitive construction involves a case marker sometimes referred to as the “attributive ablative”. This construction is only used with an indefinite head, e.g. *zër-a fëmij-ësh* [voice-INDF.NA.PL child-INDF.ABL.PL] ‘children’s voices’ (Buchholz & Fiedler 1987:415). It can embed other NPs:

- (1) *potpuri* *këng-ësh* *dashuri-e*
 potpourri.INDF.NA.SG song-INDF.ABL.PL love-INDF.ABL.SG
 [N [NP-G [NP-G]]]
 ‘potpourri of love songs’ (Max Wahlström, p.c.)

Albanian prepositions govern case. The choice is lexically determined, compare e.g. *prej Malasej-i* [from Malasej-ABL.SG] ‘from Malasej’ and *me shpatë* [with sword.ACC.SG] ‘with the sword’ (Newmark et al. 1982:290-296). Prepositions can embed other constituents, such as another preposition-marked NP in Example 2.

- (2) *libr-i* *mbi* *tavolin-ën* *në* *dhom-ën* *e* *dit-ës*
 book-DEF.NOM.SG on table-DEF.ACC.SG in room(F)-DEF.ACC.SG ADJZ.DEF.NA.F day-DEF.DAT.SG
 [N [NP-P [NP-P [NP-A]]]]
 ‘the book on the table in the living room’ (Plator Gashi, p.c.)

What is traditionally referred to as the genitive case in Albanian (on behalf of its function) is by closer inspection an adjectivizer construction. The key feature is a “particle of concord”, which agrees with its head noun in case, gender and number. This particle, which probably derives from demonstrative pronouns (Bubenik 2009:97-99), allows the embedding of NPs, certain adjectives and other parts of speech and it also indicates third person possession with a few kinship terms. The particle assigns the dative case to the embedded NP (Newmark et al. 1982:136,159-162). The following illustrates NP recursion in an adjectivized NP:

- (3) a. *shtëpi-a* *e* *shok-ut* *të* *baba-it*
 house(F)-DEF.NOM.SG ADJZ.DEF.NA.F friend(M)-DEF.DAT.SG ADJZ.DEF.DAT.SG.M father(M)-DEF.DAT.SG
 [N [NP-A [NP-A [NP-A]]]]
tim
 1SG.POSS.DAT.SG.M
 [NP-A]]]]
 ‘the house of my father’s friend’ (Plator Gashi, p.c.)

- b. *burim-i i mirëqenie-s së*
 source(M)-DEF.NOM.SG ADJZ.DEF.NOM.SG.M prosperity(F)-DEF.DAT.SG ADJZ.DEF.DAT.SG.F
 [N [NP-A [NP-A
popuj-ve të vende-ve socialiste
 people(M)-DEF.DAT.PL ADJZ.DEF.DAT country(M)-DEF.DAT.PL socialist
 [NP-A [NP-A]]]]
 ‘the source of the prosperity of the peoples of the socialist countries’ (Buchholz & Fiedler 1987:414)

There are three further adjectivizers: *-ar*, *-tar* (which has developed from *-ar*) and *-or*. They appear to have roughly the same function and are limited in their productivity. Examples are *bregdet-ar* [coast-ADJZ] ‘coastal’, *am-tar* [mother-ADJZ] ‘maternal’, and *diell-or* [sun-ADJZ] ‘solar’ (Newmark et al. 1982:200-202). They agree with the top level head of the NP in gender and number. Such adjectivizers can also embed other constituents, as illustrated in Examples 4a and 4b.

- (4) a. *rezidenc-a presidencial-e ship-tar-e*
 residence(F)-DEF.NOM.SG president.ADJZ-SG.F Albania-ADJZ-SG.F
 [N [NP-A [NP-A]]]
 ‘the residence of the Albanian president’
 b. *shtëpi-a ime atëror-e*
 house(F)-DEF.NOM.SG 1SG.POSS.NOM.SG.F father(M).ADJZ-SG.F
 [N [[NP-A] NP-A]]
 ‘the house of my father’ (Plator Gashi, p.c.)

Albanian also has determinative compounds, in which the second member modifies the first, though the reverse is also possible (Newmark et al. 1982:176). Determinative compounds, however, cannot have more than two members (Max Wahlström, p.c.). As there are no other constructions involving juxtaposition, we conclude that juxtaposition is not available for NP recursion.

5 Anatolian

5.1 Hittite

Hittite is attested from about 1600-1100 BCE on clay tablets found in today’s central Turkey. The tablets were used for administrative purposes of the Hittite kingdom (Hoffner & Melchert 2008:1-3). Hittite is written in a cuneiform script adapted from Mesopotamia, although in some instances hieroglyphs are used as well (Hoffner & Melchert 2008:9).¹

¹ Orthographic conventions: The Hittite writing system is a mixture of logograms and phonetic forms. Words can be written either by a logogram or a phonetic form or as a logogram with a phonetic component. Logograms may also stand before phonetic words as a semantic marker dubbed ‘determinative’. By convention, logograms are rendered in capitals if they are Sumerian and in italic capitals if they are Akkadian. Determinatives are rendered as superscripts. The writing system can only indicate V, CV, VC and CVC syllables (Hoffner & Melchert 2008:11-14). The examples provided here represent the phonological forms as closely as possible.

The genitive is the only construction that is fully productive and allows recursive NP embedding. Two constructions are only marginally attested: adjectivizers and juxtaposition. Adpositions exist, but they are not used adnominally. There are no head-marking strategies for NP building.

The genitive case is marked by the suffix *-aš* in the singular and *-an* in the plural. After the Old Hittite period, the suffix *-aš* was used in the plural as well. It is unclear whether this is the result of a merger with the genitive singular or the dative-locative plural, which was also *-aš* (Hoffner & Melchert 2008:73). Genitives are productive and allow NP recursion:

- (5) ^D*IŠTAR-aš* *lūli-aš* *KÁ.GAL-az*
 Istar-GEN pond-GEN door-ABL
 [[[NP-G] NP-G] N]
 ‘from the door of Ištar’s pond’ (KBo XVI 49 I 6) (Yoshida 1987:19)

Hittite does not have adnominal adpositions. There are words expressing spatial relations, which can be used as adverbs, preverbs and postpositions (Hoffner & Melchert 2008:294), but they always modify verbs, cf. Example 6.

- (6) *KUR-e* *anda uet*
 land-DL.SG into come.3SG.PST
 ‘he came into the land’ (Hoffner & Melchert 2008:298)

There are a few suffixes that function as adjectivizers. One of them is *-ašša/i-*, which is related to the Luwian adjectivizer *-assa/i-* (see Section 5.2). However, adjectivized forms are not numerous and they do not seem to be productive. Forms with the suffix *-ašša/i-* are mostly nominalized, e.g. ^D*wašdul-ašši-* [sin-ADJZ] ‘(demon) concerned with sin’ (Hoffner & Melchert 2008:56). An example for a denominal adjective is *išpant-ia-* [night-ADJZ-] ‘nocturnal’ (Hoffner & Melchert 2008:58). There is no evidence that adjectivizers allow the recursive embedding of further NPs.

Hittite possesses determinative compounds, e.g. *zaškar-aiš* [excrement-mouth] ‘anus’ (Hoffner & Melchert 2008:63). However, we have not found any instances of recursive nominal compounding and since there are no other cases of embedding by juxtaposition, we conclude that this type is not available for NP recursion in Hittite.

5.2 Luwian

Luwian was spoken in central and western Anatolia and northern Syria. The language is attested in two forms: ritual texts written in cuneiform script (Cuneiform Luwian) and inscriptions written in hieroglyphs (Hieroglyphic Luwian). The relationship between the two varieties is not entirely clear, but the linguistic differences appear to be marginal (Melchert 2008:31-32). The following description is based on Hieroglyphic Luwian (abbreviated as H Luwian) material. Most attestations of H Luwian are from the 10th to 7th century BCE, but a few date back to the 13th and 14th century BCE (Melchert 2008:31).²

² Cuneiform Luwian is only attested in ritual texts of the 16th-13th century BCE and in loanwords in Hittite texts. Consequently, not much is known about this form of Luwian (Melchert 2008:31).

The H Luwian genitive is marked by the suffix *-s(i)* (Bauer 2014:27). We are not aware of any NP constructions in which a genitive is modified by another genitive or an adjectivized NP. To be sure, there are a small number of examples in which a genitive seems to embed an additional NP constituent Bauer (2014:192-193,199-201). However, all of the relevant examples are ambiguous. In this context, it is important to bear in mind that the H Luwian corpus is dominated by expressions for possessive relations, often very complex ones (Bauer 2014:132). If genitives could embed additional NPs, one would expect to encounter such constructions in the corpus. Since we have not found any instances of such constructions, we conclude that genitives cannot control NP constituents in H Luwian. Example 7a illustrates a simple genitive construction and Example 7b the apposition of a genitive and an adjective.³

- The language has several adjectivizing suffixes, which agree in case, number and gender with their head noun. The most common suffixes are *-assa-*, *-iya-* and *-alla-*, but there are also others (Bauer 2014:151-155), as in Example 8.

- It is conceivable that the formal syncretism of the nominative singular, the genitive singular, and the genitive plural, all ending in (*)-as in some of the major inflectional classes, favored the use of adjectivizers.

³ Orthographic conventions: The H Luwian writing system is a mixture of logograms and phonetic forms. Words can be written either by a logogram or a phonetic form or as a logogram with a phonetic component. Logograms may also stand before or after phonetic words as a semantic marker dubbed ‘determinative’. By convention, logograms are rendered as their capitalized Latin counterpart or their capitalized Luwian spelling (if known). The writing system does not represent voicing contrasts in the case of most consonants or distinguish simple from geminate consonants. Only V and CV sequences can be written so that there is no way of directly indicating consonant clusters and word-final consonants. As a consequence, the phonological interpretation of the form of a H Luwian word is often based on Cuneiform Luwian data (Melchert 2008:33-34). The examples provided here are rendered in Bauer (2014)’s transcription, which represent the phonological forms as closely as possible. The symbols used in the Examples represent: () ‘determinative’, || ‘line break’, | ‘word divider’, [] ‘broken sign’, < > ‘emended sign’ (Bauer 2014:xiii).

Unlike genitives, adjectivizers are entirely unrestricted in their ability for NP recursion. In these constructions, the adjective always agrees with the head of the entire phrase and not with its immediate head:

- (9) [a]wa=ta |z[ati] ámi_i áláyaza_i-ss-an HÁ+LI-ass-an SERVUSla-ya_i
 PTCL=PTCL this.DL.SG.NT 1SG.POSS.DL.NT Arrayaza-ADJZ-DL.SG Hattusili-ADJZ-DL.SG servant-ADJZ.DL.SG
 [[NP-A] [NP-A] [[NP-A] NP-A]
 STATUARut-i OVIS(ANIMAL)ti PRAEi (*69)sasa-tu
 statue(NT)-DL.SG sheep-AI.SG ADV present-3PL.IMP
 N]
 ‘Let them present(?) the statue of me, of Arrayazza, of the servant of Hattusili, with a
 sheep.’ (MALPINAR §5) (Bauer 2014:148)

In Example 9, the head noun STATUARui ‘statue’ is modified by the conjoined adjectives áláyazassan ‘of Arrayazza’ and SERVUSlaya ‘of the servant’, the latter of which is in turn modified by the adjective HÁ+LI-assa ‘of Hattusili’. Note that the possessive pronoun ámi ‘my’ refers to the same person as the adjectives áláyazassa ‘Arrayazza’ and SERVUSlaya ‘servant’, i.e. the speaker’s name is Arrayazza and he is a servant of Hattusili.

Compounds, especially determinative ones, are scarce and not productive in Luwian and the other Anatolian languages (cf. Section 5.1) (Payne 2004:20). The few attested cases, such as REGIONi DOMINUS [country lord] ‘country-lord’, are all confined to two members. We thus conclude that juxtaposition is not available for recursive NP embedding in the language.

6 Armenian

6.1 Armenian, Classical

Classical Armenian dates back to the 5th century CE, though many of the earlier works are translations from Greek. The manuscripts, however, are from later centuries. The most ancient one, the Moscow Gospel, was written down in 887 CE (Godel 1975:1-2). The Classical Armenian period ends around the 12th century CE.

Classical Armenian uses genitives, adpositions, adjectivizers, and juxtaposition for building complex NPs. Of these, genitives and adpositions allow the embedding of further constituents. There is no head-marking construction.

In Classical Armenian nouns are inflected for case, with several syncretisms. In the singular, there is one form covering the genitive and the dative case (and in some declension classes also the locative case), while the plural form covers the ablative as well (Godel 1975:104,106).

- (10) a. jayn-i ordw-oy-n Astowac-oy
 voice-GD.SG son-GD.SG-ART God-GD.SG
 [N [NP-G [NP-G]]]
 ‘the voice of the son of God’ (John 5.25)
- b. p’ar-aw-k’ hawr iwr-oy
 glory-INS-PL father.GD.SG 3SG.POSS-GD.SG
 [N [NP-G [NP-A]]]
 ‘in the glory of his father’ (Mark 8.38)

Classical Armenian has a number of prepositions which govern case. Like genitives, they support NP recursion, as in Example 11, in which the prepositional phrase contains a genitive-marked NP:

- (11) *Yovsēp' i tan-ē Dawt'-i*
 Joseph.NOM.SG in house-ABL.SG David-GD.SG
 [N [NP-P [NP-G]]]
 'Joseph of the house of David' (Luke 1.27)

There are a number of suffixes that derive adjectives from nouns (Godel 1975:59), e.g. *-(a)kan* as in *tare-kan* [year-ADJZ] 'yearly'. However, we have not found any evidence that derived adjectives are able to embed additional NP constituents and thus conclude that this is not possible in Classical Armenian.

The language also possesses determinative compounds, e.g. *cov-ezr* [sea-side] 'coast'. While many compounds are calques from Greek, there is also a substantial number of genuine Armenian formations, which demonstrates that nominal compounding is a productive process in the language (Godel 1975:59–60). However, we have not found evidence for compounds with more than two members and thus conclude that juxtaposition is not available as a strategy for recursive NP embedding.

6.2 Armenian, Modern

Our description is based on the eastern dialect of Modern Armenian, because this is the variety included in Chang et al. (2015).

Modern Eastern Armenian relies on the same constructions that were already used in Classical Armenian: genitives, adjectivizers, adpositions, and juxtaposition ('compounding'). Like in Classical Armenian, adjectivizers and juxtaposition are not able to embed another constituent. There is no head-marking construction.

Due to case syncretism that was already present in Classical Armenian (cf. Section 6.1), there is only one marker covering both the dative and the genitive functions (Dum-Tragut 2009:83). In Modern Armenian it is generally referred to as a dative and also glossed as such. As mentioned above, the dative and other cases allow the recursive embedding of an NP:

- (12) *usucič'-ner-i ašxatavarj-i ač-i č'ap-ě*
 teacher-PL-DAT salary-DAT growth-DAT rate.NOM-DEF
 [[[NP-G] NP-G] NP-G] N]
 'the expansion rate of the teachers' salary' (Dum-Tragut 2009:235)
- (13) *derviš-i hagust-ov mi mard*
 dervish-DAT clothe-INST INDF man.NOM
 [[[NP-G] NP-G] N]
 'a man in dervish clothes' (lit. 'a man with the clothes of a dervish') (Dum-Tragut 2009:574)

Modern Armenian displays both pre- and postpositions, but postpositions are more frequent (Dum-Tragut 2009:294). Both pre- and postpositions govern a number of different cases

(Dum-Tragut 2009:295-306). Adpositions can be found in adnominal position and they are able to embed additional NPs, as the following examples illustrate:

- (14) *erku kron-ner-i miĵew p'oxagorcakc'ut'yun-ě*
 two religion-PL-DAT between cooperation.NOM-DEF
 [[NP-P] N]
 'the cooperation between the two religions' (Dum-Tragut 2009:268)
- (15) *t'urk'-er-i ew hay-er-i patmut'y-an veraberyal banaveč*
 Turk-PL-DAT and Armenian-PL-DAT history-DAT about discussion.NOM
 [[[NP-G] [NP-G] NP-P] N]
 'a discussion about the history of Turks and Armenians' (Dum-Tragut 2009:551)

Modern Eastern Armenian displays a number of suffixes that derive adjectives from nouns, e.g. *-ayin* as in *leṛn-ayin* [mountain-ADJZ] 'mountainous' (Dum-Tragut 2009:663-665). However, we have found no evidence that adjectivized NPs can embed additional NP constituents and thus conclude that such constructions are not grammatical.

Compounding is a productive process, cf. *cov-ap* 'sea-shore' 'sea shore'. Dum-Tragut (2009:671-673) does not mention any instances of recursive compounding. We thus conclude that juxtaposition is not available as a strategy for recursive NP embedding.

7 Baltic

7.1 Latvian

Latvian has two constructions that allow the recursive embedding of NPs: genitives and adpositions. The language further displays adjectivizers and juxtaposition, but these constructions do not allow the recursive expansion of NPs. There is no head-marking construction for the embedding of NPs.

Latvian nouns are inflected for case, one of which is the genitive. It is marked by a case suffix on the noun. The phonological shape of the genitive suffix varies depending on the declension class of its head noun (Praulīšs 2012:27-35). Genitive-marked nouns can embed additional NPs:

- (16) *man-as māš-as draug-a sun-s*
 1SG.POSS-F.GEN.SG sister(F)-GEN.SG boyfriend-GEN.SG dog-NOM.SG
 [[[NP-A] NP-G] NP-G] N]
 'my sister's boyfriend's dog' (Jurgis Pakerys p.c.)

There are a range of different prepositions, which govern the accusative, dative, or genitive (Praulīšs 2012:169-173). As mentioned above, prepositions allow NP recursion:

- (17) *zēn-s no ciem-a pie upe-s*
 boy-NOM.SG from village-GEN.SG at river-GEN.SG
 [N [NP-P [NP-P]]]
 'the boy from the village by the river' (Jurgis Pakerys p.c.)

Latvian has an inventory of suffixes that derive adjectives from nouns, e.g. *-isk-* (*zinātn-isk-s* [science-ADJZ-NOM.SG.M] ‘scientific’ < *zinātne* ‘science’) or *-īg-* (*priec-īg-s* [happiness-ADJZ-NOM.SG.M] ‘happy’ < *prieks* ‘happiness’) (Praulīšs 2012:74-75). These suffixes cannot be used to build recursive NP constructions (Andra Kalnača p.c.).

Finally, Latvian makes use of nominal compounding, e.g. *viesistaba* ‘living room’ < *vies(i)-* ‘guest’ + < *istaba* ‘room’ (Praulīšs 2012:50). Recursive nominal compounding, however, is not common in the language (Andra Kalnača p.c.), which makes juxtaposition unavailable as a strategy for recursive NP embedding.

7.2 Lithuanian, Modern

Lithuanian has four of the five constructions we surveyed: genitives, adjectivizers, adpositions, and juxtaposition. Of these, genitives and adpositions allow NP recursion, while adjectivizers and juxtaposition do not. Head marking is absent altogether.

The genitive case is expressed by a suffix. In the singular, its form varies depending on the declension class of the noun: *-(i)o/-(i)aus/-(i)os/-(i)es/-s*. In the plural, the genitive is marked by *-(i)ų* throughout (Ambrazas 1997:122-123). Genitives are not restricted with regard to NP recursion and are able to embed other constituents such as other genitives:

- (18) *mano seser-s vaikin-o šuo*
 1SG.POSS.GEN.SG sister-GEN.SG boyfriend-GEN.SG dog.NOM.SG
 [[[[NP-G] NP-G] NP-G] N]
 ‘my sister’s boyfriend’s dog’ (Jurgis Pakerys, p.c.)

There are several prepositions which assign either genitive, accusative or instrumental case to the noun they govern. Some of them may also be used as postpositions (Ambrazas 1997:404-407). As mentioned above, they allow NP recursion:

- (19) *berniuka-s iš kaim-o prie upė-s*
 boy-NOM.SG from village-GEN.SG at river-GEN.SG
 [N [NP-P [NP-P]]]
 ‘the boy from the village by the river’ (Jurgis Pakerys, p.c.)

Lithuanian has a number of adjectivizers, e.g. *-išk-* as in *vyr-išk-as* [man-ADJZ-NOM.SG.M] ‘male, masculine’ (Ambrazas 1997:160). We have found no evidence for denominal adjectives that embed further NP constituents and thus conclude that adjectivizers cannot be used to build recursive NP constructions.

There are determinative compounds, such as *savait-galis* [week-end] ‘weekend’ (Ambrazas 1997:129). Compounds appear to be restricted to two members, and so juxtaposition is not available as a strategy for recursive NP embedding.

7.3 Lithuanian, Old

Old Lithuanian refers to the Lithuanian spoken between 1500-1700 CE in Prussia and the Polish-Lithuanian Commonwealth. The language is attested in Bible translations and other religious texts, most of which are translated from German or Polish.

In Old Lithuanian, there are genitives, adjectivizers, adpositions, and juxtaposition (Stang 1966, Schmalstieg 1987). Genitives and adpositions allow the recursive embedding of NPs, while this is not the case for adjectivizers and juxtaposition. Head marking is absent altogether.

Nouns are inflected for case, one of which is the genitive. It is marked by a suffix, which varies depending on the number and declension class of the noun. The genitive allows NP recursion, as illustrated in Example 20.

- (20) *bals-q sunaus diev-o*
 voice-ACC.SG son.GEN.SG god-GEN.SG
 [N [NP-G [NP-G]]]
 ‘the voice of the son of god’ (John 5.25, Bitner 1701)

Old Lithuanian has a number of adpositions that govern case (Schmalstieg 1987:273-298). Like genitives, they can embed further NPs:

- (21) *krisl-q iš tavo brolio akes*
 splinter-ACC.SG out 2SG.GEN brother.GEN.SG eye.GEN.SG
 [N [NP-P [[NP-G] NP-G]]]
 ‘a splinter out of your brother’s eye’ (Matthew 7.5, Bretke 16th cent.)

There are adjectivizers, as in *tėv-išk-as* [father-ADJZ-NOM.SG] ‘fatherly’ (Endzelins 1971:131). However, we have found no evidence that they allow the recursive embedding of NPs.

Old Lithuanian also has determinative compounds, e.g. *karal-krėslis* [king-chair] ‘throne’ (Endzelins 1971:77-85), but they are, as far as we are able to establish, confined to two members. In the absence of other juxtapositions, we conclude that the type is not available as a strategy for recursive NP embedding in the language.

8 Celtic (Insular)

8.1 Breton, Middle

Middle Breton refers to the Breton spoken in Brittany between the 12th and 17th century CE. Up to the end of the 15th century, the langue is almost solely attested in glosses and proper names. After that, an ever-growing corpus of poems, plays, and prose texts of mostly religious character has been handed down to us.

In Middle Breton, there are genitives, adjectivizers and juxtapositions, but no adpositions or head marking. Adjectivizers do not allow NP recursion, but genitives and juxtapositions do.

Middle Breton has lost the Insular Celtic genitive along with the entire case morphology (Hemon 1975, Schrijver 2011) but has reanalyzed some former prepositions (e.g. *a* and *da*) into new phrasal case markers (Widmer 2017). They appear at the left edge of the NP and cannot be stranded. Thus, they are analyzed as genitives in our coding scheme. Genitives allow NP recursion:

- (22) *an mister a-n incarnation a map doue*
 ART mystery GEN-ART incarnation GEN son god
 [N [NP-G [NP-G [NP-Ø]]]]
 ‘the mystery of the incarnation of the son of god’ (Ernault 1887: § 6)

Middle Breton has a restricted number of suffixes that derive adjectives from nouns, such as *-us* in *corff-us* [body-ADJZ] ‘corporeal’ (Hemon 1976–1998:1596). This kind of word formation is of limited productivity, and the derived adjectives cannot embed further constituents.

An NP can also be embedded into another NP by juxtaposition, i.e. without any further marking (Hemon 1975:45–46). As a rule, the head precedes the dependent and the dependent allows further recursive NP embedding:

- (23) *a tut iesu a nazareth*
 GEN people Jesus GEN Nazareth
 [NP-G [NP-Ø [NP-G]]]
 ‘of the followers of Jesus of Nazareth’ (Le Berre 2011: l. 1663)

8.2 Breton, Modern

Modern Breton, like Middle Breton, uses genitives and juxtaposition to recursively embed NPs. There are also adjectivizers, but they do not allow NP recursion. Head marking is absent, and there are no adnominal adpositions.

Modern Breton has preserved the genitive that has developed from a preposition in Middle Breton (see Section 8.1) (Press 1986:212–213). Genitives allow NP recursion:

- (24) *ur plac’hig yaouank a-n oad a bemzek vloaz*
 a girl young GEN-ART age GEN 15 year
 [N [NP-G [NP-G]]]
 ‘a young girl of the age of fifteen years’ (Hemon 1976–1998:34)

Adjectivizers exist, e.g. *tad-el* [father-ADJZ] ‘paternal’ (Vallé 1980:XXI). However, we have found no evidence in the literature that adjectivized NPs can embed further NP constituents. We thus conclude that this is not possible.

Modern Breton can form complex NP constructions by juxtaposing nouns without any further marking. The relevant constructions can recursively embed NP constituents:

- (25) *toenn ti ar pesketaer*
 roof house ART fisherman
 [N [NP-Ø [NP-Ø]]]
 ‘the roof of the fisherman’s house’ (Press 1986:211)

8.3 Irish, Old

Old Irish refers to the stage of the Irish language spoken from the 8th to the 9th century CE. A small portion of the texts, mostly glosses and commentaries on Latin texts, is contained in manuscripts of that period stored on the continent. The bulk of transmitted texts covers a wide range of genres (historical, legal, narrative, religious) and only survives in Irish vellum and paper manuscripts from later periods.

In Old Irish, there are two constructions that allow the recursive embedding of NPs: genitives and adpositions. Juxtaposition and adjectivizers exist, but do not allow NP recursion. There is no head-marking construction.

Old Irish has five cases, one of which is the genitive. It is expressed with a suffix accompanied by consonant / vowel alternations — e.g. *muir* sea.NOM.SG : *mor-o* sea.GEN.SG — in some declension classes. In others, it is marked by consonant / vowel alternations only, e.g. in the *o*-stem noun *fer* man.NOM.SG : *fir* man.GEN.SG (Thurneysen 1946:176–217).

The genitive allows NP recursion:

- (26) *ruín* *ícc-e* *in-cheneli* *dóine*
 mystery.ACC.SG salvation-GEN.SG ART.GEN.SG-race.GEN.SG man.GEN.PL
 [N [NP-G [NP-G [NP-G]]]]
 ‘the mystery of the salvation of the race of men’ (Würzburg glosses 21d11)

Old Irish has a number of prepositions, which govern case (Thurneysen 1946:495–537). Such prepositional phrases allow the recursive embedding of additional NPs:

- (27) *dechur* *eter* *corpu* *nem-d-i*
 difference.NA.SG between body.ACC.PL heaven-ADJZ-ACC.PL
 [N [NP-P [NP-A]]]
 ‘the difference between heavenly bodies (and earthly bodies)’ (Würzburg glosses 13c26)

Old Irish also has two productive adjectivizers, the suffixes *-de* and *-ach*: e.g. *nem-de* [heaven-ADJZ] ‘heavenly’ (as in Example 27) and *airther-ach* [eastern-ADJZ] ‘eastern’ (Thurneysen 1946:220–223). We have not found any evidence that adjectivized NPs can embed additional NPs and conclude that this is not possible.

The language makes ample use of compounds of all sorts, including determinative compounds. They are, however, generally limited to two members, as in *talam-chumscugud* [earthquake] ‘earthquake’ (Thurneysen 1909:161). Accordingly, juxtaposition is not among the strategies that Old Irish make available for recursive NP embedding.

8.4 Irish, Modern

Modern Irish has genitives, adjectivizers, adpositions and juxtaposition, but there is no head marking. Adjectivizers do not allow NP recursion, but all other constructions do.

Like in Old Irish, nouns are inflected for case, one of which is the genitive. It is marked by consonant / vowel alternations (e.g. *fear* man.NOM.SG vs. *fir* man.GEN.SG) and / or a suffix (e.g. *muc* pig.NOM.SG vs. *muice* pig.GEN.SG) (Ó Siadhail 1989:149,151). Genitives allow recursive NP embedding:

- (28) *teach athair* *an* *chara*
 house father.GEN.SG ART friend.GEN.SG
 [N [NP-G [NP-G]]]
 ‘the house of the friend’s father’ (Mícheál Hoyne, p.c.)

Modern Irish has a number of prepositions, some of which govern case. The preposition *chun* ‘to’, for example, governs the genitive: *chun báis* [to death.GEN.SG] ‘to death’ (Ó Siadhail 1980:155). There is a case form (mostly referred to as dative or prepositional case) which is

used solely after prepositions, e.g. *in Éirinn* [in Ireland.DAT] ‘in Ireland’. In earlier stages of the language, this was a productive dative case (Hickey 2011:279). Preposition-marked NPs can embed further NPs:

- (29) *an chailleach gan fiacla in -a béal*
 the witch without teeth in -3SG.F.GEN mouth
 [N [NP-P [NP-P [NP-G]]]]
 ‘the witch without teeth in her mouth’ (Micheál Hoyne, p.c.)

Adjectivizers exist, but they cannot be used for NP recursion (Micheál Hoyne, p.c.).

Modern Irish can form complex NPs by juxtaposing two NPs in nominative case. Such strings of juxtaposed NPs can be expanded recursively, as the following example illustrates:

- (30) *mac uncail m- athar*
 son.NOM.SG uncle.NOM.SG 1SG.GEN- father.NOM.SG
 [N [NP-Ø [[NP-G] NP-Ø]]]
 ‘my father’s uncle’s son’ (Micheál Hoyne, p.c.)

8.5 Welsh, Middle

Middle Welsh refers to the Welsh spoken from the mid 12th century CE to the 15th century CE. It is attested in a large number of texts, spanning narratives, translations, legal documents, religious texts and more (Willis 2009:118).

Middle Welsh has genitives and juxtaposition, both of which allow the recursive embedding of NPs. There are also adjectivizers, but they cannot embed other NPs. There are no adnominal adpositions and head marking is absent as well.

While the inherited case morphology was completely lost (Evans 1964), Middle Welsh has developed a new genitive construction from adpositions. The most common one is the phrasal prefix *o*, e.g. *heit o wenyn* [swarm GEN bee.PL] ‘a swarm of bees’ (Evans 1964:204), but other phrasal case prefixes exist as well (e.g. *y robert* ‘to/of Robert’). The new genitives allow recursively expanded NPs:

- (31) *a thri ugein-wyr etholedigyon o degeingyl o gyuoeth y robert*
 and three twenty-man.PL select.PL GEN Degeingyl GEN kingdom to Robert
 [N [NP-G] [NP-G [NP-G]]]
 ‘and sixty select men of Degeingyl⁴, of the kingdom of Robert’ (Peniarth 17.5)

Adjectivizers exist, for example *teyrn-aid* [king-ADJZ] ‘royal, kingly’ (Zimmer 2000:478), or *neu-awl* [heaven-ADJZ] ‘heavenly’ (Morris Jones 1913:255), but they are not reported to be used for NP recursion.

NPs can modify other nouns without any marking of the embedding relationship, i.e. by juxtaposition (Willis 2009:133). Such constructions can embed further NPs:

⁴ A place name referring to the region of modern-day Flintshire.

- (32) *drws pebyll y brenhyn*
 door tent ART king
 [N [NP-Ø [NP-Ø]]]
 ‘the king’s tent’s door’ (Brut Dingestow t. 11.6)

8.6 Welsh, Modern

In Modern Welsh there are adpositions, adjectivizers and juxtaposition. Adpositions and juxtaposition both allow the recursive embedding of NPs, while this is not so for adjectivizers. There is no head-marking construction and no genitive construction.

The adposition *o* precedes the dependent and may host possessive markers and articles (Borsley et al. 2007:72). This construction allows NP recursion:

- (33) *disgrifiad o-r rhes o dai*
 description from-ART row from houses
 [N [NP-P [NP-P]]]
 ‘a description of the row of houses’ (Borsley et al. 2007:72)

Recently, colloquial Modern Welsh has newly introduced preposition stranding of *o*, cf. Example 34, which was not licensed from Middle Welsh times up until the twentieth century CE. This innovation most certainly results from language contact with English. Thus, the language has re-assigned adpositional properties to *o*:

- (34) *Lle ’dach chi ’n dod o?*
 where be.PRS.2PL 2PL PROG come.INF from
 ‘Where do you come from?’ (Borsley et al. 2007:116)

Modern Welsh possesses a number of suffixes that derive adjectives from nouns, e.g. *-ol* (*wythnosol* ‘weekly’ < *wythnos* ‘week’) or *-ig* (*gwledig* ‘rural’ < *gwlad* ‘country’) (King 2003:86–89). However, we have found no instances of adjectivized NPs that embed additional NPs. We thus conclude that this is not possible.

Finally, Modern Welsh commonly uses juxtaposition to embed nouns into NPs. Such constructions can be expanded recursively, as the following example illustrates:

- (35) *siop mab chwaer y meddyg*
 shop son sister ART doctor
 [N [NP-Ø [NP-Ø [NP-Ø]]]]
 ‘the shop of the son of the sister of the doctor’ (Borsley et al. 2007:184)

9 Germanic

9.1 Afrikaans

Afrikaans uses genitives, adpositions, juxtaposition and a head-marking construction to form recursive NP structures. There are also adjectivizers, but they cannot embed further constituents.

There is a genitive case, marked by *-s* or *-e*, but it has a limited distribution and is sometimes analyzed as linker in juxtaposition or compounds (while in our definition juxtapositions have

no dedicated markers, i.e. no marking effects beyond regular morphophonology or stress patterns). The suffix *-e* conveys a notion of plurality (cf. *student-e-lewe* [student-GEN-life] ‘student life’), while it is completely unpredictable whether a certain noun takes *-s* or not. Sometimes combinations exist both with the genitive and as a plain juxtaposition (see below) without any change in meaning, e.g. *oorlog(-s)-museum* [war(-GEN)-museum] ‘war museum’ (Donaldson 1993:438). This genitive can only be used with nouns that are not accompanied by determiners, adjectives or the like. The construction allows recursion:

- (36) *lugdiens- besprekning-s- kantoor*
 airline- booking-GEN- office
 [[[NP] NP-G] N]
 ‘airline booking office’ (Donaldson 1993:438)

There are a large number of prepositions and they can embed further constituents, such as a head-marking construction in Example 37. They govern case, but since there is no case marking on nouns, this can only be seen in combination with pronouns, which distinguish between a subject form and an object form (Donaldson 1993:123).

- (37) *’n Kennis van my oom se pa*
 ART friend of 1SG.GEN uncle POSS father
 [N [NP-P [[NP-G] NP] N-H]]
 ‘a friend of my uncle’s father’ (Donaldson 1993:98)

Afrikaans possesses several adjectivizers, e.g. *-(e)rig* as in *korrel-rig* [grain-ADJZ] ‘grainy’ (Donaldson 1993:442), but we found no evidence that adjectivized NPs can embed additional NP constituents. Accordingly, it appears that such constructions are not grammatical.

The language also has juxtaposition, e.g. *waternood* ‘shortage of water’ (*water* ‘water’ + *nood* ‘need’) (Donaldson 1993:438). Such constructions allow NP recursion:

- (38) *misdaad- toneel- bestuur*
 crime- scene- managment
 [[[NP-Ø] NP-Ø] N]
 ‘crime-scene managment’ (Alena Witzlack-Makarevich, p.c.)

Furthermore, there is a head-marking construction based on the possessive marker *se*. The particle *se* goes back to a third person singular possessive pronoun (Roberge 1996). This construction allows the recursive embedding of NPs:

- (39) *ons bur-e se vriend-e se seun*
 our neighbor-PL POSS friend-PL POSS son
 [[[N] N-H] N-H]
 ‘our neighbors’ friends’ son’ (Donaldson 1993:98)

Evidence that *se* is a head marker comes from the fact that it shows allomorphy which depends on the structure of the head, not the dependent. In constructions in which the head is empty (zero), the allomorphs *s’n* or *s’ne* have to be used:

- (40) *dis Amanda se ma s'n.*
 this.be.3SG Amanda POSS mother POSS
 [[[N] N-H] N-H]
 'It's Amanda's mother's.' (Donaldson 1993:100)

9.2 English, Old

Old English refers to the English that was spoken from the 7th to the 11th century CE in modern-day England and southern Scotland. It is attested in inscriptions and manuscripts (Pilch 1970:28).

Old English has genitives, adjectivizers, adpositions, and juxtaposition as means for embedding NPs into NPs. There is no head-marking construction. Genitives, adpositions, and juxtaposition can be used for NP recursion.

Old English nouns are inflected for case, one of which is the genitive. The singular is marked by *-es/-e* in what is known as the strong declension class and by *-an* in the weak declension class. The *an*-allomorph is not a specialized genitive case, but a more general oblique: in the singular, it marks everything except the nominative singular (and accusative with feminines), in the plural it covers all cases except the genitive and dative. The genitive plural is marked by *-a* and *-en-a* (Pilch 1970:103-104). Genitives allow NP recursion:

- (41) *xl monn-a his her-es*
 forty man-GEN.PL 3SG.GEN army-GEN.SG
 [N [[NP-G] NP-G]]
 'forty men of his army' (Anglo-Saxon Chronicle 878)

Old English has several prepositions, some of which govern case (Cassidy & Ringler 1971:92). Like in many other IE languages, adposition-marked NPs allow recursive embedding of further NPs:

- (42) *to þæm lond-um on þa healf-e munt-es*
 to DEM.DAT.PL country-DAT.PL on DEM.ACC.SG.F side(F)-ACC.SG mountain-GEN.SG
 [N [NP-P [NP-G]]]
 'to the countries on the (other) side of the mountain' (Anglo-Saxon Chronicle 887)

Adjectivizers, by contrast, cannot recursively embed NPs. Old English has a number of adjectivizers, e.g. *-en* as in *æsc-en* [ash-ADJZ] 'made of ash-wood' and *-ig* as in *blōd-ig* [blood-ADJZ] 'bloody' (Kastovsky 2006:241–242), but we found no evidence that they can be used to build recursive NP constructions.

Compounds are frequent and productive in Old English. Determinative compounds can have three members (Carr 1939), as in Example 43. Thus, juxtaposition allows the recursive embedding of NPs.

- (43) *dēoful- gylde hūs*
 devil- guild- house
 [[[NP-Ø] NP-Ø] N]
 'heathen temple' (Carr 1939:199)

9.3 English, Middle

Middle English refers to the English used from about 1100 to about 1500 CE. Texts from the 11th and 12th century CE still show many parallels to the Old English standard language. Later documents often reflect the dialect of the scribe more closely (Brunner 1965:1).

Middle English uses genitives, adjectivizers, adpositions, head marking, and juxtaposition. Except for adjectivizers, all of these constructions allow the recursive embedding of NPs.

Nouns are inflected for case, although the system is greatly reduced compared to Old English. The genitive is marked by a suffix *-e/-es/-s*. During the Middle English period, the genitive case suffix was gradually reanalyzed as a phrasal clitic (Allen 2008:152-154). As a consequence, the genitive no longer had to be marked on its head noun, but could also appear on the right edge of the NP. The Middle English genitive can embed additional NPs, regardless of its syntactic placement:

- (44) a. *my neighebores wyf*
 1SG.GEN neighbor-GEN wife
 [[[NP-G] NP-G] N]
 ‘my neighbor’s wife’ (The Wife of Bath’s Prologue, 242)
- b. *God of Love -s servant-z*
 God of Love -GEN servant-PL
 [NP-G [NP-P]] N
 ‘the servants of the God of love’ (Troilus and Criseyde, 1.15)

Middle English has a number of adpositions. These generally precede the noun they modify, but they can also follow it (Mossé 1952:125). Case government is only visible in pronouns, where adpositions govern the object form, e.g. *of mē* ‘of me’ vs. *i/ic* ‘I’ (Mossé 1952:54). Adpositions allow NP recursion:

- (45) *alle the lord-is of my reme*
 all ART.DEF lord-PL of 1SG.GEN realm
 [N [NP-P [NP-G]]]
 ‘all the lords of my realm’ (Chronicle of the Reign of Henry IV, Anno A.D. 1401–2)

Middle English has a number of adjectivizers which form denominal adjectives. They are invariable, as only monosyllabic adjectives inflect (Mossé 1952:64), and cannot be used for NP recursion.

Nominal compounding appears to be less productive in Middle English than in Old English and Early Modern English (Van Gelderen 2014:139, Sauer 1992:7). Nevertheless, Middle English possesses numerous determinative compounds, e.g. *palm-twig* ‘palm twig’ (Sauer 1992:149). Juxtapositions of this kind are attested with recursive embeddings:

- (46) *All- halow- masse- day*
 all- saint- mass- day
 [[[NP-Ø] NP-Ø] N]
 ‘All Hallows’ (Sauer 1992:324)

In addition to these inherited NP types, Middle English also has a head marking strategy to integrate NPs into NPs, the *his*-construction. This construction emerged during the Early Middle English period and gradually became obsolete again during the Early Modern English period, giving way to the 's-clitic.⁵ The *his*-construction can be used for NP recursion:

- (47) *to fortefy hys brethren ys sayyngys*
 to strengthen 3SG.GEN brethren ys comments
 [[[NP-G] NP] N-H]
 'to strengthen his brethren's comments' (Allen 2008:247)

9.4 English, Modern

Modern English by and large continues the NP types that were already present in Middle English, i.e. genitives, adpositions and juxtaposition. Adjectivizers exist, but they cannot embed further constituents. The Middle English *his*-genitive, a head marking strategy, fell into disuse during the Early Modern English period (Allen 2008:265).

The genitive clitic -s allows NP recursion, regardless of its position:

- (48) a. *Peter's mother's house*
 [[[NP-G] NP-G] N]
 b. *the queen of England's crown*
 [[NP-G [NP-P]] N]

Modern English has a number of prepositions, which can be used for NP recursion:

- (49) *the board of directors of the company*
 [N [NP-P [NP-P]]]

Prepositions can be stranded (e.g. *the bar I gave you the name of*), and they assign case (although case is visible only in pronouns, cf. *of me* vs. *I*).

Modern English adjectivizers such as *-al*, e.g. *nation-al* [nation-ADJZ] and *-ly* as in *father-ly* [father-ADJZ] are not able to embed further constituents and block fully-fledged recursion, i.e. the nominal base of adjectives is not accessible for unconstrained and recursive modification (e.g. **American Presidential plane*).⁶

Nominal compounding is a highly productive process of word formation in Modern English. Nominal compounds can be expanded recursively:

- (50) *post office building*
 [[[NP-Ø] NP-Ø] N]

⁵ It is often assumed that the 's-clitic is the etymological continuation of the *his*-construction, but Allen (2008:250) shows that the two constructions evolved separately from each other, at roughly the same time.

⁶ There is a rich literature on how to model what is possible and what not in this area, usually under the rubric of lexical integrity and discussions of the interface between morphology and syntax. We do not wish to enter this debate here. All that matters for our purposes is that English adjectivization does not tolerate unconstrained recursive embedding of the kind attested in such languages as Upper Sorbian, Albanian, Tocharian, or Hindi. In whatever model the facts are cast, the differences between adjectivization in English and these languages needs to be stated, and this is all we are interested in here.

In OHG, there are genitives, adpositions, adjectivizers and juxtaposition. With the exception of adjectivizers, all of these constructions allow NP recursion. Head marking is emergent, but not productive.

(51) a. *min-es* *truhtin-es* *muoter*
1SG.POSS-GEN.SG.M lord(M)-GEN.SG mother.NOM.SG
[[[NP-A] NP-G] N]
‘my lord’s mother’ (Schrodt 2004:34)

b. *gerst-un* *korn-es* *hut*
barley-GEN.SG grain-GEN.SG peel.NOM.SG
[[[NP-G] NP-G] N]
‘the peel of a barley grain’ (Schrodt 2004:34)

(52) *si* *tharben* *bigan* *thes* *liob-es* *zi* *iro*
 3SG.F.NOM live.in.want.INF begin.PST.3SG ART.DEF.GEN.SG.NT love(NT)-GEN.SG to 3SG.F.GEN
 [N [NP-P [NP-G]
goman
 man.DAT.SG
]]
 ‘since she began to be deprived of the love of her husband’ (Otfried 1.16.5) (Schrodt
 2004:35)

Determinative compounds, such as *oli-faz* [oil-vessel] ‘oil vessel’, are common in OHG (Carr 1939:128–129). Juxtaposition of this kind allows recursive expansion:

- There are indications for an emergent head-marking construction involving pronouns as co-constituents of the head, but all examples are ambiguous between an adnominal and adverbial interpretation, e.g. Example 54.

- (54) *demo balder-es uolon sin uuoz*
 ART.DEF.DAT.SG Balder-GEN.SG foal.DAT.SG 3SG.M.GEN foot.NA.SG
 [[[NP-G] NP] [NP-G] N]
 ‘the foot of Balder’s foal’ (Fleischer & Schallert 2011:97)

Thus, even if head marking existed, it was a marginal strategy at best and developed only later, for example in Swiss German (on which see Section 9.12).

9.6 German, Middle High

Middle High German (MHG) refers to the German dialects spoken in southern Germany between 1050 and 1500 CE (Paul 1998:10).

MHG has all five of the surveyed structures, but only genitives and adpositions are available for NP recursion.

Nouns in MHG inflect for case. The genitive is marked by a suffix, which varies depending on the declension class and number of the noun. Masculines and neuters take *-(e)s* or *-en/-in* in the singular and *-e* or *-ôno* in the plural. Feminines have *-e* or *-ûn* in the singular and *-(e)n* or *-ôno* in the plural (Paul 1998). Genitives can be used for NP recursion:

- (55) *wîb-es oug-en süeze und dâ bî wîb-es herz-en*
 woman-GEN.SG eye-GD.PL sweetness.NOM.SG and there also woman-GEN.SG heart-GD.PL
 [[[NP-G] NP-G] N] [[[NP-G] NP-G]
suht
 illness.NOM.SG
 N]
 ‘[he was] sweetness in women’s eyes and illness in women’s hearts’ (Parzival 4.20f.)
 (Prell 2005:218)

There are a number of prepositions, which govern the genitive, dative or accusative case. They can be used adnominally, e.g. *der chûnic uber Isrâhêlê* [the king over Israel] ‘the king of Israel’, and they allow recursive expansion (Prell 2005:216):

- (56) *die starch-en in min-ero christenheit-i*
 ART.NOM.PL strong-NOM.PL in 1SG.POSS-DAT.SG.F christianity(F)-DAT.SG
 [N [NP-P [NP-A]]]
 ‘the strong ones in my christianity’ (Wiener Notker 51) (Prell 2005:216)

There are several suffixes which derive adjectives from nouns, e.g. *-el* as in *scham-el* [shame-ADJZ] ‘bashful’ and *-ic* as in *nîd-ic* [envy-ADJZ] ‘envious’ (Klein et al. 2009:278,285). Like other adjectives, they agree with their head noun in gender, number and case (Paul 1998:208). There is no evidence that they can embed further constituents.

Compounding exists and two-member compounds like *apfel-boum* [apple-tree] ‘apple tree’ occur frequently. But compounding does not seem to be used for NP recursion in MHG. Though three-member compounds exist (Ruthmann 2007:4), they are rare and none of the examples can be classified as a endocentric structure with certainty. An ambiguous case is *âbent-sunnen-schîn* [evening-sun-shine] ‘evening sunshine’, which can either be interpreted as non-recursive,

with ‘evening’ modifying the compound *sunnen-schîn* or as recursive, with ‘evening’ modifying ‘sun’, which in turn modifies ‘shine’. We conclude that juxtaposition was at best a highly marginal strategy for NP recursion.

There is some indication for an emergent head-marking construction involving a possessive pronoun as a co-constituent of the head noun. However, all relevant examples are ambiguous between an adnominal and an adverbial reading, as is the case for example in Example 57a. And even such ambiguous examples are rare. The first unambiguous specimens of this construction, such as the example in Example 57b, appear in a text from 1515, i.e. shortly after the MHG period (Fleischer & Schallert 2011:97-98):

- (57) a. *Pharien-s wip besach yr-en man sin*
 Pharien-GEN.SG woman.NA.SG examine.PST.3SG 3SG.F.POSS-DAT.SG man.DAT.SG 3SG.M.GEN
 [[[NP-A] NP] N-H
wund-en
 wound-ACC.PL
]
 ‘Pharien’s wife examined the wounds of her husband’ (Prosalancelot 83.17) (Fleischer & Schallert 2011:97)
- b. *Die paur-en namen dem appt von Kempten sein*
 ART.NOM.PL farmer-NOM.PL take.PST.3PL ART.DAT.SG.M abbot(M) of Kempten 3SG.M.POSS.ACC.NT.SG
 [[NP [NP-P]] N-H
Kloster ein
 monastery(NT).NA.SG in
]
 ‘the farmers took the the monastery of the abbot of Kempten’ (*Chronica newer geschichten*, 1512-1527) (Fleischer & Schallert 2011:98)

This suggests that even if the construction already existed in MHG, it was marginal at best. It developed only later into a fully productive NP type, for example in modern Swiss German dialects (see Section 9.12).

9.7 Gothic

Gothic was spoken from the end of the 1st century to the 6th century CE. The language is almost exclusively attested in translations of the Greek New Testament from the 4th century CE. It is the only attested East Germanic language (Kotin 2012:13-21).

Gothic uses genitives, adjectivizers, adpositions, and juxtaposition to embed nominals into noun phrases. Genitives and adpositions allow NP recursion, while adjectivizers and juxtaposition cannot be used to build recursive NP structures. There is no head-marking construction.

Gothic nouns are inflected for case, one of which is the genitive (Braune & Ebbinghaus 1966:59). It is marked by the suffix *-(i)s* in the singular and by *-e/-o* in the plural. Genitives can embed other constituents:

- (58) *qens Kusin-s fauragaggjin-s Herod-es*
 wife.NOM.SG Chuza-GEN.SG steward-GEN.SG Herod-GEN.SG
 [N [NP-G] [NP-G [NP-G]]]
 ‘the wife of Chuza, of Herod’s steward’ (Luke 1.27)

There are a number of prepositions, which govern case (Braune & Ebbinghaus 1966:124). As mentioned above, they can be used for NP recursion:

- (59) *Iosef us garda Daweid-is*
 Joseph.NOM.SG from house.DAT.SG David-GEN.SG
 [N [NP-P [NP-G]]]
 ‘Joseph of the house of David’ (Luke 1.27)

Gothic has a number of adjectivizers, e.g. *-isk-* as in *gud-isk-s* [god-ADJZ-NOM.SG] ‘godly’ and *-(e)in-* as in *airþe-in-s* [earth-ADJZ-NOM.SG] ‘earthen’ (Wright 1954:178). There is no evidence that adjectivized NPs can embed additional NPs.

Gothic has determinative compounds, such as *auga-dauro* [eye-door] ‘window’, but none of them have more than two members (Carr 1939:197, Braune & Ebbinghaus 1966:62). Since there is no other juxtaposition construction for NPs, we conclude that this strategy was not available for NP recursion in Gothic.

9.8 Icelandic

Icelandic uses genitives, adjectivizers, adpositions, and juxtaposition for NP embedding, but there is no head marking. Adjectivizers do not allow NP recursion, but all the other constructions do.

Nouns are inflected for case, and there are several declension classes. The genitive singular is marked by a suffix which varies depending on the declension class of the noun. The two most common forms are *-s* (predominantly for masculines) and *-ar* (predominantly for feminines). The genitive plural is marked by *-a* throughout (Kress 1982:55ff.). Genitive-marked nouns can embed additional NPs:

- (60) *hund-ur kærast-a systur minnar*
 dog-NOM.SG boyfriend-GEN.SG sister(F).GEN.SG 1SG.POSS.GEN.SG.F
 [N [NP-G [NP-G [NP-A]]]]
 ‘my sister’s boyfriend’s dog’ (Guðrún Þórhallsdóttir, p.c.)

There are a number of prepositions in Icelandic which govern case (Kress 1982:187–188). Like genitives, they allow NP recursion:

- (61) *fugl-inn á grein-inni yfir tjörn-inni*
 bird(M).NOM.SG-DEF.NOM.SG.M on branch(F).DAT.SG-DEF.DAT.SG.F above pond(F).DAT.SG-DEF.DAT.SG.F
 [N [NP-P [NP-P]]]
 ‘the bird on the branch over the pond’ (Guðrún Þórhallsdóttir, p.c.)

There are three suffixes that derive adjectives from nouns: *-leg-*, *-sk-* and *-ug-*, e.g. *íslenskur* [Iceland-ADJZ-NOM.SG.M] ‘Icelandic’ (Thráinsson 1994:163). We found no evidence that the resulting denominal adjectives cannot embed additional NPs.

Compounds are very productive and noun-noun compounds are the most frequent type. Icelandic has both stem compounds, whose non-heads are bare stems (e.g. *snó-hús* [snow-house.NOM.SG] ‘snow house’), and genitive compounds, whose non-heads are genitive forms (e.g. *barn-a-skóli* [child-GEN.PL-school.NOM.SG] ‘children’s school’) (Thráinsson 1994:165). Both types of juxtaposition allow NP recursion:

- (62) a. *járn- stál- fótur*
 iron chair leg
 [[[NP-Ø] NP-Ø] N]
 ‘leg of an iron chair’ (Harðarson 2016:4)
- b. *garð-s- vegg-jar- staur*
 garden-GEN.SG- wall-GEN.SG- stake.NOM.SG
 [[[NP-G] NP-G] N]
 ‘garden fence stake’ (Guðrún Þórhallsdóttir, p.c.)

Note that these expressions can also have other, non-recursive readings (Harðarson 2016). For example, the expression in Example 62a can also be interpreted as ‘iron [chair leg]’, with ‘iron’ modifying the composite constituent ‘chair leg’.

According to Thráinsson (1994:165), NP recursion with compounds is more common with genitives. However, the existence of examples such as those in Example 62 indicates that recursive compounding is also possible with plain juxtaposition, which is the only kind of juxtaposition recognized by our taxonomy. (We classify genitive-marked compounds as genitives.)

9.9 Old Norse

Old Norse refers to the language used in Norway, Iceland, the Faroes and in the Norse settlements in the British Isles and Greenland from the early 9th to the late 14th century CE. It is also referred to as Medieval West Nordic. The language is attested in manuscripts from Iceland and Norway. Sources from the other areas are very scarce: there are a few inscriptions and very few manuscripts (Faarlund 2004:1-2).

Old Norse uses genitives, adjectivizers, adpositions, and compounds to embed NPs into NPs. Of these, genitives and adpositions can be used for NP recursion. There is no head-marking construction.

Old Norse nouns are inflected for case. The genitive has different forms depending on the declension class and number of the noun. Genitive-marked nouns can embed additional NPs:

- (63) *öl alda sona*
 beer.NOM.SG mankind.GEN.PL son.GEN.PL
 [N [[NP-G] NP-G]]
 ‘the beer of the sons of men’ (Hávamál 12)

Old Norse has a number of prepositions, which govern case. Prepositions usually take the accusative when expressing direction and the dative when indicating location. Other prepositions govern the genitive case (Faarlund 2004:116-117). Preposition-marked NPs can embed additional NPs:

- (64) *brautir til Óðins landa*
 road.ACC.PL to Odin.GEN.SG land.GEN.PL
 [N [NP-P [NP-G]]]
 ‘the road to Odin’s realm’ (Edda Hárbarðsljóð 56)

There are a number of adjectivizers that derive adjectives from nouns, e.g. *-sk-* as in *íslenzkr* ‘Icelandic’ derived from *Ísland* ‘Iceland’, and *-lig-* as in *konung-lig-r* [king-ADJZ-NOM.SG.M] ‘royal, kingly’ (Hægestads & Torp 1909:XXVIII-LXIII). There is no evidence, however, that the resulting adjectives can recursively embed additional NPs.

It is unclear whether compounds allow recursive expansion. According to Carr (1939:200-201), compounds consisting of more than two members are rare in Old Norse. Moreover, many of the relevant constructions are based on genitive-marked nouns, as in Example 65a. However, Carr (1939) also lists examples in which the individual compound members are not marked for genitive case, such as Example 65b, but these examples show no evidence of recursion.

- (65) a. *guðs- reiðis- verk*
 God.GEN.SG- anger.GEN.SG- act.NOM.SG
 [[[NP-G] NP-G] N]
 ‘act rousing the anger of God’ (Carr 1939:200)
- b. *hǫfuð- rað- gjafi*
 head- advice- giver.NOM.SG
 [[NP-Ø] [[NP-Ø] N]]
 ‘chief counsellor’ (Carr 1939:201)

It thus appears that unmarked juxtaposition was at best only beginning to allow NP recursion in Old Norse. This development was completed in Modern Icelandic (Carr 1939:200).

9.10 Old Saxon

Old Saxon was spoken in today’s northern Germany between the 6th and 11th century CE. The language is attested in manuscripts, most of them dating back to the 9th century CE. Most of the texts, including the well-known *Heliand*, are of a religious nature (Cathey 2000:7).

Old Saxon nouns are inflected for case, one of which is the genitive. It is marked by a suffix which has different forms depending on the number and declension class of the noun it attaches to (Cathey 2000). Genitives can be used for NP recursion:

- (66) *folk god-es engil-o*
 people.NA.SG god-GEN.SG angel-GEN.PL
 [N [[NP-G] NP-G]]
 ‘the folk of god’s angels’ (Heliand 1115) (Behaghel 1897:112)

There are several prepositions which govern case, usually the dative, accusative or instrumental. They can be used adnominally and can embed further constituents:

- (67) *thea hoh-on burg-i umbi Sodom-o land*
 ART.DEF.NA.PL high-NA.PL castle-NA.PL around Sodom-GEN.SG land.NA.SG
 [N [NP-P [NP-G]]]
 ‘the high castles of the land of Sodom’ (Heliand 4367) (Behaghel 1897:119)

Old Saxon has several suffixes that derive adjectives from nouns, e.g. *-isk*, as in *kind-isk* [child-ADJZ] ‘young’, and *-în*, as in *bôm-in* [tree-ADJZ] ‘wooden’ (Cathey 2000). There is no evidence that adjectivized NPs can embed additional NPs.

Nominal compounding is frequent in Old Saxon. Examples of determinative compounds are *meri-strôm* [ocean-stream] ‘ocean stream’ and *gast-seli* [guest-hall] ‘guest hall’ (Cathey 2000:55-56). Examples like the following suggest that this type of juxtaposition allows recursive NP embedding:

- (68) *erth- liþ- giskapu*
 earth- life- fate
 [[[NP-Ø] NP-Ø] N]
 ‘fate of life on earth’ (Carr 1939:197)

9.11 Swedish

Swedish uses genitives, adjectivizers, adpositions, and juxtaposition to embed NPs into NPs, but has no head-marking construction. NP recursion is possible with genitives, adpositions and juxtaposition.

Swedish has almost entirely lost case inflection on nouns (Holmes & Hinchliffe 2013:35ff.). The only case form that survives is the genitive, which is marked by the clitic *=s*. The genitive marker was originally a stem affix, but later developed into a phrasal affix that commonly occurs at the right edge of the NP, but can also be placed on the head if the head is not the last constituent in the NP (cf. Norde 2013). Regardless of its syntactic position, the genitive-marked constituents can embed additional NPs:

- (69) a. *drottning-en=s av England vapen*
 queen-DEF=GEN of England coat.of.arms
 [[NP-G [NP-P]] N]
 ‘the queen of England’s coat of arms’ (Norde 2013:303)
- b. *drottning-en av England =s krona*
 queen-DEF of England =GEN crown
 [[NP-G [NP-P]] N]
 ‘the queen of England’s crown’ (Norde 2013:302)

Swedish also uses adpositions as a means for NP building. There are a number of prepositions, which are usually unstressed and a small number of postpositions, which are usually stressed (Holmes & Hinchliffe 2013:154-155). Adposition-marked NPs allow recursive expansion:

- (70) *Herr Ek från vårt svensk-a kontor*
 Mister Ek of 1PL.POSS.SG.NT swedish-DEF office(NT)
 [N [NP-P [NP-A]]]
 ‘Mister Ek of our Swedish office’ (Holmes & Hinchliffe 2013:474)

There are several adjectivizers that derive adjectives from nouns, e.g. *-sk* as in *Stockholm-sk* [Stockholm-ADJZ] ‘pertaining to Stockholm’ or *-lig* as in *mänsk-lig* [human-ADJZ] ‘human (adj.)’ (Holmes & Hinchliffe 2013:624), but the resulting adjectives are not able to embed additional NPs.

Determinative compounds are productive and examples like the following suggest that this type of juxtaposition allows recursive NP embedding:

- (71) *språk- lärar- utbildning*
 language- teacher- education
 [[[NP-Ø-] NP-Ø-] N]
 ‘language teacher education’ (Per Baumann, p.c.)

9.12 Swiss German

Our description is based on the Bernese dialect, because the IELEX data of Chang et al. (2015) also comes from this dialect.

Bernese German has all five constructions that we investigated: genitives, adjectivizers, adpositions, juxtaposition and head marking. Adjectivizers are the only NP construction that does not allow the recursive embedding of NPs.

The genitive case has a very limited distribution in contemporary Bernese German, as it can only occur on nouns that denote definite human referents. (In other dialects of Swiss German, e.g. in St. Gallen, the genitive is completely lost). Nonetheless, the genitive allows NP recursion:

- (72) *Peter-s Brueder-s Huus*
 Peter-GEN brother-GEN house
 [[[NP-G] NP-G] N]
 ‘Peter’s brother’s house’

However, such structures are not acceptable to all speakers of Bernese German; some speakers of the city dialect consider it ungrammatical and only allow one level of embedding.

Prepositions are frequently used for NP embedding, with no constraints on recursion (cf. Example 73). Prepositions assign case, which can be seen on the article.

- (73) *ds- Huus vo- m Brueder vo- m Peter*
 ART.NOM.SG.NT- house(NT) of- ART.DAT.SG.M brother(M) of- ART.DAT.SG.M Peter(M)
 [N [NP-P [NP-P]]]
 ‘the house of the brother of Peter’

Bernese German also has a number of adjectivizers, e.g. *-isch* as in *italiänisch* ‘Italian’, derived from the noun *Italie* ‘Italy’, or *-lech* as in *länd-lech* [country-ADJZ] ‘rural’. However, the resulting adjectives block NP recursion entirely.

Juxtaposition is a productive process for NP embedding, and it allows recursion:

- (74) *Fänschter- rahme- farb*
 window- frame- paint
 [[[NP-Ø] NP-Ø] N]
 ‘paint for window frames’

There is also a head-marking construction involving a possessive pronoun, frequently used as an alternative to the genitive. This type also allows NP recursion:

- (75) a. *dr- Mueter ir-es Huus*
 ART.DAT.SG.F- mother(F) 3SG.F.POSS-NOM.SG.NT house(NT)
 ‘mother’s house’
- b. *dr- Mueter vo- r Anna ire-s Huus*
 ART.DAT.SG.F- mother(F) of- ART.DAT.SG.F Anna(F) 3SG.F.POSS-NOM.SG.NT house(NT)
 [[NP [NP-P]] N-H]
 ‘Anna’s mother’s house’
- c. *er Anna ire-m Brueder si-s Huus*
 ART.DAT.SG.F Anna(F) 3SG.F.POSS-DAT.SG.M brother(M) 3SG.M.POSS-NOM.SG.NT house(NT)
 [[[NP] N-H] N-H]
 ‘Anna’s brother’s house’

10 Greek

10.1 Greek, Ancient

Ancient Greek refers to the language used in Greece and Greek colonies from the 9th to the 5th century BCE. There were many dialects, most of which are only attested in inscriptions. The dominant literary dialect was Attic, although there are also literary works in Aeolic, Doric and Ionic. The following description is based on the Attic dialect.

Greek exhibits four of the surveyed NP structures: genitives, adjectivizers, adpositions and juxtaposition. All of these types except juxtaposition allow NP recursion. There is no head-marking construction.

Nouns are inflected for case. The genitive is marked by a suffix, which varies in form depending on the number and declension class of the noun it attaches to. In the singular, the genitive is marked either by *-s* or *-ou*, in the plural it is marked by *-ōn* throughout. Genitives allow the recursive embedding of NPs:

- (76) *metask^hōn toũ oíkou tēs mist^hōseōs tōn*
 partake.AOR.PTCP.NOM.SG.M ART.GEN.SG.M estate(M).GEN.SG ART.GEN.SG.F rent(F).GEN.SG ART.GEN.PL
 [NP-G(rent) [NP-G(estate) [NP-G(children)]]]
paídōn toũ Nikiou
 child(M).GEN.PL ART.GEN.SG.M Nikias(M).GEN.SG
 [NP-G(Nicias)]]]]⁷
 ‘having become part-lessee of the estate of the children of Nicias’ (Isaeus 2.9)

There are a number of prepositions which govern case, many of them the accusative. Some govern different cases depending on their function (Schwyzer 1990a:432-433). Like the genitive, they can embed a further NP:

- (77) *tēn es toūs polémous hypēr tēs patrídos*
 ART.ACC.SG.F in ART.ACC.PL.M war(M).ACC.PL over ART.GEN.SG.F motherland(F).GEN.SG
 [[NP-P [NP-P]]
andragat^hían
 steadfastness(F).ACC.SG
 N]
 ‘the steadfastness in the battles in defense of (his) country’ (Thucydides, *The Peloponnesian War* 2.42.3)

Adjectivizers also exist. The most common suffix in this function is *-io/-ia*. Examples include *pátr-ios* [father-ADJZ.NOM.SG] ‘paternal’, *k^ht^hón-ios* [earth-ADJZ.NOM.SG] ‘of the earth’ and the like. While these suffixal adjectivizers do not support NP recursion, there is another adjectivizing construction that does: this involves the definite article functioning as a ‘linker’. In this function, the article signals the embedding of a dependent phrase into an NP, and since the article confers adjectival properties to the embedded NP in the form of case, number and gender agreement, it qualifies as an adjectivizer in our taxonomy. Adjectivizers of this kind are frequently used for recursive embedding of NPs, for example:

- (78) *eis tās kómas tās en toīs ánkesi* (...) (...)
 to ART.ACC.PL.F village(F).ACC.PL ADJZ.ACC.PL.F in ART.DAT.PL.NT hollow(NT).DAT.PL (...)
 [N [NP-A [NP-P (...)
tōn oréōn
 ART.GEN.PL.M mountain(M).GEN.PL
 [NP-G]]]]
 ‘the villages in the hollows of the mountains.’ (Xenophon, *Anabasis* 4.1.7.3)

Ancient Greek makes frequent use of compounds, but determinative compounds are the rarest type and presumably of younger age than other types (Schwyzer 1990b:453). An example is *sōmato-p^hýlax* [body-guard.NOM.SG] ‘body-guard’ (Smyth 1920:248). There are compounds with three members, but they are all of the type of *batrak^ho-mýo-mak^hía* [frog-mouse-battle] ‘battle of the frogs and mice’, with two elements together modifying the third element, which means there is only one level of embedding (Smyth 1920:247). We conclude that juxtaposition was not among the strategies that Ancient Greek allowed for recursive NP embedding.

10.2 Greek, Modern

Modern Greek has genitives, adpositions, adjectivizers and juxtaposition, but no head marking. Genitives and adpositions allow NP recursion, while adjectivizers and juxtaposition do not.

⁷ The constituent ‘the estate of the children of Nicias’ is discontinuous, therefore the bracketing does not correspond exactly to the linear order of the sentence.

Modern Greek nouns are described as having four cases – nominative, accusative, genitive and vocative – although there is only one declension class in which all of these have separate endings. In all other classes, some of the forms are syncretic. The genitive is marked by a suffix, which has different forms depending on the declension class of its head noun. In most cases, the genitive is the only formally distinct case. In the plural, the genitive is marked by the suffix *-on* throughout. In the singular, it is marked by *-ø* with some masculine nouns, by *-s* with feminine nouns and by *-ou* with neuter nouns and some masculines (Mackridge 1985:135-139). Note that in most declension classes, there are only two different forms for the singular and the plural. In the plural, the genitive always has a separate form. In the singular, it is either the genitive or the nominative that has a separate form. As in Ancient Greek, genitives are compatible with recursive NP structures, cf. Example 79.

- (79) *hē hypostéria tēs oikogéneia-s tou*
 ART.NA.SG.F support(F).NA.SG ART.GEN.SG.F family(F)-GEN.SG 3SG.M.POSS.GEN.SG
 [N [NP-G [NP-G [NP-A]]]]
 ‘the support of his family’ (Mackridge 1985:65)

There are a number of prepositions, all of which generally govern the accusative. There are some syntactic constructions, in which a nominative or genitive can be used after a preposition (Mackridge 1985:203-204). Like genitives, they allow the recursive embedding of NPs:

- (80) *to spíti dípla sto magazí tēs Anna-s*
 ART.NA.NT house(NT).NA next.to at store.ACC.SG ART.GEN.F Anna(F)-GEN
 [N [NP-P [NP-G]]]
 ‘the house next to Anna’s store’ (Elisa Papathanassiou, p.c.)

There is a limited number of adjectivizing suffixes, namely *-eidēs* ‘like X’, *-énios* ‘made of X’, *-ístikos* and *-i(a)kós*, the latter being by far the most productive. There is no indication that they can embed a further constituent. Unlike in Ancient Greek, the article cannot be used as an adjectivizer anymore. Instead, genitives or adnominal adpositions are used, though the former is the more common choice (Elisa Papathanassiou, p.c.).

Modern Greek has determinative compounds, such as *petrelaio-kēlída* [oil-stain] ‘oil-slick’, but they are not very productive. Recursive compounding in Greek is quite rare in general. There are a few examples of three-member determinative compounds, e.g. *agroto-trapezo-dáneio* [farmer-bank-loan] ‘bank loan for farmers’, but this and similar examples discussed by Ralli (2013:94-95) are not recursive in our sense of embedding nouns in nouns: here *agroto-* ‘farmer’ modifies the compound *trapezo-dáneio* ‘bank loan’ as a whole and does not modify the embedded element *trapezo-* ‘bank’. Examples with recursive embedding, such *lemonó-dendro-k^hórap^ho* [lemon-tree-field] ‘field of lemon trees’ based on *lemonó-dendro* [lemon-tree] ‘lemon tree’ have “disputed acceptability” only (Ralli 2013:95). We conclude that juxtaposition does not allow NP recursion in Modern Greek.

11 Indo-Aryan

11.1 Hindi

Hindi has only one structure that allows the recursive embedding of NPs, namely adjectivizers. Adpositions exist, but they are not used adnominally. Juxtaposition also exist as a strategy, but it does not support recursive embedding. There is no head marking and no genitive.

The inherited Indo-Aryan case system survives in the form of a ternary distinction between direct, oblique, and vocative. The case forms are marked by suffixes on nouns. However, not all noun classes distinguish all three case forms. Feminine nouns, for example, no longer make a distinction in the singular (Sandahl 2000). The old genitive case has been lost. The oblique may either occur in isolation or in combination with adpositions, which occur as clitics on their head nouns. These adpositions, which have developed from relator nouns (see Bubenik 1998), specify the grammatical role of the relevant argument (Montaut 2004:56-57). Both case suffixes and adposition clitics are hardly ever used adnominally in Hindi, see the ungrammatical examples in the following:

- (81) a. **tīn baj-e sabhā*
 three o'clock-OBL.SG meeting.NOM.SG
 intended: 'The meeting at 3 o'clock.' (Verma 1971:146)
- b. **mez-par kitāb*
 table-on book.NOM.SG
 intended: 'The book on the table.' (Verma 1971:146)

Rather, case- and adposition-marked nouns have to be integrated into an NP by means of the adjectivizers =*k-* or -*vāl-*:

- (82) a. *tīn baj-e=k-ī sabhā*
 three o'clock-OBL.SG=ADJZ-NOM.SG.F meeting(F).NOM.SG
 'The meeting at 3 o'clock.' (Verma 1971:146)
- b. *mez-par-vāl-ī kitāb*
 table-on-ADJZ-NOM.SG.F book(F).NOM.SG
 'The book on the table.' (Verma 1971:146)

These adjectivization strategies are the only NP type that allows full recursive embedding of NPs. Example 83 illustrates the recursive use of the adjectivizer =*k-*, which agrees in case, number and gender with its immediate head:

- (83) *Khannā=k-ī bahin=k-e kutt-e=k-ā*
 Khanna=ADJZ-OBL.SG.F sister(F).OBL.SG=ADJZ-OBL.SG.M dog(M)-OBL.SG=ADJZ-NOM.SG.M
 [[[NP-A] NP-A] NP-A]
nām
 name(M).NOM.SG
 N]
 'Khanna's sister's dog's name' (Snell & Weightman 2003:66)

Apart from this, there are several other adjectivizing suffixes, most of them taken over from Sanskrit (Montaut 2004:148-149). Unlike *=k-* and *-vāl-*, these suffixes cannot embed additional NPs.

Hindi possesses determinative compounds, e.g. *gaṅgā-jal* [Ganga-water] ‘Ganga water’ (Montaut 2004:156). However, we have not found evidence that this kind of juxtaposition allows NP recursion.

11.2 Kashmiri

Kashmiri has adjectivizers, adpositions, and juxtaposition. There is no genitive and no head-marking construction. Only adjectivizers allow the recursive embedding of NPs.

There are adjectivizing clitics, which attach to the embedded NP and index gender and number of the head. There are different sets depending on whether the embedded NP is headed by a proper noun (Example 84a), a singular inanimate noun (Example 84b) or any other noun (Example 84c). The embedded NP appears in the ablative case in combination with the first two and in the dative case with the latter. Such adjectivizers allow NP recursion, as shown in Example 84d.

- (84) a. *mohn=un bo:y / mohn=in' beni*
 Mohan=ADJZ.SG.M brother(M) / Mohan=ADJZ.SG.F sister(F)
 ‘Mohan’s brother / Mohan’s sister’ (Wali & Koul 1996:164)
- b. *duka:n=uk mə:likh*
 shop.ABL.SG=ADJZ.SG.M owner(M)
 ‘the owner of the shop’ (Wali & Koul 1996:165)
- c. *ləḍk-an=hind' ma:sṭar*
 boy-DAT.PL=ADJZ.PL.M teacher(M).PL
 ‘the teachers of boys’ (Wali & Koul 1996:165)
- d. *me:nis bəḍ-is bə:y=sinzi ko:ri=hinz*
 1SG.DAT elder-DAT.SG.M brother(M).DAT.SG=ADJZ.SG.F daughter(F).DAT.SG=ADJZ.SG.F
 [[[NP-G] NP-A] NP-A]
za:m yiyi paga:h.
 sister.of.husband(F) come.FUT tomorrow
 N]
 ‘My older brother’s daughters’ sister-in-law will come tomorrow.’ (Wali & Koul 1996:103)

Apart from these clitics, there are other adjectivizers, most of them of Persian origin. An example is *sarkə:r-i:* [government-ADJZ] ‘governmental’ (Wali & Koul 1996:273-275). We have found no evidence that the relevant adjectivizers can embed further NPs.

Kashmiri has postpositions, which assign the dative or ablative case to the noun they govern (Wali & Koul 1996:152). We have found no evidence for the adnominal use of postpositions, which suggests that such constructions do not exist in Kashmiri. Rather, it appears that postpositions are integrated into NPs with the adjectivizer:

- (85) *me:z-i p'aṭh=uk me:zposh chuni sa:ph.*
 table-ABL.SG on=ADJZ.SG.M tablecloth(M) be.NEG clean
 'The tablecloth on the table is not clean.' (Wali & Koul 1996:101)

There are compounds in Kashmiri, but the description by Wali & Koul (1996:284–287) suggests that determinative compounds are extremely rare. In addition, Wali & Koul (1996) do not provide any evidence for recursive compounding and we are not aware of any other kind of NP embedding by means of juxtaposition. We thus conclude that juxtaposition is not available for NP recursion.

11.3 Maithili

The trees in Chang et al. (2015) include Magahi as a representative of what is traditionally called the Bihari group. Here we sample Maithili instead, which is another representative of the group and which can be assumed to have diverged lexically from the other languages in Indo-Aryan languages at about the same time depth. We chose Maithili because it is better described and better accessible to us.

Maithili allows recursive embedding only with genitives. Endocentric juxtaposition is not productive, adjectivizers are limited to a few lexical formations without recursion, adpositions cannot be used adnominally, and there is no head-marking construction.

While the inherited Indo-Aryan case system is lost (except for a few traces that show up as case-induced stem allomorphies), Maithili has developed a new genitive *-k* (Grierson 1909, Yadav 1996). This marker derives from the same etymon as the Hindi adjectivizer *=k-*, i.e. a participle of the root *kṛ-* 'do', but has lost all properties of agreement and case government. An example with recursion is the following:

- (86) *Rām-ak kākī-k ghar*
 Ram-GEN aunt-GEN house
 [[[NP-G] NP-G] N]
 'Ram's aunt's house' (Yogendra Yādava, p.c.)

There are no other adnominal cases. The locative *-me*, for example, cannot be used adnominally, and locative adpositions are relational nouns. An expression like 'take the mango in the basket under the tree (not this one)' cannot be translated by an adnominal locative (Example 87a). Instead, a participle construction is required (Example 87b).

- (87) a. * *gāch tar chiti-me ām lia*
 tree under basket-LOC mango take.IMP
 b. *gāch tar-ak chiti-me rākh-al ām lia*
 tree under-GEN basket-LOC keep-PTCP mango take.IMP
 'take the mango in the basket under the tree!' (Yogendra Yādava, p.c.)

NP embedding by means of juxtaposition is avoided, apart from compounds borrowed from Sanskrit. Expressions like 'chicken meat curry' require a genitive:

- (88) *murgā maus-ak jhor*
 chicken meat-GEN curry
 ‘chicken meat curry’

(Yogendra Yādava, p.c.)

11.4 Marathi

In Marathi, only adjectivizers allow NP recursion. Juxtaposition is possible, but is limited to two members. There are no adnominal adpositions, no genitive, and no head-marking construction.

Marathi continues the ancient Indo-Aryan case system in form of a binary contrast of direct vs. oblique. The direct form serves as a nominative, the oblique form occurs in all other contexts. The oblique combines with a number of different postpositions that are cliticized to the oblique-marked noun and specify its grammatical role (Pandharipande 1997:273-275). The bare oblique form serves as a vocative.

Marathi cases and adpositions are not attested in adnominal position. In any case, such constructions are not described by Pandharipande (1997:149-158). Rather, it appears that case- and adposition-marked nouns can only be embedded into an NP by means of the adjectivizer:

- (89) *sudhā-tS-yā* *gharā-tS-yā* *samor-ts-a* [...] *dzhāḍ*
 Sudha-ADJZ-OBL.SG house-ADJZ-OBL.SG in.front-ADJZ-NOM.SG.NT [...] tree(NT).NOM.SG
 [[[NP-A] NP-A] NP-A] N]
 ‘The [...] tree in front of Sudha’s house’ (Pandharipande 1997:156)

The adjectivizer construction here builds on the clitic *-tS- ~-ts-*, which probably goes back to a participial form of the verb stem *kṛ-* ‘do’ (Masica 1991:243). This adjectivizer attaches to the oblique form of an NP and assigns adjective properties to it, including agreement with the head in terms of number, gender, and case. The construction allows NP recursion, as shown by the example in Example 89.

Apart from this adjectivizer, there are several others, such as *-i* (e.g. *sarkār-i* [government-ADJZ] ‘pertaining to the government’), *-dār* (e.g. *tsaw-dār* [taste-ADJZ] ‘tasty’), or *-īya* (e.g. *bhārat-īya* [India-ADJZ]). These adjectivizers do not allow NP recursion, as far as we can tell.

Marathi also uses juxtaposition as a means of NP building (Pandharipande 1997:518-524). The language is rich in determinative compounds, e.g. *warṣā-rutu* [rain-season] ‘rainy season’ or *rāj-wāḍā* [king-palace] ‘royal palace’. However, we have not encountered any instances of recursive determinative compounds. Pandharipande (1997:520) describes the three-member compound *tan-man-dhan* [body-mind-money] ‘devotion’. However, the relationship between the single compound members is not hierarchical. Moreover, the author notes that such complex compounds are ‘not very common’. We thus conclude that juxtaposition is not a strategy that Marathi uses for NP recursion.

11.5 Nepali

In Nepali, recursive NP embedding is only possible by means of genitive case marking. There are no other case markers or adpositions that could be used adnominally, no adjectivizers that allow recursion and no endocentric juxtaposition, except for compounds borrowed from Sanskrit. There is also no head-marking construction.

Nepali has lost the old Indo-Aryan case system and replaced it by phrasal suffixes derived from various sources. Dative *-lāi*, for example, derives from a conjunct participle (converb) *lā-ī* ‘having taken’ (Schikowski 2013:213). A new genitive *-ko* has developed from the same participial base of the root *kr-* ‘do’ as the Hindi adjectivizer *=k-* (Masica 1991:243). For conservative speakers and in the written language, *-ko* still agrees in gender with the head noun and so it could be analyzed as an adjectivizer. In colloquial Nepali, however, agreement is completely lost and *-ko* is now a simple genitive:

- (90) Nepali
us-ko sathi-ko didi-ko ghar (*usko sathiko didiko ghar*)
 3SG-GEN friend-GEN elder.sister-GEN house
 [[[[NP-G] NP-G] NP-G] N]
 ‘his friend’s elder sister’s house’ (fieldnotes, B. Bickel)

Conservative speakers would have the feminine form *sathi-kī* here.

Pronouns retain traces of an old direct vs. oblique system, but oblique stems can only occur in combination with the innovative case suffixes and do never occur on their own (e.g. *u* ‘she’ vs. *us-ko* ‘3SG-GEN’; or *yo* ‘this’ vs. *yas-mā* ‘DEM-LOC’). We analyze these traces as stem allomorphy, conditioned by the case suffixes.

Determinative noun compounds are restricted to Sanskritized jargon in newspapers, scientific discourse etc. (mostly *tadbhavas*). In these jargons, just like in Sanskrit, they can be recursively expanded:

- (91) Nepali
 a. *viśva- vidhyālaya- sevā- āyog* (*bisso-biddyalae-sewa-ayog*)
 world school service commission
 [[[[NP-Ø] NP-Ø] NP-Ø] N]
 ‘University Service Commission’ (<http://www.tuservicecommission.edu.np>)
 b. *sthā- nāma- koś* (*istha-nama-kos*)
 place name dictionary
 [[[NP-Ø] NP-Ø] N]
 ‘Dictionary of place names’ (title of a book published by the Nepal Academy)

The equivalents of determinative compounds in modern Nepali invariably require a genitive, e.g. ‘chicken curry’ translates as *kukhurā-ko māsu-ko tarkāri*, not **kukhurā-māsu-tarkāri* (by contrast, for example, to Sinhala *kukul-mas-kariā*, cf. Section 11.8). There is no other type of juxtaposition and so we conclude that the strategy is not available for NP recursion in Nepali.

Adpositions cannot be used adnominally. To translate an expression like ‘(take) [the book [on the table]]’ one would either use a genitive without specifying the spatial relationship *ṭebul-ko kitāb* or use a relator noun such as *māthi* ‘surface, top side’ (*ṭebul māthi-ko kitāb*) (Narayan Gautam, p.c.).

11.6 Oriya

Oriya has genitives, adjectivizers, juxtaposition and adpositions, but there is no head marking. Genitives, adpositions and juxtaposition are available for recursive embedding, while adject-

tivizers are not.

The Oriya case system retains a direct vs. oblique distinction in personal pronouns (e.g. *mū* ‘1SG.NOM’ vs. *mo* ‘1SG.OBL’). In all other nominal word classes (including demonstratives serving as substitutes for third person pronouns), the distinction is only marked in honorific contexts by a newly innovated oblique case *-nkɔ*. The oblique case serves as a genitive and is also governed by adpositions.⁸ Genitives allow the recursive embedding of NPs:

- (92) *mo mamu-nkɔ sikhyaɔ*
 1SG.OBL uncle-OBL teacher
 [[[NP-G] NP-G] N]
 ‘my uncle’s teacher’ (Sadananda Das, p.c.)

Postpositions come from two sources: from relator nouns (Bubenik 1998) and, in the case of the postposition *-rɔ*, from an adjectivizer going back to a participle of the root *kɔ*- ‘do’ (Masica 1991:243). They all govern the oblique case (Neukom & Patnaik 2003:47,313). The postposition *-rɔ* can be used adnominally (as well as for marking experiencers and a few other functions) and allows NP recursion:

- (93) *mo-rɔ sangɔ-rɔ bapa-nkɔ-rɔ ghɔrɔ*
 1SG.OBL-of friend-of father-OBL-of house
 [[[[NP-P] NP-P] NP-P] N]
 ‘the house of the father of my friend’ (Manideepa Patnaik, p.c.)

The postposition *-rɔ* has given up all adjectival properties in modern Oriya.

The other postpositions cannot be used adnominally (Neukom & Patnaik 2003:126):

- (94) a. * *gãã-ru jhiɔ-ṭi*
 village-from girl-ART
 ‘the girl from the village’
 b. * *ṭebul upɔr-e bɔhi*
 table top-on book
 ‘the book on the table’

What is used instead is the semantically neutral postposition *-rɔ* or relator noun constructions (Neukom & Patnaik 2003:126):

- (95) a. *gãã-rɔ jhiɔ-ṭi*
 village-of girl-ART
 ‘the girl from the village’
 b. *ṭebul upɔrɔ-rɔ bɔhi*
 table top-of book
 ‘the book on the table’

⁸ Neukom & Patnaik (2003) treat examples like 92 as the result of case dropping because they analyze the oblique not as a case but as a case base. We are not aware of any arguments for this analysis, but note that it makes the morphology more complex and misses the generalization that the oblique is both triggered by what they call ‘case’ and by what they call ‘adpositions’.

There are also adjectivizing suffixes that integrate nominals into NPs. One such adjectivizer is *-ia*, e.g. *sarakar-ia* [government-ADJZ] ‘governmental’ (Neukom & Patnaik 2003:68). We have not found any evidence, however, that adjectivized NPs can embed additional NPs and thus conclude that this is not possible in Oriya.

Oriya also displays determinative compounds, e.g. *phulo bagica* [flower garden] ‘flower garden’ (Neukom & Patnaik 2003:19). Juxtaposition of this kind allows the recursive embedding of further NPs, as the following example demonstrates:

- (96) *kukuḍa manso torkari*
 chicken meat curry
 [[[NP-Ø] NP-Ø] N]
 ‘chicken curry’ (Manideepa Patnaik, p.c.)

11.7 Pāli

The term Pāli refers to the language which was used in the Buddhist traditions of Sri Lanka and Southeast Asia. The dating of the formation of the Pāli canon is controversial, but according to one tradition some canonical texts were brought to Sri Lanka in the 3rd century BCE (Hinüber 2001:62).

Pāli uses genitives, adjectivizers and juxtaposition for NP embedding. Genitives and juxtaposition allow recursive embedding. Adpositions exist, but they are not used adnominally. Head marking is absent altogether.

Pāli nouns are inflected for case. The genitive is marked by a suffix, which varies depending on the declension class and number of the noun. In some declension classes, there is only one form covering the instrumental, ablative and genitive (Oberlies 2001:140–149). Genitives allow NP recursion:

- (97) *migāra- mātu pāsāde*
 Migara- mother.GEN.SG palace.LOC
 [[[NP-Ø-] NP-G] N]
 ‘in the palace of Migara’s mother’ (Aṅguttaranikāya 2.35)

There are postpositions, which can govern any case except the nominative and vocative. They are rare in general and mostly appear as first members of compounds. Fahs (1989:102) observes that what is expressed by other languages by adpositions, is covered in Pāli by relator nouns, absolutes, adjectives and participles etc. Furthermore, Fahs (1989:104–105) explicitly mentions that relator nouns are being used instead of case forms, but does not mention adpositions in this context. In addition, we are not aware of any example of an adposition that is used adnominally. Taking all these observations together, we conclude that adnominal adposition constructions were unavailable in Pāli.

There are several suffixes which derive adjectives from nouns (and in most cases also nouns from nouns). Examples are *-ya* in *gamma*⁹ [village.ADJZ] ‘vulgar’ and *-ima* in *majjhima* [middle-ADJZ] ‘medium, middling’ (Warder 2005 [1991]:254). Adjectives agree with their

⁹ The suffix *-ya* undergoes assimilation to the previous consonant.

head noun in gender, number and case (Duroiselle 1997:160). There is no evidence whatsoever that derived adjectives can embed other NPs.

Juxtapositions (compounds) are very frequent and become more complex over time: in the older language, they mostly consist of up to three stems, but in the later language more extensive ones can be found (Duroiselle 1997:129). Endocentric juxtapositions are frequent as well. Examples include *nadi-tīraṃ* [river-bank] ‘river bank’ and *rāja-putto* [king-son] ‘prince’ (Duroiselle 1997:132). As with other types of juxtapositions, they frequently have three or more members, which modify each other (Warder 2005 [1991]:78):

- (98) *kūṭā- gāra- sālā*
 gable- house- hall
 [[[NP-Ø-] NP-Ø-] N]
 ‘hall of the house with a gable’ (?:78)

Like in Vedic Sanskrit and Avestan (cf. 11.9 and 12.1), the non-head can also be modified by an external genitive:

- (99) *brāhmaṇa-ssa pada- sadd-ena*
 brahmin-GEN.SG foot- sound-INS.SG
 [[[NP-G] NP-Ø-] N]
 ‘by the sound of the footsteps of the Brahmin’ (Wijesekera 1936:229)

11.8 Sinhala

Sinhala has two constructions that allow NP recursion: genitives and juxtaposition. Adpositions exist, but they cannot be used adnominally. Adjectivizers that allow NP recursion appear *in statu nascendi*, but are not yet fully grammaticalized. Head marking is absent altogether.

Sinhala nouns are inflected for case, which is marked by suffixes. There is one case which covers genitive and locative functions. It has different forms for animate and inanimate nouns (Chandralal 2010:79,81). On animates, it is indicated by the suffix *-ge*. On inanimates, however, the genitive is marked by the suffix *-ee* in the singular Example 100a and *-wəḷə/-walwəḷə* in the plural. These genitives can be used for NP recursion, as in Example 100b.

- (100) a. *winaasy-ee mulə*
 destruction-GEN.SG beginning.NOM.SG
 ‘the beginning of destruction’ (Chandralal 2010:118)
- b. *apee ayya-ge noona-ge malli-ge*
 1PL.GEN elder.brother-GEN.SG wife-GEN.SG younger.brother-GEN.SG
 [[[[[NP-G] NP-G] NP-G] NP-G]
duwə
 daughter.NOM.SG
 N]
 ‘our elder brother’s wife’s younger brother’s daughter’ (Chandralal 2010:10)

There are no adnominal adpositions (in our sense) in Sinhala. Instead of adpositions, Sinhala uses relator nouns, which are inflected for case:

- (101) *wattə-ʈə pahalə / wattə-ʈə pahal-in*
 estate-DAT.SG below.NOM.SG / estate-DAT.SG below-INS.SG
 ‘below the estate / from below the estate’ (Gair 1970:33)

When such relator nouns modify other nouns, they are embedded by a construction involving a participle. With inanimates, *æti* is used, which is most probably a past participle derived from the existential copula *æt-*. With animates, the present participle of the verb ‘to be, to stand’, *sitinə*, is used. These are incipient adjectivizer constructions that seem to recapitulate a development similar to that of of adjectivizers from *kṛ-* ‘do’ in other Indo-Aryan languages several centuries earlier:

- (102) a. *kaamar-ee æti meese uḍə æti mall-ee æti potə*
 room-GEN.SG be.PTCP table on be.PTCP bag-GEN.SG be.PTCP book.NOM.SG
 ‘the book in the bag on the table in the room’¹⁰ (Tilakaratne 1992:164)
- b. *siilimə-hi sitinə makuluwə*
 ceiling.NOM.SG-on stand.PTCP spider.NOM.SG
 ‘the spider on the ceiling’ (Tilakaratne 1992:163)

The construction does not appear to have been fully grammaticalized, although further fieldwork would be needed to firmly establish this. There are also adjectivizing suffixes, e.g. *-muwaa* (*dæwə-muwaa* [wood-ADJZ] ‘wooden’) or *-ikə* (*aarth-ikə* [economy-ADJZ] ‘economical’) (Chandralal 2010:84–85), but we are not aware that they allow the recursive embedding of NPs.

Juxtaposition is a very productive process in Sinhala, which also includes endocentric constructions such as *baicikal roode* [bicycle wheel] ‘bicycle wheel’. Although instances seem to have two members, it is also possible to have recursive stacking of more members:

- (103) *kukul- mas- kariə*
 chicken- meat- curry
 [[[NP-Ø-] NP-Ø-] N]
 ‘chicken curry’ (Chandralal 2010:89)

11.9 Vedic Sanskrit

Vedic Sanskrit refers to the language of the Vedas, ritual texts that were compiled around the mid-second century to the mid-first century BCE. It is the oldest well-attested language of the Indo-Aryan subbranch.

Vedic Sanskrit has genitives, adjectivizers, adpositions and juxtapositions. Adjectivizers do not allow the recursive embedding of NPs, but the other two constructions do. Head marking is absent altogether.

The genitive is expressed by a suffix, which varies according to the declension class and number of the noun it attaches to. Genitives are unconstrained with regard to recursion. In Example 104a, the genitive *amītrāṇām* ‘of the enemies’, which modifies the head noun, is in

¹⁰ Note that we adjusted the orthography and glosses used by Tilakaratne (1992) to the orthography and glosses used by Chandralal (2010).

turn modified by the genitive of the 3rd sg. pronoun *asya* ‘his’. In Example 104b, the genitive *viśām* ‘of the clans’ is modified by the denominal adjective *daívīnām* ‘divine’. Note that the adjective agrees with its head noun in case, gender and number, like when it is the only modifier (cf. Example 105 below).

- (104) a. *amítr-āṇām a-sya sénā-ṃ*
 enemy-GEN.PL 3SG-GEN.SG troop-ACC.SG
 [[NP-G [NP-G]] N]
 ‘the troop of his enemies’ (Taittirīya Saṃhitā 3.4.8.4)
- b. *viś-āṃ daív-ī-nām utá pūrva-yā-vā*
 clan(F)-GEN.PL god-ADJZ.F-GEN.PL and before-go-NOM.SG
 [[NP-G [NP-A]] N]
 ‘and the leader of the clans of the gods’ (Rig Veda 3.34.2d)
 (cf. *dev-ānām viś-as* [god-GEN.PL clan-GEN.PL] ‘clans of the gods’)

There are a number of prepositions in Vedic Sanskrit, which govern case. They cannot be used adnominally; instead, they always modify predicates (Macdonell 1916:208-210,285).

There are several suffixes used as adjectivizers, the most prominent one being *-(i)ya-*. With some of these suffixes, the stem undergoes vowel gradation, traditionally referred to as *Vṛddhi*. Such adjectives agree with their head noun in case, number and gender:

- (105) *nákir-mā dáiv-y-am sáh-o vara-te*
 nobody.NOM.SG-1SG.ACC god-ADJZ-NA.SG.NT power(NT)-NA.SG hinder-3SG.PRS.MD
 ‘no divine power holds me back’ (Rig Veda 4.42.6ab)

We have not come across any examples in which a denominal adjective is modified by an other NP. We thus conclude that they cannot embed NPs.

Juxtapositions in the form of compounds are abundant in Vedic Sanskrit, but those of interest, the determinatives, are the rarest type. An example of a determinative compound is *rāja-putrá-* [king-son-] ‘son of a king’ (Wackernagel 1905:243). Determinative compounds can be recursively expanded, but only with genitive-marked NPs:

- (106) a. *árvato māṃsa- bhikṣām*
 horse.GEN.SG meat- request.ACC.SG
 [[[NP-G] NP-Ø] N]
 ‘the request for the meat of the steed (s.c. the aforementioned horse which is being cooked during the horse sacrifice)’ (Rig Veda 1.162.12c) (Wackernagel 1905:31)
- b. *vīra-hā vā eśá devānām*
 man-slayer(M).NOM.SG PTCL DEM.NOM.SG.M god.GEN.PL
 [hā (N) [vīra- (NP-Ø) [devānām (NP-G)]]]
 ‘now he is the slayer of the men of the gods’ (Taittirīya Saṃhitā 1.5.2.5)

In the period that followed Vedic Sanskrit, this constraint is resolved and determinative compounds can be expanded directly inside the compound. The determinative compound in Example 107 has four members. The first two are coordinated (*veda* and *vedāṅga*) and together, they are embedded in the phrase headed by *-jñah* ‘scholar’.

(107) Epic Sanskrit

veda- veda- aṅga- tattva- jñāḥ
veda- veda- limb- truth- scholar
 [[[NP-Ø] [[NP-Ø] NP-Ø]] NP-Ø] N]

‘a scholar in the essence of the Vedas and the limbs of the Vedas, too’¹¹ (Rāmāyaṇa 1.1.13c)

11.10 Vlax Romani

Vlax Romani refers to the dialects of Romani spoken in Southeastern Europe. There is no genitive and no head-marking construction. Juxtaposition exists, but seems to be very marginal. Adjectivizers and adpositions are productive and allow the recursive embedding of NPs.

Nouns are inflected for case, though the system is heavily reduced. There is a direct/nominative case and an oblique/accusative case. These are mainly used for subjects and direct objects respectively. All the oblique relations are expressed by adding a suffix to the oblique/accusative (Igla 1996:23).

One of the main constructions for NP recursion builds on an adjectivizer. The construction involves a clitic =*k*-/=*g*- which governs oblique NPs and agrees with the head noun in number and (in the singular) also in gender, just like any other adjective (Hancock 1995:72):

- (108) a. *e čha-əs=k-o dad*
 ART.DEF boy-OBL-ADJZ-SG.M father(M)
 ‘the boy’s father’ (Igla 1996:24)
- b. *e čha-əs=k-i dej*
 ART.DEF boy-OBL-ADJZ-SG.F mother(F)
 ‘the boy’s mother’ (Igla 1996:24)
- c. *e čha-əs=k-e phralá*
 ART.DEF boy-OBL-ADJZ-PL brother.PL
 ‘the boy’s brothers’ (Igla 1996:24)

Adjectivizer constructions allow NP recursion. The adjectivizer always agrees with the immediate head:

- (109) *murr-e dad-əs=k-o amal-əs=k-o kher*
 1SG.POSS-SG.OBL.M father(M)-OBL-ADJZ-SG.M friend(M)-OBL-ADJZ-SG.M house(M)
 [[[NP-A] NP-A] NP-A] N]
 ‘the house of my father’s friend’ (Anthony Grant, p.c.)

There are a number of prepositions, which may govern the locative case¹² unless there is a definite article, in which case the direct/nominative case is used, e.g. *ande o veš* [in ART.DEF

¹¹ The *vedāṅga* (lit. ‘limb of the veda’) is a term for a certain class of predominantly scholastic and exegetic works regarded as auxiliary to the Veda.

¹² It is often not used with ordinary nouns, but always with pronouns.

forest] ‘in the forest’ vs. *pàša man-de* [near 1SG.OBL-LOC] ‘near me’ (Hancock 1995:73). Prepositions can be used adnominally (Example 110a), and in this function can also embed further NPs (Example 110b):

- (110) a. *khoj katar e bakrja*
 tallow of ART.DEF sheep.PL
 ‘tallow of the sheep’ (Boretzky 1994:108)
- b. *e klishka pe e sinija ande e soba*
 ART.DEF book on ART.DEF table in ART.DEF room
 [N [NP-P [NP-P]]]
 ‘the book on the table in the room’ (Ian Hancock, p.c.)

Compounds play a marginal role in Romani and are not productive to the most part. Noun-noun compounds are especially rare and there are only a few lexicalized cases (Matras 2002). There is no other juxtaposition construction, and we conclude that this type is not available for NP recursion in Vlax Romani.

12 Iranian

12.1 Avestan

Avestan is the language of the *Avesta*, the sacred book of the Zoroastrians. This collection of mostly ritual texts is generally assumed to have been composed in the late second and early first millennia BCE. Old Avestan represents an earlier form of the language than Young Avestan, but Old Avestan is unlikely to be the direct ancestor of Young Avestan. Our description includes both varieties (as indicated below).

In Avestan, we find all surveyed structures: genitives, adjectivizers, compounds, head marking, and adpositions. The first three allow NP recursion. Adjectivizers cannot be used for recursive NP embedding, and adpositions are not attested in adnominal function.

Avestan nouns are inflected for case. There are three genders and three numbers, and all eight cases that are reconstructed for PIE are preserved in Avestan, including the genitive (Hoffmann & Forssman 1996:114-115). Avestan allows recursive NP embedding with genitives:

- (111) *Zaraθuštr-ō nmān-ahe Pourusasp-ahe*
 Zaraθuštra-NOM.SG house-GEN.SG Pourusasp-GEN.SG
 [N [NP-G [NP-G]]]
 ‘Zarathustra of the house of Pourusasp’ (Young Avestan, Yasna 9.13)

There are various suffixes for deriving adjectives from nouns, for example *-a-* (*maniiuu-a-* ‘of the spiritual world’), *-i-* (*āhuir-i-* ‘of Ahura (Mazda)’), and *-ya-* (*tūir-ii-* ‘from Tura’) (Skjærvø 2009:167–168). Denominal adjectives derived in this way are very common in Avestan, but the grammars and descriptions do not mention any ability to embed further constituents, and we have not come across any examples in the corpus. This suggests that they are highly marginal, if they exist at all. But there is another adjectivizing construction which does allow NP recursion. This construction involves the use of the relative pronoun as a linker of adjectives or embedded NPs:

- (112) a. *aoi yqm ast-uuit-ī-m gaēθqm*
 against REL.ACC.SG.F bone-ADJZ-F-ACC.SG world(F).ACC.SG
 [NP-P [NP-A]]
 ‘against the material world’ (Young Avestan, Yasna 9.8)
- b. *aspa-ciṭ yōi miθrō- druḡqm*
 horse(M).NOM.PL.-even REL.NOM.PL.M contract- infringer.GEN.PL
 [N [NP-A [[NP-Ø] NP-G]]]
 ‘even the horses of the infringers of contracts’ (Young Avestan, Yašt 10.20)

Avestan also allows the recursive extension of juxtapositions, not by adding a third member to the construction, but by adding an external genitive NP. This is illustrated in (Example 113), in which the embedded genitive *daēuuanqm* ‘of the old gods’ modifies the embedded noun *kamərəδa-* ‘head’. Note that the linear order does not correspond to the phrase structure, so we omit an interlinear display of the hierarchical structure:

- (113) *kamərəδō-jan-ō daēuua-nqm*
 head-smash-NOM.SG old.god-GEN.PL
 [*janō* (N) [*kamərəδō-* (NP-Ø) [*daēuuanqm* (NP-G)]]]
 ‘smasher of the heads of the old gods’ (Young Avestan, Yasna 57.33)

In Young Avestan, the relative pronoun often takes the invariable from *yaṭ*, which formally corresponds to the nominative/accusative neuter singular. The lack of agreement morphology suggests that the particle *yaṭ* does not assign any adjectival properties anymore and so effectively functions as a head marking *ezāfe* that links adjectives (Example 114a) and NPs (Example 114b) to the head. However, we are not aware of any instances of recursive embedding with *yaṭ*. This is attested only in younger members of the Iranian family.

- (114) a. *ahmi aṇhuuō yaṭ ast-uuiṇt-i*
 this.LOC.SG.M life(M).LOC.SG (EZ|REL.NA.SG.NT) bone-ADJZ-LOC.SG.M
 ‘in this material life’ (Young Avestan, Vidēvdād 5.39)
- b. *puθr-əm yaṭ pourušasp-ahe*
 son(M)-ACC.SG (EZ|REL.NA.SG.NT) Pourušaspa(M)-GEN.SG
 [N-H [NP-G]]
 ‘the son of Pourušaspa’ (Young Avestan, Yašt 5.18)

12.2 Persian, Middle

Middle Persian is the direct successor of Old Persian and was the language used by local rulers (from the late 3rd century BCE) in modern-day south-western Iran (*Fārs*) after the fall of the Old Persian empire. From 224 CE onwards it was the official language of the Sasanid empire until the Arab conquest in ca. 650 CE and continued to be used by Zoroastrians for centuries after the spoken language had further evolved into Early Modern Persian. The bulk of Middle Persian documents is known from inscriptions and mostly religious (Manichean, Zoroastrian, and Christian), historical, and legal literature written on parchment and papyri found in the Near East and along the Silk Road (Skjærvø 2009:196–197, Durkin-Meisterernst 2014:14–25).

In Middle Persian there is no genitive case, but the language has adjectivizers, adpositions, juxtapositions, and a head-marking construction, the *ezāfe*. The latter three allow the recursive embedding of NPs.

As for case, Middle Persian makes a two-way distinction between *rectus* and *obliquus*. This case distinction is clearly in decay, but there is reliable evidence that the system is likely to have survived until late Middle Persian (Skjærvø 2009:205). The two cases are still fairly well distinguished in the 1SG pronoun, as shown in Example 115. The *rectus* form *an* is employed for S/A arguments, e.g. in the non-past tense as illustrated in Example 115a. The oblique form *man* is used for P arguments in the non-past tense (Example 115b), and for both A and P arguments- in the past tense. When governed by an adposition, it is the oblique form *man* which is used (Example 115c). Therefore Middle Persian *pad*, and *andar*, are still to be classified as prepositions, which is also in accordance with their etymology.

- (115) a. *an hēm ādur*
 1SG.RCT am fire
 ‘I am the fire’ (Middle Persian from Turfan, Brunner 1977:55)
- b. *man wēnēd*
 1SG.OBL look.IMP.2PL
 ‘Look at me!’ (Middle Persian from Turfan, Brunner 1977:55)
- c. *kū-tān hān ... pad man wināst*
 QUOT-2PL this against 1SG.OBL sin.PST
 ‘you ... sinned against me’ (Middle Persian from Turfan, MacKenzie 1979:508)

The following example shows the embedding of an NP inside a preposition-marked NP (Gignoux & Tafazzoli 1993:36):

- (116) *tār-kirb-ān pad čīhr ud dēs ī Azdahāg*
 darkness-body-PL in shape and form EZ Azdahāg
 [N [NP-P N-H [NP]]]
 ‘creatures of darkness in the shape and appearance of (the dragon) Azdahāg’ (Gignoux & Tafazzoli 1993:36)

This suggests that the prepositional type of NPs is compatible with recursive NP structures.

The genitive case was lost in Late Old Persian and is absent from Middle Persian. Instead, juxtaposition is used. This constructions allows the recursive embedding of NPs (Skjærvø 2009:265):

- (117) *šāh-ān šāh ērān (= šāh šāh-ān ērān)*
 king-PL king Erān [N [NP-Ø [NP-Ø]]]
 ‘king of kings of Erān (i.e. of Iranian peoples)’ (Skjærvø 2009:265)

Adjectivizers, as in *āb-īg* [water-ADJZ] ‘watery, aquatic’, are quite productive (Skjærvø 2009:262–263, Durkin-Meisterernst 2014). However, the literature does not mention that adjectivizers allow the recursive embedding of NPs. This suggest that adjectivizers cannot be used to build recursive NP constructions.

Head marking occurs in a construction usually referred to as *ezāfe*. It consists of a linker *ī(g)* that marks the embedding relationship (Skjærvø 2009:263):¹³

(118) Middle Persian

kār- nāmag ī Ardašīr ī Pābagān
 deed- book EZ Ardašīr EZ clan.of.Pābag
 [NP-Ø N] H [N-H [N-H NP]]
 ‘book of (the) deeds of Ardašīr (son) of Pābag’ (Skjærvø 2009:263)

The dependent noun is in the oblique case although this is of course only visible where the forms are available. Historically, the Middle Persian *ezāfe* particle *ī(g)* has pronominal origins. It is historically related to the Old Persian relative pronoun *haya-* (Skjærvø 2009:100):

(119) Old Persian

kāra haya manā
 army(F).NOM.SG REL.NOM.SG.F 1SG.GEN
 ‘my army’ (Darius Behistun 2.25, Skjærvø 2009:100)

12.3 Persian, Modern

Modern Persian uses genitives, adjectivizers, juxtaposition, and head marking for NP embedding. Genitives and head marking allow NP recursion.

Modern Persian has lost all inherited case marking and has reanalyzed adpositions as new phrasal case markers (according to our taxonomy, where adpositions are required to show case government or stranding behavior). The preposition *az* ‘from’ comes close to a semantically neutral genitive, although it is not as neutral as the parallel developments we find in, for example, German *von* ‘from’ or French *de* ‘from’, and still conveys an ablative notion. At any rate, NPs embedded by means of *az* allow recursive expansion (Example 120):

(120) *yek kolāh az pashm-e shotor*
 one hat from wool-EZ camel
 [N [NP-G N-H [NP]]]
 ‘a hat made of camel wool’ (Sascha Völlmin, p.c.)

There are several adjectivizers that derive adjectives from nouns, e.g. the suffix *-i/-ī* as in *Irān-i* [Iran-ADJZ] ‘Iranian’ (Windfuhr & Perry 2009:527). However, there is no evidence that adjectivized NPs embed additional NPs.

Modern Persian also occasionally uses juxtaposition as a strategy to build complex NP structures, e.g. *hafte-nāme* [week-document] ‘weekly periodical’ (Windfuhr & Perry 2009:528), but instances of recursive applications of this are extremely rare (Sascha Völlmin, p.c.). We have only come across one juxtaposition that consists of more than two nominal elements, viz. *shotor-gāv-palang* [camel-cow-leopard] ‘giraffe’. However, the express in question is not recursive. Accordingly, there is no evidence that Modern Persian exploits juxtaposition as a productive means for building recursive NP structures.

¹³ The linear order does not entirely correspond to the hierarchical structure since the *ezāfe* modifies the element *kār* ‘deed’ which is embedded in the topmost head noun *nāmag* ‘book’ right after it.

The construction that is most commonly used to build complex NP structures is a head-marking construction. In this construction, the head is marked by what is known as the *ezāfe* particle. The embedded constituent can be headed by any word class, e.g. a noun, an adjective, etc. The *ezāfe* construction can embed additional NP constituents, as the following example illustrates:

- (121) *ketāb-e pedar-e Hasan*
 book-EZ father-EZ Hasan
 [N-H [N-H [NP]]]
 ‘the book of Hasan’s father’ (Lazard 1992:67)

12.4 Northern Pashto

In Pashto there is only one construction that allows the recursive embedding of NPs, namely adpositions. Adjectivizers and compounds exist as well, but they cannot embed further constituents. There is no genitive and no head-marking construction.

In Pashto, there are pre- and postpositions and they can combine into circumpositions. Such circumpositions are used more frequently than either pre- or postpositions (Babrakzai 1999:41). Prepositions usually govern the oblique case (Tegey & Robson 1996:158). While this is not always evident with nouns, it can be seen with pronouns: the preposition *də*, which regularly reduces to a sibilant before pronouns, e.g. *z-ma* ‘of me’, requires the first person singular oblique pronoun *ma* (rather than the direct form *za*) (Babrakzai 1999:30-31). Adpositions can embed further NP constituents:

- (122) *də kitab χane də mudir də wror kor.*
 of book house of manager of brother house
 [[[NP-P [[NP-Ø] N]] NP-P] NP-P] N]
 ‘The house of the brother of the manager of the library.’ (Babrakzai 1999:31)

There are a number of adjectivizing suffixes that derive adjectives from nouns, e.g. *-áy* (*jāpān-áy* [Japan-ADJZ] ‘Japanese’) (David 2014:150-152). It seems that denominal adjectives cannot embed other NPs. In any case, we have not encountered any examples in the available material.

Pashto also has compounds, e.g. *lmar-xātə* [sun-rising] ‘east’. However, many of them have been borrowed from other languages, especially Persian (David 2014:101). We have not come across any nominal compounds that consists of more than two members. This suggests that juxtaposition is not among the strategies that allow recursive embedding of NPs in Pashto.

12.5 Ossetic

In Ossetic, we find genitives, adpositions, juxtaposition and head marking. Except for juxtaposition, all these constructions are available for NP recursion.

Ossetic nouns are inflected for case, one of which is the genitive. It is marked by the suffix *-i* (Digor dialect) or *-i* (Iron dialect), as in Example 123, and derives from an ancient genitive ending *-ah* (Thordarson 2009:132). For most nominals it also marks accusative and inessive, i.e.

it is syncretic and therefore commonly glossed as oblique (David Erschler, p.c.). The genitive can embed additional NP constituents:

- (123) *soslan-i beχ-i k'edzele*
 Soslan-OBL horse-OBL tail
 [[[NP-G] NP-G] N]
 'Soslan's horse's tail' (Digor dialect; David Erschler, p.c.)

There is one preposition and several postpositions in Ossetic, which predominantly express location and govern various cases. Adposition-marked NPs can embed further NPs, no matter whether the NP is embedded by a preposition (Example 124a) or a postposition (Example 124b):

- (124) a. *fendeg mē- fid-i χedzar-i wenge*
 road 1SG.OBL- father-OBL house-OBL until
 [N [[[NP-G] NP-G] NP-P]
 'the/a road up to my father's house'
 b. *seχ^war enē mē- mad-i fidgun(-ej)*
 breakfast without 1SG.OBL- mother-OBL meat.pie(-ABL)
 [N [NP-P [[NP-G] NP-G]]]
 'the/a breakfast without my mother's meat pie' (Digor dialect; David Erschler, p.c.)

Adjectives and nouns cannot be clearly distinguished based on morphology (Erschler 2016:3158). With regard to their function however, some nominal stems occur almost exclusively either as head or modifier (Thordarson 2009:86). Also, there are various derivational suffixes which form either nouns as in Iron *xorz-zinad* 'good-ness', or adjectives *pedagog-on* 'pedagogical' (cf. Thordarson 2009:86-87). We have found no evidence that adjectivized noun can embed additional NP constituents and thus conclude that this is not possible in Ossetic.

Ossetic makes frequent use of compounds, such as *axsen-nez* [stomach-illness] 'stomach illness' (Erschler 2016:3162-3163). Such collocations are quite common, but not with three or more members, suggesting that juxtaposition does not allow recursion.

Ossetic has developed a head-marking construction involving a possessive pronominal clitic on the head. The embedded NP is assigned dative case (similar to the Swiss German construction described in Section 9.12). This construction allows NP recursion:

- (125) *mē- fid-i limen-en e- kizge*
 1SG.GEN- father-OBL friend-DAT 3SG.GEN- daughter
 [[[[NP-G] NP-G] NP] N-H]
 'my father's friend's daughter' (Digor dialect; David Erschler, p.c.)

In addition to this, there is also the trace of an other, presumably older, head-marking construction in the form of a suffix *-i* (Digor dialect) or *-i* (Iron dialect). The form happens to be formally identical to the genitive case resulting in the apparent synchronic puzzle of a genitive marking a head:

- (126) *mæ fid-i zæronð*
 1SG.GEN father-LNK old
 'my old father' (Iron dialect; Thordarson 2009:109)

This construction displays an atypical syntactic structure for Ossetic NPs, as the modifier occurs in postnominal rather than prenominal position. In addition, the construction is semantically specialized for specific kinds of physical and mental properties and states such as ‘old’, ‘good’, ‘stupid’, etc. (Thordarson 2009:109). The *i*-construction is thus limited to a few fixed expressions only (Belyayev 2010:298) and, unlike the head marking type based on possessive forms (Example 125), does not support recursive NP embedding (David Erschler, p.c.).

12.6 Southern Baluchi

There are three main varieties of Baluchi: Southern Baluchi (spoken in South Pakistan and Southeast Iran), Eastern Baluchi (spoken in Pakistan) and Western Baluchi (spoken in Pakistan, Iran, Afghanistan, and Turkmenistan). The varieties are quite different in terms of grammatical structure (Jahani & Korn 2009), but their divergence from the most common recent ancestor (i.e. theoretical branch lengths) can be assumed to be sufficiently similar for the purpose of phylogenetic modeling. We base our analysis on Southern Baluchi because we have much better access to data from this variety than from the others.

Southern Baluchi has genitives, adpositions, juxtaposition and adjectivizers. Only genitives and adpositions can embed other constituents. There is a head-marking construction, but it is not productive.

In Southern Baluchi, nouns are inflected for case, number, and indefiniteness. The language has a genitive case, which is marked by the suffix *-ay*, *-ē* or *-ī* in the singular and by the suffix *-ānī* in the plural (Jahani & Korn 2009). Genitive-marked nouns can embed additional NPs:

- (127) *manī dost-ē pit-ē lōg*
 1SG.GEN friend-GEN.SG father-GEN.SG house.NOM
 [[[NP-G] NP-G] NP-G] N]
 ‘my friend’s father’s house’ (Riaz Ahmed, p.c.)

Southern Baluchi has prepositions, postpositions, and circumpositions. Prepositions usually govern the oblique, while postpositions and circumpositions govern the genitive case (Jahani & Korn 2009). Most postpositions have developed from relator nouns in the oblique case and in many cases they are still best analyzed as such rather than as adpositions. Prepositions, however, constitute a lexical class in their own right. Preposition-marked nouns allow recursive NP structures:

- (128) *yak wahag-ē pa(r) taī dōst-ē pit-ā*
 one gift-INDF for 2SG.GEN friend-GEN.SG father-OBL.SG
 [N [NP-P [[NP-G] NP-G]]]
 ‘a gift for your friend’s father’ (Riaz Ahmed, p.c.)

There is an adjectivizer *-ī*, which derives adjectives from nouns, e.g. *iran-ī* [Iran-ADJZ] ‘Iranian’. The resulting adjectives cannot embed other NPs, however (Riaz Ahmed, p.c.).

The language also has nominal compounds, e.g. *log-banok* [house-lady] ‘wife’ and *insān-dōst* [human.begin-friend] ‘philanthropist’. Recursive compounding, however, is not productive in Southern Baluchi (Riaz Ahmed, p.c.), and we thus conclude that juxtaposition is not a strategy for NP recursion.

Southern Baluchi also has a head marking *ezāfe* construction, but this strategy has been borrowed only recently from Persian and is confined to fixed phrases (Jahani & Korn 2009:656), such as *nam-ē huda* [name-EZ God] ‘the name of God’ (cf. the native genitive construction *huda-ē nam-ā* [God-GEN name-OBL.SG] ‘the name of God’). Thus, the *ezāfe* cannot be considered a productive means for the building of recursive NP structures in Southern Baluchi.

13 Italic

13.1 French

Of the five constructions surveyed, French has three: genitives, adjectivizers and juxtaposition, of which only the first can embed additional NPs. There are no adpositions and no head marking.

French possesses a number of NP-building constituents that are commonly referred to as prepositions in reference grammars. In our coding scheme, these constituents count as genitives rather than prepositions because they do not govern case in contemporary French. To be sure, French ‘prepositions’ require a special form of pronouns, the so-called disjunctive pronouns (Batchelor & Chebli-Saadi 2011:446). However, disjunctive pronouns cannot be analyzed as case-marked pronominal forms because they can refer to participants in both subject and object function (cf. Example 129a and Example 129b). French genitives can embed further constituents as Example 129c illustrates.

- (129) a. *Lui, il ne peut pas ven-ir.*
 3SG.M.DISJ 3SG NEG can.PRS.3SG NEG come-INF
 ‘He cannot come.’
- b. *Je ne le vois pas, lui.*
 1SG NEG 3SG.M.OBL see.PRS.1SG NEG 3SG.M.DISJ
 ‘I do not see him.’
- c. *le chien de la voisin-e de Martha*
 ART.SG.M dog(M) GEN ART.SG.F neighbor-F.SG GEN Martha(F)
 [N [NP-G [NP-G]]]
 ‘the dog of Martha’s neighbor’

Adjectivizers exist, e.g. *familial* [family.ADJZ] ‘domestic’ or *côtier* [coast.ADJZ] ‘coastal’, but cannot recursively embed additional NPs.

Compounding is a productive process in French, though noun-noun compounds are not the most frequent type. Often, the first element is the head and the second the modifier, as in *timbre-poste* [stamp-mail] ‘postage stamp’. These compounds are limited to two members. Thus, juxtaposition is not available for recursive NP embedding in French.

13.2 Italian

Italian uses adpositions, adjectivizers, and juxtaposition for NP embedding. Of these three strategies, only adpositions and juxtaposition can be used for recursive embedding. There is no genitive and no head marking.

Italian has a wide range of prepositions, which can occur in adnominal position. Prepositions govern an oblique case, which is however only visible in pronouns (Maiden & Robustelli 2007:171), as in Example 130a. Adposition-marked nominals can embed an additional NP, as Example 130b demonstrates.

- (130) a. *un regalo per te*
 ART.SG.M gift(M).SG for 2SG.OBL
 ‘a gift for you’ (Francesco Gardani, p.c.)
- b. *il libro sul tavolo nel soggiorno*
 ART.SG.M book(M).SG on.M.SG table(M).SG in.M.SG living.room(M).SG
 [N [NP-P [NP-P]]]
 ‘the book on the table in the living room’ (Francesco Gardani, p.c.)

There are a number of adjectivizing suffixes, which derive adjectives from nouns, e.g. *-ale* (*nazionale* [nation.ADJZ] ‘national’) or e.g. *-ano* (*italiano* [Italia.ADJZ] ‘Italian’) (Maiden & Robustelli 2007:443-444). Such denominal adjectives cannot embed additional NPs, however.

Italian also uses plain juxtaposition as a means of NP building (Bisetto 2010). Such NPs are typically left-headed, e.g. *capo-stazione* [master-station] ‘station master’ or *trasmissione radio* [transmission-radio] ‘radio transmission’. These NPs can be recursively expanded, although we note that these constructions are limited stylistically and to some extent also semantically (Bisetto 2010):

- (131) a. *programma riciclo materiali*
 program recycling stuff
 [N [NP-Ø [NP-Ø]]]
 ‘stuff recycling program’ (Bisetto 2010:28)
- b. *ufficio responsabile reparto giocattoli e attrezzature sport-iv-e*
 office manager section toys and facilities sport-ADJZ-PL
 [N [NP-Ø [NP-Ø [[NP-Ø] [NP-Ø [NP-A]]]]]]
 ‘toys and sports facilities section manager office’ (Bisetto 2010:27)

13.3 Latin

Latin is attested as early as the sixth century BCE. The examples presented below are all from later times, mostly from the Classical Latin period (1st century BCE to 3rd/4th century CE) and, in the case of the Bible translation (Weiss 2009:23-24), the Late Latin period (3rd and 4th century CE).

Latin uses genitives, adpositions and, to a minor extent, juxtaposition and adjectivizers for NP embedding. However, only genitives and adpositions are productive strategies to build recursive NP constructions. Head marking is absent altogether.

The genitive is the primary means of expressing relations between nouns and is marked by a suffix whose phonological form depends on the declension class of a given noun. Genitives allow the recursive embedding of NPs:

- (132) *morb-us et aegrotatio, ex totius valetudin-is corpor-is conquassation-e*
 disease-NOM.SG and sickness.NOM.SG out.of.all.GEN health-GEN.SG body-GEN.SG disturbance-ABL.SG
 [[NP-G [NP-G]] N
et perturbation-e gignuntur
 and disorder-ABL.SG produce.3PL.PRS.PASS
 N]
 ‘disease and sickness are entirely produced by disturbance and disorder of the health of the body’
 (Cicero, Tusculanae Disputationes 4.29)

Latin has a range of prepositions, which govern case. Preposition-marked NPs are compatible with recursive NP structures:

- (133) *librum de vita eius*
 book.ACC.SG of life.ABL.SG DEM.GEN.SG
 [N [NP-P [NP-G]]]
 ‘a book about his life’ (Plinius, Epistolae 4.7.2)

Numerous adjectivizers are present in every period of Latin, but they play a marginal role in the language (Baldi & Nuti 2010:356,364). Unlike genitives, derived adjectives almost never control additional NPs. We have come across only one example from an early comic play by Terentius Afer, first performed 161 BCE, in which a derived adjective embeds a further constituent:

- (134) *pater-n-um amic-um me assimul-abo uirgin-is*
 father-ADJZ-ACC.SG.M friend(M)-ACC.SG 1SG.ACC feign-1SG.FUT girl-GEN.SG
 NP-A N NP-G
 [*amicum* (N) [*paternum* (NP-A) [*virginis* (NP-G)]]]
 ‘I’ll make believe I’m a friend of the girl’s father’ (Terentius, Phormio 128) (Baldi & Nuti 2010:364)

In this example, the genitive *uirginis* ‘of the girl’ is a dependent of the derived adjective *paternum* ‘of the father’ and not the head noun *amicum* ‘friend’. However, this example is generally considered very odd, and the lack of additional instances suggests that there is a strong general tendency, grammatical or stylistical, against the modification of derived adjectives and therefore against NP recursion with adjectivizers. This conclusion is supported by the observation that derived adjectives were never very common to begin with. Also, while adjectivizers are explicitly mentioned and discussed by Baldi & Nuti (2010:363–364) as modifiers of possessive pronouns and genitives, adjectivizers modified by another NP are never mentioned. It is conceivable that they may have been more common in the older stages of the language and then gradually fell out of use. However, adjectivized NPs were clearly not a productive means for building recursive NP structures in Classical Latin or later stages of the language.

Compounds exist but are quite rare (Fruyt 2002:259) and there is no evidence whatsoever for recursive compounds. The attested compounds are mostly lexicalized (e.g. *capri-ficus* [male.goat-fig] ‘fig tree’ or *angi-portus* ‘narrow passage’ Fruyt 2002:266–267). The only compounds that are more common are those whose first element is a preverb or preposition as in *con-discipulus* [with-pupil] ‘a fellow pupil’, not a noun. Thus, juxtaposition does not seem to have been available for recursive NP embedding in Latin.

13.4 Romanian

Romanian has two NP structures that allow recursive NP embedding: genitives and adpositions. The language also makes use of endocentric juxtaposition, but such constructions are not available for NP recursion. Adjectivizers only play a minor role in Romanian and head marking is absent altogether.

Romanian has two cases, an unmarked nominative-accusative that is primarily used for subjects and direct objects, and a genitive-dative case that is used for indirect objects and possession, among other functions. With masculine and neuter nouns, the genitive-dative case is only marked on the definite and indefinite article that accompanies the noun. The noun itself remains unchanged (Example 135a and Example 135b). With feminine nouns, an additional suffix *-i/-e/-ele* (Example 135c and Example 135d) is added (Cojocaru 2004:32):

- (135) a. *un pom / unui pom*
 ART.INDF.NA.SG.M tree(M) / ART.INDF.GD.SG.M tree(M)
 ‘a tree / of a tree’
- b. *pom-ul / pom-ului*
 tree(M)-ART.DEF.NA.SG.M / tree(M)-ART.DEF.GD.SG.M
 ‘the tree / of the tree’
- c. *o cas-ă / unei cas-e*
 ART.INDF.NA.SG.F house(F)-NA.SG / ART.INDF.GD.SG.F house(F)-GD.SG
 ‘a house / of a house’
- d. *cas-a / cas-e-i*
 house(F)-ART.DEF.NA.SG.F / house(F)-GD.SG-ART.DEF.GD.SG.F
 ‘the house / of the house’ (Cojocaru 2004:33)

The genitive-dative can embed other constituents, as is shown in Example 136, where the genitive *sânelui* ‘of the blood’ embeds a possessive pronoun.

- (136) *izvor-ul sânge-lui ei*
 source/fountain(M)-ART.DEF.NA.SG.M blood(M)-ART.DEF.GD.SG.M 3SG.F.GEN
 [N [NP-G [NP-G]]]
 ‘the source/fountain of her blood’ (Mark 6.18)

Romanian makes frequent use of prepositions, which govern different cases (Cojocaru 2004:171). Most of them do not occur alone, but as a composite form with the preposition *de* ‘of’. Like the genitive case, they can embed further NPs (cf. Example 137).

- (137) *cas-a de lângă magazin-ul Ana-e-i*
 house(F)-ART.DEF.NA.SG.F of by store(M)-ART.DEF.NA.SG.M Ana(F)-GD.SG-ART.DEF.GD.SG.F
 [N [NP-P [NP-G]]]
 ‘the house next to Ana’s store’ (Selim Özgür, p.c.)

There are several adjectivizing suffixes, e.g. *-iu* as in *argint-iu* [silver-ADJZ] ‘silvery’ or *-al* as in *anu-al* [year-ADJZ] ‘yearly’ (Gönczöl-Davies 2008), but we have found no evidence that such derived adjectives can embed other constituents.

Compounds do not play a major role in the Romanian language and determinative compounds such as *floarea-soarelui* [flower-sunshine] ‘sunflower’ have a low productivity or are even obsolete (Grossmann 2012:148,153). Moreover, we have not come across any examples of recursive compounding. We thus conclude that juxtaposition is not available for recursive NP embedding.

13.5 Sardinian

Our description is based on Cagliari Sardinian. The language has only one construction that allows the recursive embedding of NPs: the genitive. Adjectivization and juxtaposition exist, but these strategies do not allow recursive embedding of NP constituents. There are no adpositions and head marking is absent as well.

The genitive is marked by the proclitic *de*, which is traditionally referred to as a preposition. We analyze it as a genitive though, because it has lost its adpositional behavior such as case government. Unlike in Italian, case is not detectable in pronouns anymore because the oblique pronoun forms only ever occur after a preposition, i.e. there is no situation where the oblique form can be analyzed as case assigned independently of the preposition. The reason for this is that an oblique pronoun in object function requires a differential object marker. The old direct vs. oblique alternation is thus best analyzed as a stem alternation triggered by the case marker that precedes the pronoun, very similar to what happened in several modern Indo-Aryan languages (e.g. in Maithili or Nepali, as described in Sections 11.3 and 11.5 respectively.) The new *de*-genitive allows the recursive embedding of other constituents, such as another genitive or possessive pronoun:

- (138) *su cane 'essu piseddu de sorre mia*
 ART.SG.M dog(M) GEN.ART.SG.M¹⁴ boyfriend(M) GEN sister(F) 1SG.POSS.SG.F
 [N [NP-G [NP-G [NP-A]]]]
 ‘my sister’s boyfriend’s dog’ (Antonello Porcu, p.c.)

There are a number of adjectivizers, such as *-inu* in *berbek-inu* [sheep-ADJ.SG.M] ‘ovine’ (Simone Pisano, p.c.), but we found no evidence that they can embed further constituents.

Compounding is not a productive process in Sardinian and the recursive expansion of determinative compounds is not possible. Rather, the genitive *de* is used to render what in another language (e.g. Italian) might be a compound:

- (139) *programma de ritzicru de materiales*
 program GEN recycling GEN materials
 [N [NP-G [NP-G]]]
 ‘stuff recycling program’ (Simone Pisano, p.c.)

This suggests that juxtaposition is not available for recursive NP embedding.

¹⁴ The clitic *de* regularly combines with the article and the initial *d* is elided in certain contexts.

13.6 Spanish

In Spanish, only adpositions allow the recursive embedding of NPs. The language also features adjectivization and juxtaposition, but these strategies do not allow recursive NP embedding. Genitives and head marking are absent from the language.

Spanish displays a number of adpositions (Batchelor 2006:205–206). Their status as adpositions is based on the fact that they govern case. Most adpositions govern the prepositional case in combination with first and second person singular pronouns (cf. Example 140c and Example 140d) as well as third person reflexive pronouns, but the nominative case in all other contexts. In addition, there are some adpositions that exclusively govern the nominative case (Butt & Benjamin 1994:106):

- (140) a. *Yo compr-o una casa.*
 1SG.NOM buy-PRS.1SG ART.INDF.F house(F)
 ‘I buy a house.’ (Batchelor 2006:154)
- b. *Tú compr-as una casa.*
 2SG.NOM buy-PRS.2SG ART.INDF.F house(F)
 ‘You buy a house.’ (Batchelor 2006:154)
- c. *Habl-an de mí.*
 speak-PRS.3PL of 1SG.PREP
 ‘They speak of me.’ (Batchelor 2006:157)
- d. *Lo hag-o por ti.*
 3SG.M.ACC do-PRS.1SG for 2SG.PREP
 ‘I do it for you.’ (Batchelor 2006:157)

Adpositions allow the recursive embedding of NPs:

- (141) *el perro de-l padre de mi amigo*
 ART.SG.M dog(M) of-ART.SG.M father(M) of 1SG.GEN friend(M)
 [NP [NP-P [NP-P [NP-G]]]]
 ‘the dog of my friend’s father’ (Martha Mariani, p.c.)

Spanish possesses a set of derivational suffixes that derive adjectives from nominals, e.g. *-al* (e.g. *central* ‘central’ < *centro* ‘center’) or *-oso* (e.g. *aceitoso* ‘oily’ < *aceite* ‘oil’) (Española 2010:133). In the literature, adjectivizers are not described as allowing the embedding of additional NPs. We thus conclude that recursive embedding of NPs is not possible with adjectivizers.

Spanish makes use of juxtaposition to form complex NPs. Such juxtapositions are typically left-headed, e.g. *telaraña* ‘spiderweb’ < *tela* ‘cloth’ + *araña* ‘spider’ or *bocacalle* ‘intersection’ < *boca* ‘mouth’ + *calle* ‘street entrance, side street’ (Española 2010:196–197). We checked with three native speakers whether recursive nominal compounding is possible. We presented each speaker with hypothetical three-member compounds from different semantic fields (e.g. **puerta valla jardín* [gate-fence-garden] ‘garden fence gate’, **programa reciclaje material* [program-recycling-stuff] ‘stuff recycling program’, **puchero carne cabra* [stew-meat-goat] ‘goat meat stew’). All of them rejected the relevant constructions as ungrammatical. We conclude that juxtapositions is not available for the recursive embedding of NPs in Spanish.

14 Slavic

14.1 Bulgarian

Bulgarian deviates from other Slavic languages in that it only has one major strategy for recursive NP structures, namely adpositions. There is no genitive and no head-marking construction, and while juxtapositions and adjectivization exist, these strategies do not allow the recursive embedding of NPs.

In Bulgarian there are prepositions which govern case. Because there is no case marking on nouns in the spoken language, this can only be seen on pronouns: e.g. *az* [1SG.NOM] ‘I’ vs. *na mene* [at 1SG.OBL] ‘at me’ (Max Wahlström, p.c.). Prepositions can embed other constituents and allow NP recursion:

- (142) *tova e domăt na brat mi*
 this is house.DEF of brother 1SG.DAT
 [N [NP-P [NP-G]]]
 ‘This is the house of my brother.’ (Scatton 1993:237)

The language makes use of denominal adjectives to embed nominals into NPs. This strategy is commonly used to express possessive relationships, as in *brat-ov* [brother-ADJZ] ‘brother’s’ (Scatton 1993:221). However, denominal adjectives can never embed an additional NP (Corbett 1987:310).

Juxtaposition is productive in Bulgarian, but recursive structures are marginal at best. It only exists in specialized technical vocabularies. Determinative compounds such as *disko-moda* [disco-fashion] ‘disco fashion’ exist, but they are confined to two members (Max Wahlström, p.c.).

14.2 Old Church Slavic

Old Church Slavic (henceforth OCS) is attested in a text corpus that is commonly dated to the late 10th century CE. The individual texts are translations of Greek ecclesiastical texts and were first translated into OCS about one hundred years earlier. The texts primarily display dialectal features representative of Balkan Slavic varieties, but also show some influence of Slavic varieties spoken in Moravia (Huntley 1993:125).

OCS uses genitives, adjectivizers, adpositions, and juxtaposition to embed nominals into NPs. Of these, genitives and adpositions are commonly used to build embed additional NP constituents, while adjectivizers are only marginally attested in this function. Juxtaposition does not allow recursive NP embedding, and head marking is absent altogether.

OCS nouns are inflected for case. Recursive NP constructions are commonly formed with the genitive:

- (143) *iz očese bratra tvoego*
 out.of eye.GEN.SG brother(M).GEN.SG 2SG.POSS.SG.M
 [NP-P [NP-G [NP-A]]]
 ‘from your brother’s eye’ (Codex Marianus, Matthew 7.5)

OCS also uses adpositions, which govern case, for the formation of recursive NP constructions:

- (144) *dŭva otŭ učēnikŭ svoixŭ*
 two.ACC.DU of disciple(M).GEN.PL 3SG.POSS.PL.M
 [N [NP-P [NP-A]]]
 ‘two of his disciples’ (Codex Marianus, Mark 11.1)

There are several adjectivizers in OCS. The resulting denominal adjectives agree in gender, case and number with their head noun. There is marginal evidence that OCS denominal adjectives can embed additional NPs:

- (145) *otŭ uzdy koń-bnyj-ę cēsare*
 from bridle(F).GEN.SG horse(M)-ADJZ-GEN.SG.F emperor(M).ADJZ-GEN.SG.F
 [N [NP-A [NP-A]]]
 ‘from the bridle of the horse of the emperor’ (Codex Suprasliensis 193.9)

However, as Huntley (1993) points out, there are only three instances of a denominal adjective controlling an additional constituent in the entire OCS corpus. In a complex NP in which a possessor NP controls an additional possessor NP or stands in adposition to an additional possessor NP, both dependents are usually in the genitive (Huntley 1993: 218–219; Trubetzkoy 1954:188, 192; Vaillant 1964:133–4). Accordingly, the embedding properties of denominal adjectives are extremely limited, and the genitive is clearly preferred over denominal adjectives for the formation of recursive NP constructions.

A survey of the PROIEL materials (Haug & Jøhndal 2008) confirms this analysis, with one potentially important counterexample: the 76-generation genealogy of Jesus in Luke 3.23 is a string of recursively embedded patronymics in the form of possessive adjectives:

- (146) *synŭ syi jěko mŭnimŭ bę Iosif-ov-ŭ Ili-ev-ŭ*
 son(M).NOM.SG being as thought was Joseph(M)-ADJZ-NOM.SG.M Eli(M)-ADJZ-NOM.SG.M
Mattat-ov-ŭ Levi-in-ŭ Melxi-ev-ŭ Ianna-ev-ŭ
 Matthat(M)-ADJZ-NOM.SG.M Levi(M)-ADJZ-NOM.SG.M Melchi(M)-ADJZ-NOM.SG.M Jannai(M)-ADJZ-NOM.SG.M
 ... (68 more generations) *Adam-ov-ŭ božei*
 ... Adam(M)-ADJZ-NOM.SG.M God(M).ADJZ.NOM.SG.M
 ‘being (as was supposed) the son of Joseph, which was the son of Heli, which was the son of Matthat, which was the son of Levi, which was the son of Melchi, which was the son of Jannai ... which was the son of Adam, which was the son of God’ (Codex Marianus, Luke 3.23)

The Greek original has a recursive string of genitives:

- (147) *huiós [...] Iōsēf toū Ēlī toū Mat^hat toū Leuī*
 son.NOM.SG [...] Joseph(M) ART.GEN.SG.M Eli(M) ART.GEN.SG.M Matthat(M) ART.GEN.SG.M Levi(M)
toū Melk^h toū Iannaī [...] toū Adām toū
 ART.GEN.SG.M Melchi(M) ART.GEN.SG.M Jannai(M) [...] ART.GEN.SG.M Adam(M) ART.GEN.SG.M
T^heoū
 God(M).GEN.SG
 ‘the son ... of Joseph, which was the son of Heli, which was the son of Matthat, which

was the son of Levi, which was the son of Melchi, which was the son of Janna ... which was the son of Adam, which was the son of God' (Luke 3.23)

The Slavic rendition faithfully copies the recursion, but uses possessive adjectives rather than calquing the Greek morphology. It is impossible to know whether this OCS example is vestigial or embryonic, but it shows that recursion was a marginal possibility for medieval Slavic, at least in the specific context of patronymics. Given the limits of the evidence and the strong preference for genitives, we conclude that adjectivization is not available as a general strategy for NP recursion in OCS.

OCS makes use of juxtaposition for complex NPs, e.g. *bogo-mati* [god-mother] 'mother of god' (Vaillant 1974:738). However, we have not come across any such constructions with more than two members. This suggests that recursive embedding was not common with juxtaposition in OCS, if it existed at all. The other Slavic language with a sizable medieval attestation, Old Russian (including its distinctive Old Novgorod variant), appears to have been identical to OCS in all these respects (see also footnote 14 in Section 14.3 just below.)

14.3 Russian

Russian uses genitives, adjectivizers, adpositions, and juxtaposition for NP embedding, but only genitives and adpositions are able to embed an additional NP. There is no head-marking construction.

Russian nouns are inflected for case, one of which is the genitive. Genitives allow NP recursion:

- (148) *teksty pesen raznyx ispolnitelej i grupp*
 text.NOM.PL song.GEN.PL various.GEN.PL performer.GEN.PL and group.GEN.PL
 [N [NP-G [NP-G NP-G]]]
 'texts of songs of various performers and groups' (Timberlake 2004:205)

Russian also has prepositions. Some of them govern only one case; others can combine with multiple cases (Andrews 2001:66). They too can embed additional NPs:

- (149) *mal'čik iz derevni na reke*
 boy.NOM.SG from village.GEN.SG on river.PREP.SG
 [N [NP-P [NP-P]]]
 'the boy from the village by the river' (Jekaterina Mažara, p.c.)

Russian has adjectivizers that are frequently used to derive denominal adjectives, in particular to express possessive relationships (Timberlake 2004:127). However, such adjectives cannot embed additional NPs (Corbett 1987:308-309):¹⁵

- (150) (**Ivan-ov-a/Ivan-a*) *mam-in-a kniga*
 Ivan-ADJZ-SG.F/Ivan-GEN.SG mother(F)-ADJZ-SG.F book(F)
 Intended: 'Ivan's mother's book.'

¹⁵ There are a very few examples suggesting that this may have been possible in Old Russian (Corbett 1987:309):

Juxtaposition is not a common strategy to build recursive NP structures. Schönle (1975:151) lists a number of compounds with three members, e.g. *ugle-rudo-voz* [coal-ore-load] ‘load of coal ore’. However, as Schönle (1975:153) points out, such instances of recursive compounding are quite rare. They might be productive only for very few final elements, e.g. *samo-letostroenie* [[self-fly-]building] ‘airplane building’, but note that the first compound is already lexicalized. Moreover, they are confined to specific technical jargons.

14.4 Upper Sorbian

Upper Sorbian has genitives, adjectivizers, adpositions, and juxtaposition. Both genitives and denominal adjectives can be used to build recursive NP structures, while juxtaposition does not allow recursive embedding. Head marking is absent from Upper Sorbian.

Upper Sorbian has seven cases, one of which is the genitive (Schuster-Šewc 1996:65). Genitives allow NP recursion:

- (151) *praw-o naš-ich muž-ow*
 right-NOM.SG 1PL.POSS-GEN.PL husband-GEN.PL
 [N [[NP-A] NP-G]]
 ‘the right of our husbands’ (Corbett 1987:302)

Adjectivizers are very productive in Upper Sorbian (Schuster-Šewc 1996:104), and they can recursively embed further constituents. In Example 152, the denominal adjective is modified by another denominal adjective:

- (152) *přez Mar-in-eje maćer-n-u smjerć*
 through Marja-ADJZ-GEN.SG.F mother(F)-ADJZ-ACC.SG.F death(F).ACC.SG
 [[[NP-A] NP-A] N]
 ‘through Marja’s mother’s death’ (Lötsch 1965:378)

Denominal adjectives agree in case, gender and number with their immediate head. Thus, in Example 152, the first level adjective *maćernu* ‘mother’s’ agrees with the head noun *smjerć* ‘death’, and the second level adjective *Marineje* ‘Maria’s’ with the nominal head contained in the adjectivized form *maćernu*.

There are several prepositions in Upper Sorbian which govern case (Schuster-Šewc 1996:218). They allow NP recursion:

- (153) *hólc z wjeski při rěce*
 boy.NOM.SG from village.GEN.SG at river.LOC.SG
 [N [NP-P [NP-P]]]
 ‘the boy from the village by the river’ (Sonja Wölke, p.c.)

-
- toě Marf-in-ymě mužemě*
 that.GEN.SG.F Marfa(F)-ADJZ-INS.SG.M husband(M).INS.SG
 [[[DEM] NP-A] N]
 ‘that Marfa’s husband’ (Corbett 1987:309)

Stone (1993:651) describes a number of determinative compounds with two members, but does not mention any instances of recursive compounding. Schuster-Šewc (1991) lists many compounds, none of which have more than two members. According to Sonja Wölke (p.c.), nominal compounding is indeed strongly restricted in Upper Sorbian to the extent that a compound cannot have more than two members. Thus, the language does not allow juxtaposition for recursive NP embedding.

15 Tocharian

15.1 Tocharian B

Tocharian refers to a branch of Indo-European which is attested in two closely related languages or dialects, Tocharian A (eastern variant) and B (western variant). They are attested from the 5th to 9th century CE in manuscripts found around the Turpan Oasis in the modern-day Chinese province Xinjiang. Most of the documents are translations of Sanskrit Buddhist texts (Krause & Thomas 1960:37-38). Our description is based on Tocharian B, as this is the language also sampled in the IELEX data used by Chang et al. (2015).

Tocharian B exhibits four of the NP structures that we surveyed: it has case, adjectivizers, adpositions, and juxtaposition. Both the genitive and the adjectivizers can embed further NPs. Adpositions cannot be used adnominally and head marking is absent altogether.

Genitives allow NP recursion as shown in (Example 154):¹⁶

- (154) *oñkolmä-mts lānte sayi*
 elephant-GEN.PL king.GEN.SG son.GEN.SG
 [[[NP-G] NP-G] N]
 ‘of the son of the king of elephants’ (THT 74a4) (Adams 2009:304)

In the literature (Carling 2000, Krause & Thomas 1960:171), we found no evidence that pre- and postpositions in Tocharian are used adnominally in Tocharian B and conclude that such constructions do not exist in the language.

The suffixes *-(i)ye*, *-ññe*, or *-šše* are used as adjectivizers, with *-šše* being the most widely used suffix (Adams 2009:306-307). As with genitives, NP recursion is possible, i.e. an adjectivized noun can be modified by an other constituent. If the other constituent includes an adjectivizer as well, the second-level embedded adjective agrees in gender with the underlying noun of the first level adjective and not with the topmost head noun (Adams 2009:304-305), i.e. agreement is normally with the immediate head:

- (155) *laksa-ññ-ai klautsai-šše-e špe[l]*
 fish-ADJZ-OBL.SG.F ear(F)-ADJZ-NO.SG.M poultice(M).NO.SG
 [[[NP-A] NP-A] N]
 ‘a poultice of fish ears’ (PK AS 3Bb2) (Adams 2009:304)

¹⁶ Writing conventions: []=damaged sign, ()=restored parts of missing signs.

The ability to form compounds is quite limited in Tocharian, and many of the attested compounds are loan translations from Sanskrit. Determinative compounds do exist, as for example *syalle-were* [sweat-smell] ‘smell of sweat’ or *tana-mot* [grain-alcoholic.drink] ‘grain brandy’ (Bernhard 1958:166,167). However, we have not come across any example with three members in the extensive survey by Bernhard (1958), and it is thus safe to conclude that juxtaposition was not available for recursive NP embedding in Tocharian.

References

- Adams, Douglas Q. 2009. Genitive and Adjective in Tocharian. *Journal of Indo-European Studies* 37(3&4). 299–320.
- Allen, Cynthia. 2008. *Genitives in early English: typology and evidence*. Oxford: Oxford University Press.
- Ambrazas, Vyautas. 1997. *Lithuanian grammar*. Lithuania: Baltos Lankos.
- Andrews, Edna. 2001. *Russian*. München: Lincom Europa.
- Babrakzai, Farooq. 1999. *Topics in Pashto Syntax*: University of Hawaii at Manoa PhD dissertation.
- Baldi, Philip & Andrea Nuti. 2010. Possession. In Philip Baldi & Pierluigi Cuzzolin (eds.), *New Perspectives on Historical Latin Syntax. Constituent Syntax: Quantification, Numerals, Possession, Anaphora*, vol. 3, Berlin, Boston: Mouton De Gruyter.
- Batchelor, Ronald Ernest. 2006. *A student grammar of Spanish*. Cambridge University Press.
- Batchelor, Ronald Ernest & Malliga Chebli-Saadi. 2011. *A reference grammar of French*. Cambridge University Press.
- Bauer, Anna. 2014. *Morphosyntax of the Noun Phrase in Hieroglyphic Luwian*. Leiden: Brill.
- Behaghel, Otto. 1897. *Die Syntax des Heliand*. Prag, Wien, Leipzig: F. Tempski.
- Belyayev, Oleg. 2010. Evolution of case in Ossetic. *Iran and the Caucasus* 14. 287–322.
- Bernhard, Franz. 1958. *Die Nominalkomposition im Tocharischen*: Universität Göttingen PhD dissertation.
- Bisetto, Antonietta. 2010. Recursiveness and Italian compounds. *SKASE Journal of theoretical linguistics* 7. 14–35.
- Boretzky, Norbert. 1994. *Romani*. Wiesbaden: Harrassowitz.
- Borsley, Robert D., Maggie Tallerman & David Willis. 2007. *The Syntax of Welsh*. Cambridge: Cambridge University Press.
- Braune, Wilhelm. 2004. *Althochdeutsche Grammatik I. Bearbeitet von Ingo Reiffenstein*. Tübingen: Niemeyer 15th edn.
- Braune, Wilhelm & Ernst A. Ebbinghaus. 1966. *Gotische Grammatik mit Lesestücken und Wörterverzeichnis*. Tübingen: Niemeyer.
- Brunner, Christopher. 1977. *A syntax of western Middle Iranian*. Delmar, NY: Caravan Books.
- Brunner, Karl. 1965. *An outline of Middle English Grammar (translated by Grahame Johnston)*. Cambridge, MA: Harvard University Press.
- Bubenik, Vit. 1998. *A historical syntax of late Middle Indo-Aryan (Apabhramsa)*. Amsterdam, Philadelphia: John Benjamins.
- Bubenik, Vit. 2009. The rise and development of the possessive construction in Middle Iranian with parallels in Albanian. In Vit Bubenik, John Hewson & Sarah Rose (eds.), *Grammatical change in Indo-European languages*, 89–101. Amsterdam: Benjamins.
- Buchholz, Oda & Wilfried Fiedler. 1987. *Albanische Grammatik*. Leipzig: Verlag Enzyklopädie.
- Butt, John & Carmen Benjamin. 1994. *A new reference grammar of Modern Spanish*. Edward Arnold 2nd edn.
- Carling, Gerd. 2000. *Die Funktionen der lokalen Kasus im Tocharischen*. Berlin: Mouton de Gruyter.
- Carr, Charles Telford. 1939. *Nominal compounds in Germanic*. London: St. Andrews University.
- Cassidy, Frederic G. & Richard N. Ringler. 1971. *Bright's Old English grammar & reader*. New York: Holt, Rinehart and Winston 3rd edn.
- Cathey, James E. 2000. *Old Saxon*. München: Lincom Europa.
- Chandralal, Dileep. 2010. *Sinhala*. Amsterdam, Philadelphia: John Benjamins.
- Chang, Will, Chundra Cathcart, David Hall & Andrew Garrett. 2015. Ancestry-constrained phylogenetic analysis supports Indo-European steppe hypothesis. *Language* 91. 194 – 244.
- Cojocaru, Dana. 2004. *Romanian grammar*. Durham, NC: Slavic and East European Language Research

- Center (SEELRC), Duke University.
- Corbett, Greville G. 1987. The morphology/syntax interface: evidence from possessive adjectives in Slavonic. *Language* 299–345.
- David, Anne. 2014. *Descriptive Grammar of Pashto and its Dialects*. Boston: Walter de Gruyter.
- Donaldson, Bruce C. 1993. *A grammar of Afrikaans*. Berlin, New York: Mouton De Gruyter.
- Dum-Tragut, Jasmine. 2009. *Armenian: Modern Eastern Armenian*, vol. 14 London Oriental and African Language Library. Amsterdam, Philadelphia: John Benjamins.
- Durkin-Meisterernst, Desmond. 2014. *Grammatik des Westmitteliranischen (Parthisch und Mittelpersisch)*. Wien: Verlag der Österreichischen Akademie der Wissenschaften.
- Duroiselle, Charles. 1997. *A Practical Grammar of the Pāli Language*. Lismore, Australia: Buddha Dharma Education Association 3rd edn.
- Endzelins, Jānis. 1971. *Comparative phonology and morphology of the Baltic languages*. The Hague & Paris: Mouton.
- Ernault, Emile. 1887. La vie de sainte Catherine. *Revue Celtique* 8. 76–95.
- Erschler, David. 2016. Ossetic. In Peter O. Mueller, Ingeborg Ohnheiser, Susan Olsen & Franz Rainer (eds.), *Word-Formation. An International Handbook of the languages of Europe*, vol. 5, chap. 173, 3157–3179. Berlin, Boston: Mouton De Gruyter.
- Española, Real Academia. 2010. *Nueva gramática de la lengua española*. Espasa.
- Evans, D. Simon. 1964. *A Grammar of Middle Welsh*. Dublin: Dublin Institute for Advanced Studies.
- Faarlund, Jan Terje. 2004. *The Syntax of Old Norse. With a survey of the inflectional morphology and a complete bibliography*. Oxford: Oxford University Press.
- Fahs, Achim. 1989. *Grammatik des Pali*. Leipzig: Verlag Enzyklopädie 2nd edn.
- Fleischer, Jürg & Oliver Schallert. 2011. *Historische Syntax des Deutschen. Eine Einführung*. Tübingen: Narr.
- Fruyt, Michèle. 2002. Constraints and productivity in Latin nominal compounding. *Transactions of the Philological Society* 100(3). 259–287.
- Gair, James W. 1970. *Colloquial Sinhalese clause structures*. The Hague: Mouton De Gruyter.
- Gignoux, Philippe & A. Tafazzoli (eds.). 1993. *Anthologie de Zādspram. Édition critique du texte pehlevi*. Paris: Association pour l'Avancement des Etudes Iraniques.
- Godel, Robert. 1975. *An introduction to the Study of Classical Armenian*. Wiesbaden: Reichert.
- Gönczöl-Davies, Ramona. 2008. *Romanian: An Essential Grammar*. New York: Routledge.
- Grierson, George A. 1909. *An introduction to the Maithili dialect of the Bihārī language as spoken in North Bihār*. Calcutta: Asiatic Society of Bengal [2nd edition].
- Grossmann, Maria. 2012. Romanian compounds. *Probus* 24(1).
- Hancock, Ian. 1995. *A handbook of Vlax Romani*. Columbus, OH: Slavica Publishers.
- Harðarson, Gísli Rúnar. 2016. Peeling away the layers of the onion: on layers, inflection and domains in Icelandic compounds. *Journal of Comparative German Linguistics* 19. 1–47.
- Haug, Dag T. T. & Marius L. Jøhndal. 2008. Creating a Parallel Treebank of the Old Indo-European Bible Translations. In Caroline Sporleder & Kiril Ribarov (eds.), *Proceedings of the Second Workshop on Language Technology for Cultural Heritage Data (LaTeCH)*, 27–34.
- Hawkins, J. David. 2000. *Corpus of Hieroglyphic Luwian Inscriptions. Vol. 1 Inscriptions of the Iron Age*. Berlin/New York: de Gruyter.
- Hemon, Roparz. 1975. *A historical morphology and syntax of Breton*. Dublin: Dublin Institute for Advanced Studies.
- Hemon, Roparz. 1976–1998. *Geriadur istorel ar brezhoneg*. Plomelin: Preder 2nd edn.
- Hickey, Raymond. 2011. *The dialects of Irish: Study of a changing landscape*. Berlin, Boston: De Gruyter.

- Hinüber, Oskar von. 2001. *Das ältere Mittelindisch im Überblick*. Vienna: Österreichische Akademie der Wissenschaften 2nd edn.
- Hoffmann, Karl & Bernhard Forssman. 1996. *Avestische Laut- und Flexionslehre*. Innsbruck: Innsbrucker Beiträge zur Sprachwissenschaft.
- Hoffner, Harold & H. Craig Melchert. 2008. *A Grammar of the Hittite language*. Winona Lake, ID: Eisenbrauns.
- Holmes, Philip & Ian Hinchliffe. 2013. *Swedish: a comprehensive grammar*. London: Routledge.
- Huntley, David. 1993. Old Church Slavonic. In Bernard Comrie & Greville G. Corbett (eds.), *The Slavonic languages*, 125–187. London: Routledge.
- Hægestads, Marius & Alf Torp. 1909. *Gamalnorsk ordbok*. Kristiania: Norske Samlaget.
- Igla, Birgit. 1996. *Das Romani von Ajia Varvara: deskriptive und historisch-vergleichende Darstellung eines Zigeunerndialekts*. Wiesbaden: Harrassowitz.
- Jahani, Carina & Agnes Korn. 2009. Balochi. In Gernot Windfuhr (ed.), *The Iranian Languages*, 634–692. New York: Routledge.
- Kastovsky, Dieter. 2006. Vocabulary. In Richard Hogg & David Denison (eds.), *A history of the English language*, chap. 4, 199–270. Cambridge: Cambridge University Press.
- King, Gareth. 2003. *Modern Welsh: A Comprehensive Grammar*. London, New York: Routledge.
- Klein, Thomas, Hans-Joachim Solms & Klaus-Peter Wegera. 2009. *Mittelhochdeutsche Grammatik: Wortbildung*, vol. 3. Tübingen: Niemeyer.
- Kotin, Michail L. 2012. *Gotisch im (diachronen und typologischen) Vergleich*. Heidelberg: Winter.
- Krause, Wolfgang & Werner Thomas. 1960. *Tocharisches Elementarbuch – Grammatik*, vol. 1. Heidelberg: Winter.
- Kress, Bruno. 1982. *Isländische Grammatik*. München: Hueber.
- Lazard, Gilbert. 1992. *A grammar of contemporary Persian*. Costa Mesa, CA: Mazda Publishers.
- Le Berre, Yves. 2011. *La passion et la résurrection bretonnes en 1530*. Brest: C.R.B.C.
- Lötzsch, Ronald. 1965. Das sog. Possessivadjektiv im Slawischen, speziell im Sorbischen, und seine Stellung im System der Redeteile. *Forschungen und Fortschritte* 39. 377–379.
- Macdonell, Arthur Anthony. 1916. *A Vedic Grammar for Students*. Oxford: Clarendon Press.
- MacKenzie, David N. 1979. Mani's Šāhburagān I. *Bulletin of the School of Oriental and African Studies* 41. 499–511.
- Mackridge, Peter. 1985. *The Modern Greek Language*. Oxford: Oxford University Press.
- Maiden, Martin & Cecilia Robustelli. 2007. *A reference grammar of modern Italian*. London: Routledge 2nd edn.
- Masica, Colin P. 1991. *The Indo-Aryan languages*. Cambridge: Cambridge University Press.
- Matras, Yaron. 2002. *Romani – A Linguistic Introduction*. Cambridge: Cambridge University Press.
- Melchert, H. Craig. 2008. Luvian. In Roger D. Woodard (ed.), *The Ancient Languages of Asia Minor*, Cambridge: Cambridge University Press.
- Montaut, Annie. 2004. *A grammar of Hindi*. München: Lincom Europa.
- Morris Jones, John. 1913. *A Welsh Grammar*. Oxford: Clarendon.
- Mossé, Fernand. 1952. *A Handbook of Middle English*. Baltimore: Johns Hopkins Press.
- Neukom, Lukas & Manideepa Patnaik. 2003. *A grammar of Oriya* (ASAS 17). Universität Zürich.
- Newmark, Leonard, Philip Hubbard & Peter Prifti. 1982. *Standard Albanian: a reference grammar for students*. Stanford, CA: Stanford University Press.
- Norde, Muriel. 2013. Tracing the origins of the Swedish group genitive. In Anne Carlier & Jean-Christophe Verstraete (eds.), *The Genitive*, 299–332. Amsterdam, Philadelphia: John Benjamins.
- Ó Siadhail, Mícheál. 1980. *Learning Irish: an introductory self-tutor*. Dublin: Dublin Institute for Advanced

- Studies.
- Ó Siadhail, Mícheál. 1989. *Modern Irish. Grammatical Structure and Dialectal Variation*. Cambridge: Cambridge University Press.
- Oberlies, Thomas. 2001. *Pāli: A Grammar of the Language of the Theravāda Tipiṭaka*. Berlin, New York: Walter de Gruyter.
- Pandharipande, Rajeshwari V. 1997. *Marathi*. London: Routledge.
- Paul, Hermann. 1998. *Mittelhochdeutsche Grammatik. überarbeitet von Peter Wihl und Siegfried Grosse*. Tübingen: Niemeyer 24th edn.
- Payne, Annick. 2004. *Hieroglyphic Luwian*. Wiesbaden: Harrassowitz.
- Pilch, Herbert. 1970. *Altenglische Grammatik*. München: Hueber.
- Prauliņš, Dace. 2012. *Latvian: An essential grammar* Routledge Essential Grammars. Routledge.
- Prell, Heinz-Peter. 2005. Zur Neubearbeitung der mittelhochdeutschen Syntax von Ingeborg Schröbler. Mit einem Vergleich von Vers- und Prosatexten am Beispiel der Nominalphrase. In Claudia Wich-Reif & Yvon Desportes (eds.), *Syntax: Althochdeutsch-Mittelhochdeutsch: eine Gegenüberstellung von Metrik und Prosa: Akten zum internationalen Kongress an der Freien Universität Berlin, 26. bis 29. Mai 2004*, 209–222. Berlin: Weidler.
- Press, Ian. 1986. *A grammar of modern Breton*. Berlin, New York: Mouton de Gruyter.
- Ralli, Angela. 2013. *Compounding in modern Greek*. Berlin: Springer.
- Roberge, Paul T. 1996. Multilevel syncretism and the evolution of Afrikaans periphrastic possessives with *se*. *Stellenbosch Papers in Linguistics* 30. 123–153.
- Ruthmann, Davina. 2007. *Entwicklung des Wortschatzes vom Mittelhochdeutsch bis zum Gegenwartsdeutsch*. Bergische Universität Wuppertal MA thesis.
- Sandahl, Stella. 2000. *A Hindi reference grammar*. Leuven: Peeters.
- Sauer, Hans. 1992. *Nominalkomposita im Frühmittelenglischen*. Tübingen: Mouton De Gruyter.
- Scatton, Ernest A. 1993. Bulgarian. In Bernard Comrie & Greville G. Corbett (eds.), *The Slavonic Languages*, 188–248. London, New York: Routledge.
- Schikowski, Robert. 2013. *Object-conditioned differential marking in Chintang and Nepali*: University of Zürich Doctoral dissertation.
- Schmalstieg, William R. 1987. *A Lithuanian historical syntax*. Columbus, OH: Slavica.
- Schönle, Paul Walter. 1975. *Zur Wortbildung im modernen Russisch*. München: Sagner.
- Schrijver, Peter. 2011. *Middle and Early Modern Breton* 359–429. Bremen: Hempen.
- Schrodt, Richard. 2004. *Althochdeutsche Grammatik II*. Tübingen: Niemeyer.
- Schuster-Šewc, Heinz. 1991. Zur lexikalischen Nomination im Sorbischen. *Zeitschrift für Slawistik* 36(2). 261–270.
- Schuster-Šewc, Heinz. 1996. *Grammar of the Upper Sorbian Language*. München, Newcastle: Lincom Europa.
- Schwyzer, Eduard. 1990a. *Griechische Grammatik*, vol. 2: Syntax und Syntaktische Stilistik. München: C.H.Beck 6th edn.
- Schwyzer, Eduard. 1990b. *Griechische Grammatik*, vol. 1: Lautlehre, Wortbildung, Flexion. München: C.H.Beck 6th edn.
- Skjærvø, Prods Oktor. 2009. Old Iranian. In Gernot Windfuhr (ed.), *The Iranian Languages*, 43–195. New York: Routledge.
- Skjærvø, Prods Oktor. 2009. *Middle West Iranian* 197–278. New York: Routledge.
- Smyth, Herbert Weir. 1920. *Greek Grammar for Colleges*. New York: American Book Company.
- Snell, Rupert & Simon Weightman. 2003. *Teach yourself Hindi*. London: Hodder and Stoughton Educational.

- Splett, Jochen. 2000. Wortbildung des Althochdeutschen. In Werner Besch, Anne Betten, Oskar Reichmann & Stefan Sonderegger (eds.), *Geschichte der deutschen Sprache und ihrer Erforschung*, vol. 2.2 Handbooks of Linguistics and Communication Science, chap. 76, 1213–1222. Berlin/New York: Walter de Gruyter 2nd edn.
- Stang, Christian S. 1966. *Vergleichende Grammatik der baltischen Sprachen*. Oslo/Bergen/Tromsø: Universitetsforlaget.
- Stone, Gerald. 1993. Sorbian. In Bernard Comrie & Greville G. Corbett (eds.), *The Slavonic Languages*, London, New York: Routledge.
- Tegey, Habibullah & Barbara Robson. 1996. *A Reference Grammar of Pashto*. Washington, D.C.: Center for Applied Linguistics.
- Thordarson, Fridrik. 2009. *Ossetic grammatical studies*. Wien: Verlag der Österreichischen Akademie der Wissenschaften.
- Thráinsson, Höskuldur. 1994. Icelandic. In Ekkehard König & Johan Van der Auwera (eds.), *The Germanic Languages*, chap. 6, 142–189. London, New York: Routledge.
- Thurneysen, Rudolf. 1909. *Handbuch des Alt-Irischen*. Heidelberg: Winter.
- Thurneysen, Rudolf. 1946. *A Grammar of Old Irish*. Dublin: Dublin Institute for Advanced Studies revised and enlarged edition with supplement edn.
- Tilakaratne, Sunanda. 1992. Spatial Expressions in Sinhala: Appearance of Verb Forms. *Kansas Working Papers in Linguistics* 17(1). 159–189.
- Timberlake, Alan. 2004. *A reference grammar of Russian*. Cambridge: Cambridge University Press.
- Vaillant, André. 1974. *Grammaire comparée des langues slaves: La formation des noms*, vol. IV. Paris: Ed. Klincksieck.
- Vallé, François. 1980. *Grand dictionnaire français-breton*. Glornel: Association bretonne de culture 2nd edn.
- Van Gelderen, Elly. 2014. *A history of the English language*. John Benjamins revised edition edn.
- Verma, Manindra K. 1971. *The structure of the noun phrase in English and Hindi*. Delhi: Motilal Banarsidass.
- Wackernagel, Jacob. 1905. *Altindische Grammatik: Einleitung zur Wortlehre. Nominalkomposition*, vol. 2 1. Göttingen: Vandenhoeck & Ruprecht.
- Wali, Kashi & Omkar N. Koul. 1996. *Kashmiri*. London, New York: Routledge.
- Warder, A. K. 2005 [1991]. *Introduction to Pāli*. Oxford: The Pali Text Society 3rd edn.
- Weiss, Michael L. 2009. *Outline of the Historical and Comparative Grammar of Latin*. Ann Arbor, MI: Beech Stave Press Inc.
- Widmer, Paul. 2017. Cases, paradigms, affixes and indexes. Selecting grammatical relations in Middle Breton. In Erich Poppe, Karin Stüber & Paul Widmer (eds.), *Referential properties and their impact on the syntax of Insular Celtic languages*, 217–242. Münster: Nodus.
- Wijesekera, O.H. de A. 1936. *Syntax of the Cases in Pali Nikayas*. Sri Lanka: The Postgraduate Institute of Pali and Buddhist Studies, University of Kelaniya PhD dissertation.
- Willis, David. 2009. Old and Middle Welsh. In Martin J. Ball & Nicole Müller (eds.), *The Celtic Languages*, 117–160. London, New York: Routledge.
- Windfuhr, Gernot & John R Perry. 2009. Persian and Tajik. In Gernot Windfuhr (ed.), *The Iranian Languages*, 416–544. London, New York: Routledge.
- Wright, Joseph. 1954. *Grammar of the Gothic Language*. Oxford: Clarendon Press.
- Yadav, Ramwatar. 1996. *A reference grammar of Maithili*. Berlin: Mouton de Gruyter.
- Yoshida, Daisuke. 1987. *Die Syntax des althethitischen substantivischen Genitivs*. Heidelberg: Winter.
- Zimmer, Stefan. 2000. *Studies in Welsh Word-Formation*. Dublin: Dublin Institute for Advanced Studies.