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Linguistic typology and usage frequency

MARTIN HASPELMATH
Max Planck Institute for Evolutionary Anthropology (Leipzig)

1. Grammatical typology and grammatical universals

Linguistic typology was about (non-genealogical) **language classification** for a long time, but since the 1970s, its main goal has been to find language universals.

Since 1808/1818/1822:

isolating/analytic languages vs.
synthetic/flective vs.
agglutinating languages

but what exactly do these terms mean?

Since (1963): the search for language universals has become more prestigious (Joseph Greenberg, 1915-2001)

We can distinguish three main types of robust **grammatical universals**:

– universals of **ordering** (e.g. Greenberg 1963; Dryer 1992)

e.g. SVO & prepositions (English-type),
SOV & postpositions (Japanese-type)

– universals of **coding length** (e.g. Greenberg 1966; Haspelmath 2021)

e.g. *book-Ø* vs. *book-**s**,*
Spanish *cant-Ø-a vs. cant-**ar**-á*
'sings' vs. 'will sing'

– universals of **coexpression** and **synexpression** (e.g. Kemp et al. 2018)

e.g. *sister* ‚female sibling' ≠ *brother* ‚male sibling'
vs. *cousin* 'male or female cousin'
(*cousin* colexifies both meanings)

I will argue that universals of coding length and universals of coexpression/synexpression have a close relationship with usage frequency.

2. Universals of ordering

e.g. Greenberg (1963: 62)

Universal 2.	In languages with prepositions, the genitive almost always follows the governing noun, while in languages with postpositions it almost always precedes.
Universal 3.	Languages with dominant VSO order are always prepositional.
Universal 4.	With overwhelmingly greater than chance frequency, languages with normal SOV order are postpositional.

Dryer (1992): correlations with the order of object and verb:

VO	OV
prepositional	postpositional
noun-genitive	genitive-noun
adjective-standard	standard-adjective

etc.

	English	Japanese
e.g.	***drink*** *water!*	*mizu o* ***nomu****!* (水を飲む)
	under *the table*	*teeburo no* ***shita ni*** （テーブルの下に）
	the ***roof*** *of the house*	*ie no* ***yane*** (家の屋根)
	bigger *than a mountain*	*yama yori* ***ookii*** (山より大きい)

These generalizations can be illustrated by the maps of the *World atlas of language structures* (Haspelmath et al. 2005).

Usage frequency plays no role in explaining these generalizations; they seem to be due to principles of efficient processing (see Dryer 1992; Hawkins 2004; Futrell et al. 2015).

3. Universals of coding length

There are quite a few recurrent coding asymmetries in the expression of grammatical meanings, as illustrated in Table 1.

Table 1: Examples of universal grammatical coding asymmetries

singular	plural	(*book – book-**s***)
present	future	(*go – **will** go*)
3rd person	2nd person	(Spanish *canta – canta-**s***)
nominative	accusative	(Hungarian *ember – ember-**t***)
affirmative	negative	(*go – **don't** go*)
allative	ablative	(*to – **from***)
positive	comparative	(*small – small-**er***)

– a ***coding asymmetry*** is a pattern in which languages may show the expected asymmetric or symmetric coding, but not "counter-symmetric coding"
(= asymmetric in the opposite direction)

e.g.	*book-Ø*	*book-s*	(English)
	ksiązk-a	*ksiązk-i*	(Polish)
	shu-Ø	*shu-Ø*	(Mandarin)
but not:	**book-sig*	**book-Ø*	

– "world-wide tendency" means that in any representative set of languages, there will be evidence for the asymmetry, or at least no counterevidence

	English	Polish	Turkish	Hebrew	Swahili	…
SINGULAR	*book*	*ksiązk-a*	*kitap*	*sefer*	*ki-tabu*	
PLURAL	*book-s*	*ksiązk-i*	*kitap-lar*	*sfar-im*	*vi-tabu*	

Proposed explanation:
the efficiency theory of asymmetric coding

Communication is facilitated for speakers and hearers (= is more efficient) if languages show a tendency to have **shorter shapes for more predictable information**.
Some meanings are conveyed more frequently, and are hence more ***predictable***, so these can be conveyed with shorter coding.

4. Universal coding asymmetries

Universal hypothesis:
If a language makes a coding contrast between meaning 1 (more frequent) and meaning 2 (less frequent), then meaning 1 shows a strong tendency to be coded with a shorter shape than meaning 2, and often by zero.

4.1. Singular vs. plural (vs. dual) (cf. Greenberg 1966)

	Hebrew	Khanty (Uralic)
SG	*yom*	*xot*
PL	*yam-**im***	*xot-**ət***
DL	*yom-**ayim***	*xot-**ŋən***
	'day(s)'	'house(s)'

4.2. Nominative vs. accusative (Greenberg 1963)

	English	German	Quechua
NOM	*he*	*Herr Kim*	*wasi* 'house'
ACC	*hi-**m***	*Herr-**n** Kim*	*wasi-**ta***

4.3. Second person vs. third person (Seržant & Moroz 2022)

	German	Spanish	Arabic
2nd	*komm-st*	*viene-s*	*katab-ta*
3rd	*komm-t*	*viene-Ø*	*katab-a*

4.4. Allative vs. ablative marking

	English	Sri Lanka Portuguese	Principense
ALLATIVE	*to*	*maaket* 'to the market'	*fya* 'to the market'
ABLATIVE	***from***	*kaaza **impa*** 'from home'	***fo** fya* 'from the market'

4.5. Male vs. female occupational terms

	Latin	German	Hungarian
MALE	*rex*	*König*	*király*
FEMALE	*reg-**ina***	*König-**in***	*király-**nő***

4.6. Positive vs. comparative vs. superlative (Bobaljik 2012)

	English	Hungarian	French
positive	*small*	*kis*	*petit*
comparative	*small-**er***	*kis-**ebb***	***plus** petit*
superlative	*small-**est***	***leg**-kis-**ebb***	***le** plus **petit***

4.7. Cardinal numerals vs. ordinal numerals (cf. Stolz 2001: 519)

	English	Japanese	Lezgian
CARDINAL	*seven*	*nanatsu*	*irid*
ORDINAL	*seven-th*	*nanatsu-me*	*irid lahaj*

4.8. Present tense vs. future tense (cf. Greenberg 1966)

	English	Latin	Kiribati
PRS	*they praise*	*lauda-nt*	e *taetae* 'he speaks'
FUT	*they* ***will*** *praise*	*lauda-****b****-unt*	e ***na*** *taetae* 'he will speak'

4.9. Affirmative vs. negative (Miestamo 2005)

	Hebrew	English	Egyptian Arabic
AFF	*katavti*	*I wrote*	*šuf-t* 'I saw'
NEG	***lo*** *katavti*	*I did****n't*** *write*	***ma*** *šuft-ti-****š*** 'I didn't see'

5. Short form corresponds to high frequency

some corpus frequencies (BNC of English, 100 million words):

small	42,738	*hot*	8,633
smaller	7,101	*hotter*	179
seven	16,878	*he*	633,413
seventh	1,437	*him*	152,045

(1)**The form-frequency correspondence universal**
Languages tend to have shorter shapes for more frequent meanings.

(2)**The grammatical form-frequency correspondence hypothesis**
When two grammatical meanings that differ minimally (i.e. that form a semantic opposition) occur with significantly different frequencies, the less frequent meaning tends to be overtly coded (or coded with more segments), while the more frequent meaning tends to be zero-coded (or coded with fewer segments).

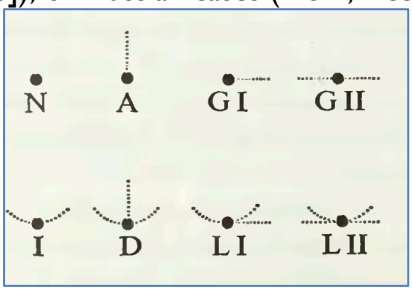
(3) causal chain:
frequency of use —> predictability —> shortness of coding

6. An explanation in terms of markedness?

Jakobson (1932):

- grammatical categories are often semantically asymmetric
- one member of an opposition is **marked**, the other one is **unmarked**

e.g. Jakobson (1936[1971:66]), on Russian cases (Nom, Acc, Gen, Instr, Dat, Loc):



Can we say in general that the **unmarked member** of the opposition lacks a marker, while the **marked member** has a marker?

> Jakobson did not make this claim explicitly, and he did not carry out cross-linguistic surveys.

But Greenberg (1966) made this claim very explicit, and he gave a substantial number of examples from different areas of grammar.

But does markedness "explain" anything? According to Greenberg, text frequency is an important correlate of markedness:

- unmarked categories are frequent
- marked categories are rare

Greenberg (1966: 14):

> Another important characteristic of unmarked and marked categories noted by Trubetzkoy is that of text frequency. In general the unmarked category has higher frequency than the marked. It is of some interest to note that George K. Zipf, in his pioneering studies of language frequency phenomena, had arrived at the same hypotheses by a different, but, as can be shown, ultimately related route, and some of his results are quoted by Trubetzkoy. For,

Jakobson was not particularly interested in frequency of use, but Greenberg was very much interested in linking language structures to language use. He did not spell the idea out in detail, but he noted that frequency may be **the explanatory factor** in grammatical "markedness asymmetries":

> While frequency is thus merely a resultant, though a very important one, of overall diachronic tendencies in phonology, it is tempting to adjudge its role in grammar-semantics as primary.

This inspired me to suggest that one should replace "markedness" by usage frequency (Haspelmath 2006).

7. An explanation in terms of naturalness?

Dressler and Mayerthaler proposed in the 1980s that coding asymmetries should be explained by **"diagrammatic iconicity"**, a kind of "naturalness explanation" (Mayerthaler 1981; Dressler 1985; cf. Gaeta 2019).

Iconicity: "more meaning corresponds to more form"

e.g.	*dog*	*dog* + *s*
	'dog'	'dog' + 'PL'

According to Dressler and Mayerthaler, this is "more natural" than, say, subtractive morphology and therefore much more common.

recall:	*book-Ø*	*book-s*	(English)
	książ-k-a	*książ-k-i*	(Polish)
	shu-Ø	*shu-Ø*	(Mandarin)
but not:	**book-sig*	**book-Ø*	

A vocal critic of their "naturalness theory" was Witold Mańczak (e.g. 1982; 2000), e.g.

> Mayerthaler est persuadé que ce n'est pas la fréquence mais le caractère marqué ou non marqué des éléments linguistiques qui joue un rôle primordial dans la langue, comme en témoigne la citation suivante (p. 140): "Frequenzargumente lassen sich unseres Erachtens in der morphologietheoretischen Diskussion… kaum argumentativ einsetzen.
>
> A notre avis, c'est précisément la fréquence qui constitue une clef pour l'intelligence de la langue.

(1982: 146)

I first heard about Mańczak's work on frequency of use through Bybee (1985), who was strongly inspired by Greenberg. Bybee had met Mańczak in Poland in 1976 and 1978, at conferences organized by Jacek Fisiak.

Mańczak not only criticized Dressler and Mayerthaler, but also Greenberg (1966):

> Le reproche le plus important qu'on puisse faire au livre de Greenberg, c'est qu'il complique énormément les choses, tandis que la réalité linguistique est beaucoup plus simple: les termes 'marqué' et 'non marqué' (qu'ils soient employés dans un sens étroit ou large) sont complètement superflus; en outre, deux lois suffisent pour remplacer les neufs critères proposés par le linguiste américain.

(Mańczak 1970: 31)

Mańczak claims that Greenberg's nine "markedness criteria" can be replaced by two simple laws:

- **Zipf's Law of Abbreviation**:
  frequently used elements are generally ***shorter*** than rarely used elements

- **Mańczak's Law of Differentiation** (Haspelmath 2024)
  frequently used linguistic elements are generally ***more differentiated***
  than rarely used elements

For example, Greenberg observes that plural forms generally show fewer gender and case distinctions than singular forms, e.g.

	Singular	Plural
Nom.	homō	hominēs
Gen.	hominis	hominum
Dat.	hominī	hominibus
Acc.	hominem	hominēs
Abl.	homine	hominibus

Here, Mańczak would say that the plural is less differentiated because it is less frequent.

I conclude:

- Jakobson was not right that markedness can explain coding asymmetries
  (but cf. Kiparsky & Tonhauser 2012)
- Greenberg was right that frequency plays an important role in coding asymmetries
- Mańczak (1970) was the first to state this clearly
- Mayerthaler (1981), Dressler and others were wrong to suggest that iconicity is needed to explain these tendencies; Mańczak's critique was well-taken

8. Ergative and accusative alignment: A coexpression universal

Ergative alignment: P = S vs. A

(4) Lezgian (Mel'čuk 1988: 212-213, adjusted)
a. *Ruš-**a*** *zi* *perem-Ø* *gazun-na.*
girl-**ERG** my shirt-ABS tear-AOR
A P
'The girl tore my shirt.'

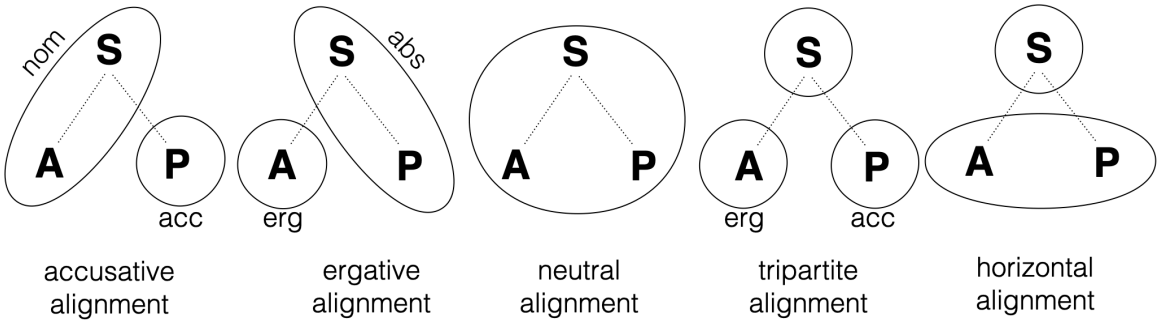
b. *Ruš-Ø* *aluq^{h}-na.*
girl-ABS fall-AOR
S
'The girl fell.'

Accusative alignment: A = S vs. P

(5) Hungarian (Moravcsik 1978: 257, 259)
a. *János-Ø* *elült-ette* *a* *fák-**at*** *a* *kert-ben.*
János-NOM plant-PST.3SG.DEF the tree-**ACC** the garden-INESS
A P
'János planted the trees in the garden.'

b. *János-Ø* *átúsz-ott* *a* *tav-on.*
János-NOM swim-PST.3SG the lake-SUPERESS
S
'Jan swam across the lake.'

The logical possibilities are usually presented in this way:



But only the first three are widely attested, e.g. in Comrie (2005).

Tripartite alignment is very rare, and horizontal alignment is practically unattested – for good functional reasons:

- tripartite alignment makes too many distinctions
- horizontal alignment makes the wrong distinction

The familiar three argument-types S, A and P represent an instance of a **"semantic map"** (Haspelmath 2003) or **coexpression diagram** (Haspelmath 2024).

Three further coexpression diagrams:

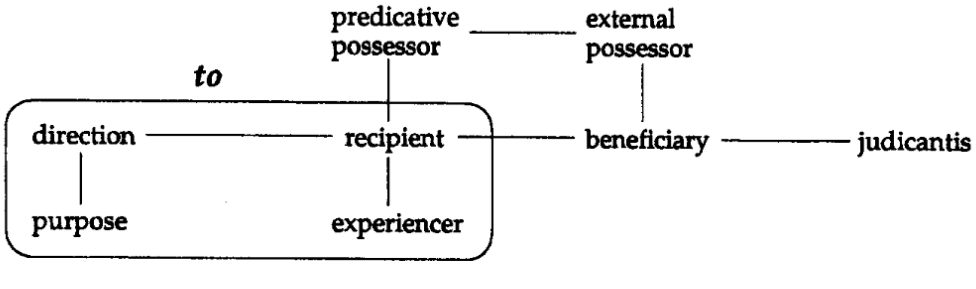


FIG. 8.1. A semantic map of typical dative functions/the boundaries of English *to*.

(Haspelmath 2003)

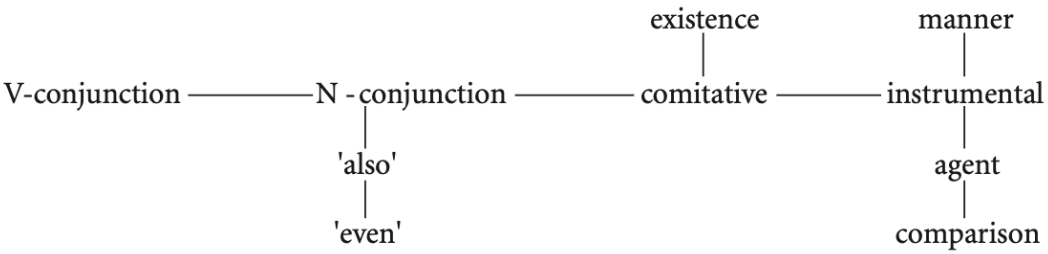
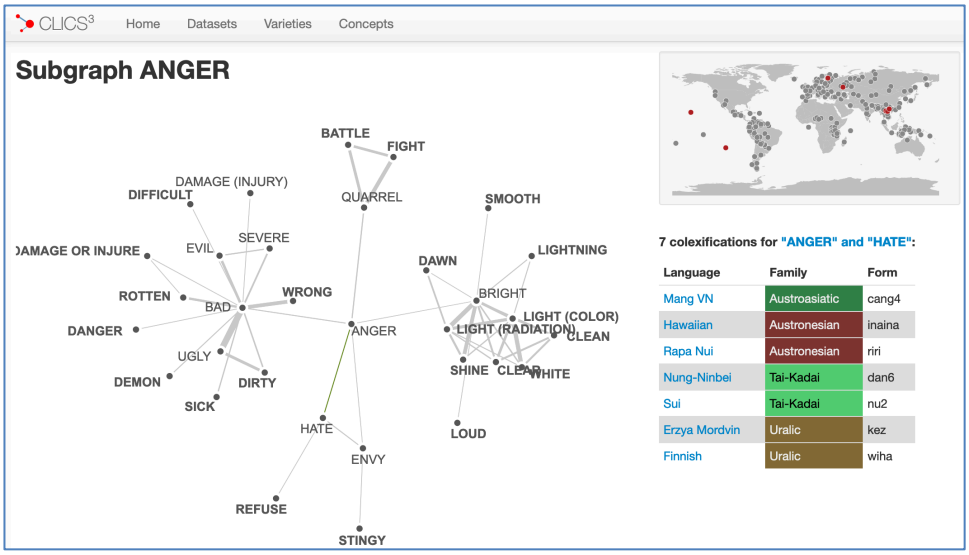


Figure 1. A semantic map for conjunction and related notions

(Haspelmath 2004)

CLICS subgraphs: (https://clics.clld.org/graphs/subgraph_82)



Lexical coexpression patterns were also considered by Milewski (1965):

	węgierskie	niemieckie	polskie	malajskie
'brat starszy'	*bâtya*	*Bruder*	*brat*	*sudarā*
'brat młodszy'	*öcs*			
'siostra starsza'	*néne*	*Schwester*	*siostra*	
'siostra młodsza'	*húg*			

Jak widzimy, grupa ta rozczłonkowana jest w języku węgierskim na cztery klasy związane z czterema różnymi wyrazami, w języku niemieckim i polskim na identyczne dwie klasy, w języku malajskim zaś wcale nie jest podzielona. Możemy więc powiedzieć, że pod tym względem język polski i niemiecki należą do jednego typu, który przeciwstawia się tak typowi węgierskiemu, jak i malajskiemu.

(Lexical coexpression is now typically called ***colexification***, e.g. List et al. 2018)

Milewski did not propose any lexical universals, but he also extended the coexpression approach to grammatical marking:

Stosunki składniowe członu niekonstytutywnego do członu konstytutywnego:	Typy syntaktyczne: 1	2	3	4	5	6	
podmiotu do orzeczenia	*a*	*a*	*a*	*a*	*a*	*a*	**intransitive subject (S)**
agensa do orzeczenia	*a*	*b*	*a*	*b*	*a*	*b*	**transitive subject (A)**
pacjensa do orzeczenia	*b*	*a*	*b*	*a*	*b*	*a*	**transitive object (P)**
członu określającego do członu określanego	*c*	*c*	*b*	*b*	*a*	*a*	**possessor**

Type (1): S = A vs. P vs. possessor: Polish

Type (2): S = P vs. A vs. possessor: Caucasian languages, such as Lezgian

Type (3): S = A vs. P = possessor: Hopi (accusative = genitive)

Type (4): S = P vs. A = possessor: Eskimo (ergative = genitive)

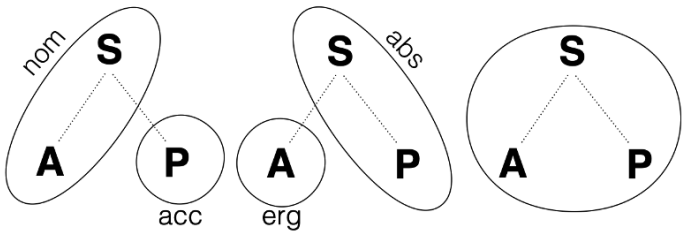
Milewski on Type (2) languages (ergative languages):

> W językach tego typu brak formalnej różnicy między zdaniami przechodnimi i nieprzechodnimi. Wszystkie z naszego punktu widzenia są nieprzechodnie. Podmiotem formalnym, który zgadza się z orzeczeniem, jest pacjens, agens zaś jest traktowany jako coś w rodzaju okolicznika narzędzia. Obok zdania *sarna śpi* stoi zdanie *sarna zabita ojcem.* Obie te konstrukcje są nieprzechodnie, choć druga odpowiada znaczeniowo naszemu zdaniu przechodniemu *ojciec zabił sarnę.*

(This sounds very much like what Mel'čuk (1988) said about Lezgian, an East Caucasian language – maybe he was influenced by Milewski? Mel'čuk definitely influenced me, and as a result, I studied the Lezgian language in the early 1990s.)

9. Ergative and accusative case-marking: A coding length universal

Ergative alignment:	P = S	vs. A
Accusative alignment:	A = S	vs. P



accusative alignment | ergative alignment | neutral alignment

In addition to the coexpression universal, there is also a coding length universal:

Universal:
If a language has a nominative-accusative distinction, then the **accusative** marking is longer than the nominative marking.
If a language has an ergative-absolutive distinction, then the **ergative** marking is longer than the absolutive marking.

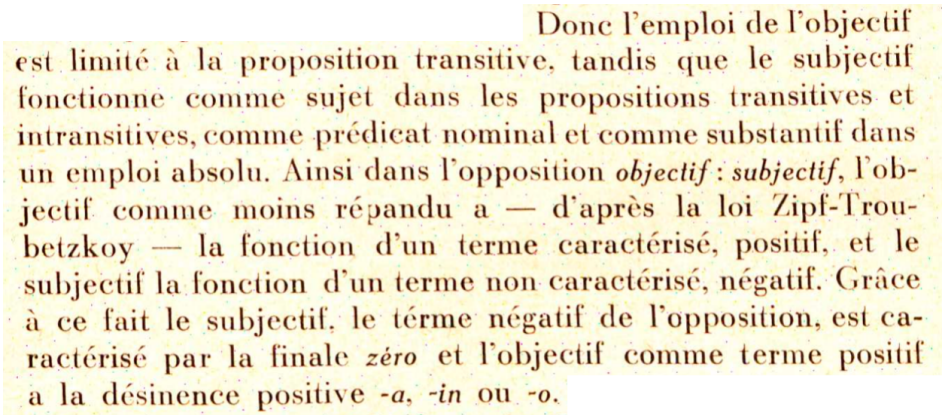
Lezgian	absolutive	*ruš*	'girl'
	ergative	*ruš-a*	'girl'
Hungarian	nominative	*fák*	'tree'
	Accusative	*fák-at*	'tree'

38. Where there is a case system, the only case which ever has only zero allomorphs is the one which includes among its meanings that of the subject of the intransitive verb.

(Greenberg's 1963 Universal 38)

Recall that coding length universals are due to frequency of use: frequently occurring grammatical meanings are expressed by short forms or zero.

Milewski (1950: 164) made precisely this observation about the nominative vs. accusative contrast:



Donc l'emploi de l'objectif est limité à la proposition transitive, tandis que le subjectif fonctionne comme sujet dans les propositions transitives et intransitives, comme prédicat nominal et comme substantif dans un emploi absolu. Ainsi dans l'opposition *objectif* : *subjectif*, l'objectif comme moins répandu a — d'après la loi Zipf-Trubetzkoy — la fonction d'un terme caractérisé, positif, et le subjectif la fonction d'un terme non caractérisé, négatif. Grâce à ce fait le subjectif, le térme négatif de l'opposition, est caractérisé par la finale *zéro* et l'objectif comme terme positif a la désinence positive *-a*, *-in* ou *-o*.

The **accusative is less frequent** ("moins répandu") and is thus "characterized positively", as a consequence of the "Zipf-Trubetzkoy Law".

It is not easy to find generalizations about accusative and ergative constructions, but this one has turned out to be robust – and the correct explanation was found in 1950, long before these ideas were discussed widely among linguists.

10. Universals of synexpression

coexpression (of two meanings A and B) = expression of either A or B in a form (alternatively)

synexpression (of two meanings A and B) = expression of both A or B in a form (simultaneously)

e.g. Polish *-ami* synexpresses 'plural' and 'instrumental'
English *bitch* synexpresses 'dog' and 'female'

– ***coexpression*** means that a form **does not differentiate** where it might be expected to differentiate

– ***synexpression*** means that a form **differentiates** where it might be expected not to differentiate

Consider Milewski's kinship terms again:

	węgierskie	niemieckie	polskie	malajskie
'brat starszy'	*bâtya*	*Bruder*	*brat*	*sudarā*
'brat młodszy'	*öcs*			
'siostra starsza'	*néne*	*Schwester*	*siostra*	
'siostra młodsza'	*húg*			

– From the perspective of English, Hungarian *öcs* **syllexifies** 'brother' and 'younger' (it overdifferentiates).

– From the perspective of Polish, Malay *sudarā* **colexifies** 'brat' (brother)' and siostra' (sister) (it underdifferentiates)

Syllexification patterns have often been discussed under the heading of **"lexicalization patterns"** (Talmy 1985; Levin & Rappaport Hovav 2019), but primarily for verbal event representation.

The most interesting universal of synexpression is Mańczak's Law (already mentioned above):

> **Mańczak's Law of Differentiation** (1966: 84)
> More frequently used linguistic elements are generally more differentiated than less frequently used elements.

Table 2. Syllexification in higher-frequency words (Mańczak 1966; 1970)

	highly frequent			***less frequent***		
English	*drink*	*drank*		*consume*	*consum-ed*	
French	*aller*	*va*	'go (INF/3SG)'	*marcher*	*marche*	'walk (INF/3SG)'
French	*père*	*mère*	'father/mother'	*directeur*	*directr-ice*	'director'
Polish	*dwa*	*drugi*	'two/second'	*dziesięć*	*dziesiąt-y*	'ten(th)'
Italian	*buono*	*migliore*	'good/better'	*nuovo*	*più nuovo*	'newe(er)'
Russian	*idët*	*šel*	'goes/went'	*igraet*	*igra-l*	'play(ed)'
German	*Hengst*	*Stute*	'stallion/mare'	*Löwe*	*Löw-in*	'lion(ess)'

Note also a very puzzling phenomenon:

synexpression of "unrelated" meanings

e.g. French *au garçon* (*au* [o], < *à le*) '[to [the boy]]'

e.g. English *they're coming* [ðɛə kʌmɪŋ] '[they [are coming]]'

When meanings are highly frequent, they can be synexpressed even when they are not directly related.

In inflection, this is called ***cumulative exponence***, e.g.

Latin		SG	PL	
	NOM	*can-is*	*can-es*	'dog(s)'
	GEN	*can-is*	*can-um*	
	DAT	*can-i*	*can-ibus*	
	ACC	*can-em*	*can-es*	
	ABL	*can-e*	*can-ibus*	

But what explains this regularity?

Tentative explanation:

Rare expressions must be long (due to Zipf's Law of Abbreviation), and roots cannot be too long – there is a universal **Root Size Constraint**:

> In all languages, **roots are preferably monosyllabic or bisyllabic**, and longer roots are less preferred the longer they are.
>
> e.g. *dog, cat, horse, bee*
> *pigeon, beetle, zebra, sparrow*
>
> uncommon: *chimpanzee, flamingo, caribou*
> *caterpillar, alligator, cassowary*

(But why is this so? There is no good explanation, it seems...)

I would like to suggest:

> Lower-frequency meanings must be expressed by form sequences because of the Root Size Constraint: They are **too rare to be expressed as minimal forms**, because they would be too long.

Consider the following contrasting pairs:

elephant	*young elephant*	
dog	***puppy*** (= young + dog)	(*puppy* synexpresses both meanings)
fifty	*fifty-two*	
ten	***twelve*** (= ten + two)	(*twelve* syllexifies both meanings)
cousin	*female cousin*	
sibling	***sister*** (= female + sibling)	(*sister* syllexifies both meanings)

The combinations 'young elephant', 'fifty plus two' and 'female cousin' are simply too rare to get short roots of their own, and long roots are impossible – thus, they must be expressed by form sequences.

11. Concluding remarks

- linguistic typology used be concerned with classifying languages, but the interest has shifted to identifying universals (after 1963)

- word order universals are the best-known worldwide generalizations, and they still play an important role (they are not related to usage frequency)

- universals of coding length (asymmetric coding) are best explained by usage frequency and predictability (as noted by Greenberg, and especially by Mańczak) – not by "markedness" or "naturalness"

- universals of alignment (accusative, ergative) are partly universals of coexpression, and partly universals of coding length

- Milewski (1950; 1965) developed ideas about alignment patterns that had little influence, but turned out to be on the right track

- Mańczak's Law of Differentiation is an important contribution to our understanding of synexpression patterns and deserves to be much better known

References

Bobaljik, Jonathan David. 2012. *Universals in comparative morphology: Suppletion, superlatives, and the structure of words*. Cambridge, MA: MIT Press.

Bybee, Joan L. 1985. *Morphology: A study of the relation between meaning and form*. Amsterdam: Benjamins.

Comrie, Bernard. 2005. Alignment of case marking. In Haspelmath, Martin & Dryer, Matthew S. & Gil, David & Comrie, Bernard (eds.), *The world atlas of language structures*, 398–405. Oxford: Oxford University Press. ((http://wals.info/chapter/98))

Dressler, Wolfgang U. 1985. On the predictiveness of Natural Morphology. *Journal of Linguistics*. Cambridge University Press 21(2). 321–337. (doi:10.1017/S002222670001029X)

Dryer, Matthew S. 1992. The Greenbergian word order correlations. *Language* 68(1). 81–138.

Futrell, Richard & Levy, Roger P. & Gibson, Edward. 2020. Dependency locality as an explanatory principle for word order. *Language*. Linguistic Society of America 96(2). 371–412. (doi:10.1353/lan.2020.0024)

Greenberg, Joseph H. 1963. Some universals of grammar with particular reference to the order of meaningful elements. In Greenberg, Joseph H. (ed.), *Universals of language*, 73–113. Cambridge, MA: MIT Press.

Greenberg, Joseph H. 1966. *Language universals: With special reference to feature hierarchies*. The Hague: Mouton.
Haspelmath, Martin & Dryer, Matthew & Gil, David & Comrie, Bernard (eds.). 2005. *The world atlas of language structures*. Oxford: Oxford University Press.
Haspelmath, Martin. 2003. The geometry of grammatical meaning: Semantic maps and crosslinguistic comparison. In Tomasello, Michael (ed.), *The New Psychology of Language, volume 2*, 211–243. New York: Lawrence Erlbaum. (10.5281/zenodo.831410)
Haspelmath, Martin. 2004. Coordinating constructions: An overview. In Haspelmath, Martin (ed.), *Coordinating constructions*, 3–39. Amsterdam: Benjamins.
Haspelmath, Martin. 2006. Against markedness (and what to replace it with). *Journal of Linguistics* 42(1). 25–70. (doi:10.1017/S0022226705003683)
Haspelmath, Martin. 2021. Explaining grammatical coding asymmetries: Form-frequency correspondences and predictability. *Journal of Linguistics* 57(3). 605–633. (doi:10.1017/S0022226720000535)
Haspelmath, Martin. 2024. Coexpression and synexpression patterns across languages: Comparative concepts and possible explanations. *Frontiers in Psychology (to appear)*. (https://ling.auf.net/lingbuzz/007402)
Hawkins, John A. 2004. *Efficiency and complexity in grammars*. Oxford: Oxford University Press.
Jakobson, Roman. 1932. Zur Struktur der russischen Verbums. Pražskỳ Linguistickỳ Kroužek.
Kemp, Charles & Xu, Yang & Regier, Terry. 2018. Semantic typology and efficient communication. *Annual Review of Linguistics* 4(1). 109–128. (doi:10.1146/annurev-linguistics-011817-045406)
Kiparsky, Paul & Tonhauser, Judith. 2012. Semantics of inflection. In Maienborn, Claudia & von Heusinger, Klaus & Portner, Paul (eds.), *Semantics: An international handbook of natural language meaning*, 2070–2097. Berlin: De Gruyter Mouton.
Levin, Beth & Rappaport Hovav, Malka. 2019. Lexicalization patterns. In Truswell, Robert (ed.), *The Oxford handbook of event structure*, 395–425. Oxford: Oxford University Press.
List, Johann-Mattis & Greenhill, Simon J. & Anderson, Cormac & Mayer, Thomas & Tresoldi, Tiago & Forkel, Robert. 2018. CLICS2: An improved database of cross-linguistic colexifications assembling lexical data with the help of cross-linguistic data formats. *Linguistic Typology* 22(2). 277–306. (doi:10.1515/lingty-2018-0010)
Mańczak, Witold. 1966. La nature du supplétivisme. *Linguistics* 4(28). 82–89. (doi:10.1515/ling.1966.4.28.82)
Mańczak, Witold. 1970. Sur la théorie die catégories "marquées" et "non-marquées" de Greenberg. *Linguistics* 8(59). 29–36. (doi:10.1515/ling.1970.8.59.29)
Mańczak, Witold. 1982. Review of: "Willi Mayerthaler, Morphologische Natürlichkeit." *Studies in Language* 6(1). 146–152. (doi:10.1075/sl.6.1.12man)
Mańczak, Witold. 2000. Criticism of naturalness: Naturalness or frequency of occurrence? *Folia Linguistica Historica* 34. 149–154. (doi:10.1515/flih.2000.21.1-2.149)
Mayerthaler, Willi. 1981. *Morphologische Natürlichkeit*. Wiesbaden: Athenaion.
Mel'čuk, Igor' A. 1988. *Dependency syntax: Theory and practice*. Albany: State University Press of New York.
Miestamo, Matti. 2005. *Standard negation: The negation of declarative verbal main clauses in a typological perspective*. Berlin: Mouton de Gruyter.
Milewski, Tadeusz. 1950. La structure de la phrase dans les langues indigènes de l'Amérique du Nord. *Lingua Posnaniensis*.
Milewski, Tadeusz. 1965. *Językoznawstwo*.
Moravcsik, Edith A. 1978. On the case marking of objects. In Greenberg, Joseph H (ed.), *Universals of human language*, vol. 4: Syntax, 249–289. Stanford: Stanford University Press. (https://zenodo.org/record/4688136)

Seržant, Ilja A. & Moroz, George. 2022. Universal attractors in language evolution provide evidence for the kinds of efficiency pressures involved. *Humanities and Social Sciences Communications* 9(1). 1–9. (doi:10.1057/s41599-022-01072-0)

Stolz, Thomas. 2001. ORDINALIA – Linguistisches Neuland: Ein Typologenblick auf die Beziehung zwischen Kardinalia und Ordinalia und die Sonderstellung von EINS und ERSTER. In Igla, Birgit & Stolz, Thomas (eds.), *Was ich noch sagen wollt... A multilingual festschrift for Norbert Boretzky on occasion of his 65th birthday*, 507–530. Berlin: Akademie-Verlag.

Talmy, Leonard. 1985. Lexicalization patterns. In Shopen, Timothy (ed.), *Language typology and syntactic description (Volume III)*, 57–149. Cambridge: Cambridge University Press.