UNIVERSITYOF BIRMINGHAM

Cognitive approaches to uniformity and variability in morphology

Milin, Petar; Bermel, Neil; Blevins, James P.

Document Version
Publisher's PDF, also known as Version of record

Link to publication on Research at Birmingham portal

Petar Milin*, Neil Bermel and James P. Blevins

Cognitive approaches to uniformity and variability in morphology

Abstract: This special issue of Cognitive Linguistics reexamines the notions of uniformity and variability within morphological systems from a cognitive linguistic standpoint. It challenges traditional perspectives that regard morphological variability as mere deviations from the norm, suggesting instead that such variability is systematic and shaped by external influences including language acquisition and processing constraints. The contributions in this issue promote a shift from isolated analysis to a holistic view of paradigms, classes, and systems, advocating for a framework where morphological structures are seen as integral to communicative and functional aspects of language. By accounting for the broad adaptive dynamics of language systems, the complex interplay between uniformity and variability is revealed as an inherent aspect of language usage.

Keywords: morphology; paradigms; classes; uniformity; variability

The initial idea for this special issue of Cognitive Linguistics was born in the aftermath of the workshop session "The imperfectability of morphology: from analogy to anomaly (and back again)" that took place during the 20th International Morphology Meeting in Budapest in 2022.[1] The issue aims to broaden the initial productive discussions in two related ways. The broader objective is to engage cognitive linguists, a group diverse in interests, with current initiatives and research in morphology that align with cognitive approaches. Importantly, contemporary morphological research emphasizes cognitive plausibility and ecological validity, aiming to explain linguistic patterns based on external factors influencing language

---

[1] See: <http://archive.nytud.hu/imm20/>; <http://archive.nytud.hu/imm20/workshops/Blevins-WS-prop-IMM20_2022.pdf>.

*Corresponding author: Petar Milin, Department of Modern Languages, University of Birmingham, Edgbaston, Ashley Building, Birmingham, B15 2TT, United Kingdom, E-mail: p.milin@bham.ac.uk. https://orcid.org/0000-0001-9708-7031

Neil Bermel, School of Languages and Cultures, University of Sheffield, Sheffield, UK,
E-mail: n.bermel@sheffield.ac.uk. https://orcid.org/0000-0002-1663-9322

James P. Blevins, Department of English, George Mason University, Fairfax, VA, USA,
E-mail: jblevin6@gmu.edu. https://orcid.org/0000-0002-9409-3740

acquisition, usage, and change. This convergence between cognitive and morphological studies suggests potential for mutual benefits and deeper collaboration within a shared endeavour. The second, more focused goal, providing a unifying theme for this issue's papers, invites a detailed reevaluation of *uniformity* and *variability* in morphology. Viewed from a functional and communicative angle, these concepts reveal the dynamic balances between cognitive pressures relevant to general learning and information processing. The findings in the individual papers are mainly drawn from broadly cognitive explanations, moving beyond the idealized assumptions of "language design" prevalent in earlier literature.

A striking shift in perspective brought by cognitive approaches is the understanding that uniform (or "regular") and variable (or "irregular") linguistic patterns naturally coexist as stable states within a dynamic communication system, which manages external pressures, especially from language usage and acquisition. Shifting from viewing variability as merely a deviation from a supposed norm of uniformity, we can systematically explore how languages manage these competing forces. The articles in this issue illustrate the advantages of this shift by reconsidering phenomena previously dismissed as "exceptions" or "anomalies" within frameworks that operate with *a priori notions of language design*, detached from functional and communicative considerations, while also treating language as distinctly separate from other cognitive structures and functions.

Morphological systems provide especially revealing test cases for an examination of the dynamic relationship between uniformity and variability, as they exhibit a wide range of patterns and phenomena that resist assimilation to any globally uniform norm. Much of this variability is persistent, i.e., systematic, reflecting principles of organization that are orthogonal to idealizations imported from normative approaches. The concept of "compositionality," crucial in syntax, lacks clear relevance in morphology, where system properties surpass the mere sum of individual parts – a proposal akin to a cognitive linguistic take on Gestalt principles (cf., Talmy 2008). An extensive literature, spanning from Matthews (1972) to Harris (2009), has also established the prevalence of often radical mismatches between *units of meaning* and *units of form*, though the possible functional reflexes of different types of mismatches largely remain a topic for future research. On fundamental questions regarding the basic elements of analysis, the usage-based and cognitive linguistic principle that word-level linguistic units exhibit inseparability of form-and-meaning introduces a novel, productive framework for theory and research. This aligns seamlessly with the contemporary word-and-paradigm models in morphology (Blevins 2016). The papers in this issue support a shift in analytical focus from isolated variants to paradigms, classes, and systems, and the effect of these affiliations on meaning and usage.

This reevaluation brings two main insights: one architectural, the other methodological. Architecturally, we understand better the balance between uniformity and system integration, challenging the strict division between describing uniform patterns and variable linguistic units. Relaxing this rigid qualitative distinction helps to account for the observation that perfectly uniform systems are, like completely random systems, unattested, while allowing for a more unified treatment of both types of phenomena. Methodologically, we see phenomena like *defectivity* (incomplete patterns) and *overabundance* (multiple pattern options) not as anomalies but as part of a continuum that also includes *canonical* instances as a limiting case rather than a privileged solution. Viewing these patterns as alternative strategies for filling *form slots* facilitates a deeper exploration of a range of neglected issues, including patterns of occurrence, general distributional regularities, and, more generally, the key role that function and usage play in shaping the grammatical conventions of a language. This integrated perspective meets morphological challenges and aligns with broader cognitive, functional, and communicative linguistic approaches.

1 The uniformity-variability symbiosis

All languages achieve a balance between uniform patterns and localized variations, and this dynamic is especially pronounced in morphological systems. In numerous grammatical frameworks, this balance is often viewed as a dichotomy: broad, general patterns adhere to central principles, while deviations are relegated as exceptions, anomalies, or minor divergences, not central to the linguistic structure. This approach conflicts with the common occurrence of irregular forms and the historical evidence where deviations from uniformity not only persist but expand (Maiden 2011a, 2011b). As a consequence, system-internal principles and constraints that apply to core patterns, as in the case of the *one form – one meaning* principle (Anttila 1977) or the *paradigm economy* principle (Carstairs 1983), are intrinsically limited in scope. In the best case, they encapsulate common or salient patterns or generalizations. In the worst case, they express typological biases or theoretical idealizations. But in virtually all cases, they overfit a subclass of patterns in ways that cannot be extended to a description of the system as a whole.

A recognition of the limitations of system-internal principles is implicit in the identification of external factors as the locus of explanation in the domain of morphology. The factors that impact language learning and usage, including general learning biases and processing constraints, appear to play a significant role in shaping grammatical structures, often exerting opposite influences (Blevins et al. 2017; Marzi et al. 2019). Learning generally favours uniform patterns and transparent

co-relations, which facilitate generalisation and extrapolation (cf., Divjak et al. 2023; Ellis 2006; Romain et al. 2022), whereas usage-driven processing constraints are most acute for general patterns that define a dense space of potential alternatives, conferring advantages on form-meaning units that are unique, with more pronounced schematicity, entrenchment, and conventionality (cf., Booij 2017; Langacker 2019). The influence of these competing factors will be expected to vary across languages, modulated by the inertia and attraction associated with established patterns, including the transparency of the inherited word stock, the complexity of the inflectional system, and the size and semantic consistency of families of derivational forms.

Language's dynamic nature entails trade-offs and varying equilibrium states. For instance, systems often fluctuate between facilitating learning and enhancing processing efficiency, seldom maximizing both. These trade-offs mirror broader communication system dynamics, where a perfect balance between encoding and decoding efforts, or between different communicative tasks, is unattainable. Each grammar embodies a distinct solution to these trade-offs, integrating linguistic traits with, among others, psychological, social, and historical factors. The interplay of different pressures crafts a complex array of solutions within any absolute limitations set by speech capacity – though this concept remains ambiguous. For example, as demonstrated by the *uncertainty balancing* reported by Filipović Đurđević and Milin (2019), there appears to be no fixed bound on complexity along either the paradigmatic or syntagmatic axis in isolation, but, instead, constraints on spikes in complexity along both axes simultaneously.

2 General goals

The choice of topics covered in this special issue is guided by three interrelated objectives. The first involves contributing to the development of a *typology of splits*: divergent patterns and irregularities that can exist concurrently within a single linguistic system. The second aims to delineate the scope of external factors influencing language: those pressures outside the language that shape these internal splits. The third objective is to synthesize empirical observations and theoretical insights to pinpoint which language usage factors might predispose certain structural splits over others. The inherently varied yet analysable nature of morphological systems makes them a perfect case study for addressing the set objectives, and the synthesis is intended to initiate a broader discussion of how external demands – cognitive, communicative, and others – may influence the internal organization of language.

Each of the articles within this special issue brings a unique perspective to the study of the ways that regular and irregular units coexist within linguistic systems. These diverse perspectives share several core aims with usage-based linguistics. First and foremost, they focus on analysing entire linguistic systems as they are used in real-world contexts rather than relying solely on selectively chosen anecdotal examples. They also strive to understand the underlying functions and mechanisms that sustain variation within these systems and acknowledge that elements within a language are not inherently "correct" or "wrong" in any absolute sense but make distinctive contributions as part of a broader system's complexity and dynamics. Through these lenses, the contributions explore the intricate balance between uniformity and variability, offering insights into the nature of language structure and variation.

3 Descriptive goals

In most languages described as exhibiting inflection class morphology, inflectional paradigms and classes are typically characterized by a high degree of regularity. However, it is also common for these generally uniform systems to contain anomalies, such as gaps or unexpected forms, that deviate from the regular patterns. For these exceptional elements to preserve their place within a language, they generally need to possess unique, or at least distinctive, patterns of occurrence and co-occurrence, which resist or counterbalance the levelling forces exerted by more commonly occurring types. Despite widespread acknowledgement of these "anomalous" phenomena, available descriptions tend to be sparse, while our understanding remains incomplete, largely because it has been widely, if uncritically, assumed that deviations from a norm have no unifying properties that would be amenable to detailed analysis. This assumption has recently been challenged by research such as that by Divjak et al. (2021), which illustrates how less probable allomorphs in Polish remain learnable within their linguistic ecosystem, thereby maintaining their presence and purpose (pp. 64–66).

Few languages are characterized primarily by exceptional elements, yet the Papuan language Yele is often cited as fitting this description (cf., Henderson 1995; Levinson 2022). The conventional tendency to deem exceptions as peripheral, outside a language's core grammar and communicative essence, reinforces the view that *exceptionality must have limits*. However, this *preference for uniformity* has limited thorough explorations into the breadth of anomalies, the conditions under which they prosper, and their possible prominence within linguistic systems. This special issue aims to bridge these gaps by examining the interplay between regularity and exceptionality across different linguistic systems.

Contributions on Czech (Bermel et al.), Croatian (Hržica et al.), Estonian (Aigro and Vihman), and French (Copot and Bonami), explore the intricacies of diverse inflectional systems, particularly in areas where these systems diverge from expected norms of uniqueness and consistency. Through comprehensive analyses of these languages, the contributions provide a broader understanding of linguistic systems as multifaceted and adaptable, comprising diverse, often mismatched elements that nonetheless align along a spectrum of schematicity or conventionality (see Langacker 2019). The overarching aim is to lay the groundwork for a typology that views languages as complex and adaptive systems (cf., Beckner et al. 2009; Ellis 2016), tackling the task of scrutinising the myriad forms of irregularities and standard patterns that exist concurrently.

4 Theoretical goals

The exploration of the division of communicative labour between regular and exceptional has been approached from various theoretical angles. Usage-based models offer one fruitful point of departure for these discussions, building on the aforementioned notions of schematicity, entrenchment, and conventionality (in Langacker 2009, 2019). Then, the frequency effect, recognized as one of the most significant predictors of language behaviour, also exhibits contrasts that can serve as a unique proxy for variability or exceptionality (see Divjak 2019 for an in-depth discussion). Application of measures from information theory, including *word surprisal* (Hale 2003) and *paradigm entropy* (Ackerman and Malouf 2013), quantify how the distribution of individual word units diverge from expected linguistic patterns, offering a measure of exceptionality from a macro perspective. The use of relative entropy in the studies by Milin et al. (2009) extends this framework, addressing unpredictability within nominal paradigms and classes. This methodological approach is further refined and broadened by Filipović Đurđević and Milin (2019), which integrate the syntagmatic analysis in Hale (2003) with the paradigmatic analyses in Ackerman and Malouf (2013) and Milin et al. (2009), providing a comprehensive model of the interaction between these dimensions and enhancing our grasp of linguistic unpredictability on a global scale.

In their work "Paradigmatic predictability in derivational morphology", Copot and Bonami investigate the predictability of newly formed lexemes derived from common bases, challenging the conventional "rooted tree" model of derivational morphology. Their empirical study with French speakers and novel word formations advocates for a paradigmatic perspective on derivation. This viewpoint suggests that words are interlinked through broad derivational schemas without needing direct

ties to a singular *base word*, advocating for a word-and-paradigm morphology (Blevins 2016) that resonates with cognitive and related linguistic frameworks (cf., Booij 2010, 2017; Booij and Audring 2017; Langacker 1987, 2009, 2019).

5 Explanatory goals

The final objective of this special issue is to leverage empirical descriptions and theoretical insights to propose functional explanations for observed patterns of language adaptation, particularly the tension between uniformity and variability. The functional and communicative effects of different combinations of uniform patterns and exceptional items, and their implications for the resilience and adaptability of a language is a central concern of usage-based linguistic accounts in general, and cognitive linguistics in particular. It has long been recognized in cognitive psychology that human learning mechanisms, which are capable of statistical approximation and error correction, adapt to diverse inputs (as outlined by, for example, Rescorla 1988; Widrow and Lehr 1990), and to language inputs more specifically (see, for example, Arnon and Ramscar 2012; Baayen et al. 2011; Chuang and Baayen 2021; Divjak et al. 2024; Ellis 2006; Milin et al. 2023; Pirrelli et al. 2020; Ramscar et al. 2013). These processes, which maintain a balance between statistical regularities for generalization and idiosyncrasies necessitating specific processing and response, are essential for language development and usage.

The symbiotic co-evolution of language users and systems reflects this adaptive dynamic, where exceptionality, especially in morphology, is likely to be finely tuned for and by usage – i.e., learning and processing. In fact, a balance between regular structures and exceptional forms not only facilitates generalization but may also be essential for efficient linguistic performance and adaptation. A hypothetical language that is "perfect" from the standpoint of an abstract model of language design might be prone to overfitting during the learning process, with the consequence that language users would be intolerant of deviations, incapable of assimilating new linguistic patterns, and hampered by a rigid and ineffective communication system. Traditional linguistic analyses, particularly those rooted in formal grammars, have focused predominantly on uniform patterns, often at the expense of understanding the more probabilistic and variable nature of language, where certainty is not absolute but falls within a spectrum of predictability. Cognitive Linguistics offers tools for embracing the inherent systematicity present in language, even when full predictability is not achievable, allowing learners to dynamically adapt their current state of language knowledge over time.

This volume's contributions utilize cognitive linguistic methodologies to explore these phenomena further. Aigro and Vihman in "What drives speakers' preferences?

Probing parallel form usage" investigate the impact of frequency and structural patterns in morphological choice, utilizing corpus data to demonstrate the negligible role of traditionally cited lexical-semantic features in these decisions. Meanwhile, Hržica, Košutar, Bošnjak Botica, and Milin in "The role of entrenchment and schematization in the acquisition of rich verbal morphology" take a close look into Croatian child language acquisition through parental reports, uncovering the nuanced role of type frequency over token frequency in morphological development, suggesting a different timeline for the impact of entrenchment in language learning. Bermel, Knittl, Alldrick, and Nikolaev, in "Ideal and real paradigms: Confronting evidence from grammar and corpora", examine the disconnect between normative grammatical recommendations and actual language use, particularly in the context of defective and overabundant paradigm cells. Their findings challenge conventional understandings of entrenchment and pre-emption, advocating for expanded definitions to better explain linguistic data. These three studies collectively underscore the complexity of linguistic adaptation and the need for a multifaceted approach to understanding language as a dynamic, user-oriented system.

We hope that this special issue offers meaningful insights and plausible answers to the queries posited in this introduction, at the intersection of morphology and cognitive linguistics. Our goal is to initiate a productive dialogue that deepens our understanding of linguistic structures and processes, fostering a collaborative exploration between natural theoretical allies.

Petar Milin, Neil Bermel, James P. Blevins.

Data availability statement: Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

References

Ackerman, Farrell & Robert Malouf. 2013. Morphological organization: The low conditional entropy conjecture. *Language* 89(3). 429–464.

Anttila, Raimo. 1977. *Analogy*. Berlin, New York: De Gruyter Mouton.

Arnon, Inbal & Michael Ramscar. 2012. Granularity and the acquisition of grammatical gender: How order-of-acquisition affects what gets learned. *Cognition* 122(3). 292–305.

Baayen, R. Harald, Petar Milin, Dusica Filipović Đurđević, Peter Hendrix & Marco Marelli. 2011. An amorphous model for morphological processing in visual comprehension based on naive discriminative learning. *Psychological Review* 118(3). 438–481.

Beckner, Clay, Richard Blythe, Joan Bybee, Morten H. Christiansen, William Croft, Nick C. Ellis, John Holland, Jinyun Ke, Diane Larsen-Freeman, Tom Schoenemann. 2009. Language is a complex adaptive system: Position paper. *Language Learning* 59(s1). 1–26.

Blevins, James P. 2016. *Word and paradigm morphology*. Oxford: Oxford University Press.

Blevins, James P., Petar Milin & Michael Ramscar. 2017. The Zipfian paradigm cell filling problem. In *Perspectives on morphological organization*, 139–158. Leiden: Brill.

Booij, Geert. 2010. Construction morphology. *Language & Linguistics Compass* 4(7). 543–555.

Booij, Geert. 2017. The construction of words. In Barbara Dancygier (ed.), *The Cambridge handbook of cognitive linguistics*, 229–246. Cambridge: Cambridge University Press.

Booij, Geert & Jenny Audring. 2017. Construction morphology and the parallel architecture of grammar. *Cognitive Science* 41. 277–302.

Carstairs, Andrew. 1983. Paradigm economy. *Journal of Linguistics* 19(1). 115–128.

Chuang, Yu-Ying & R. Harald Baayen. 2021. Discriminative learning and the lexicon: NDL and LDL. In *Oxford Research Encyclopedia of Linguistics*. Oxford: Oxford University Press.

Divjak, Dagmar. 2019. *Frequency in language: Memory, attention and learning*. Cambridge: Cambridge University Press.

Divjak, Dagmar, Petar Milin, Adnane Ez-Zizi, Jarosław Józefowski & Christian Adam. 2021. What is learned from exposure: An error-driven approach to productivity in language. *Language, Cognition & Neuroscience* 36(1). 60–83.

Divjak, Dagmar, Laurence Romain & Petar Milin. 2023. From their point of view: The article category as a hierarchically structured referent tracking system. *Linguistics* 61(4). 1027–1068.

Divjak, Dagmar, Irene Testini & Petar Milin. 2024. On the nature and organisation of morphological categories: Verbal aspect through the lens of associative learning. *Morphology*. 1–38. https://doi.org/10.1007/s11525-024-09423-0 (Epub ahead of print).

Ellis, Nick C. 2006. Selective attention and transfer phenomena in L2 acquisition: Contingency, cue competition, salience, interference, overshadowing, blocking, and perceptual learning. *Applied Linguistics* 27(2). 164–194.

Ellis, Nick C. 2016. Salience, cognition, language complexity, and complex adaptive systems. *Studies in Second Language Acquisition* 38(2). 341–351.

Filipović Đurđević, Dušica & Petar Milin. 2019. Information and learning in processing adjective inflection. *Cortex* 116. 209–227.

Hale, John. 2003. The information conveyed by words in sentences. *Journal of Psycholinguistic Research* 32. 101–123.

Harris, Alice C. 2009. Exuberant exponence in Batsbi. *Natural Language & Linguistic Theory* 27. 267–303.

Henderson, James. 1995. *Phonology and grammar of Yele, Papua New Guinea*. Canberra: Pacific Linguistics.

Langacker, Ronald W. 1987. Nouns and verbs. *Language* 63(1). 53–94.

Langacker, Ronald W. 2009. *Investigations in cognitive grammar*. Berlin, New York: De Gruyter Mouton.

Langacker, Ronald W. 2019. Morphology in cognitive grammar. In Jenny Audring & Francesca Masini (eds.), *The Oxford handbook of morphological theory*, 346–364. Oxford: Oxford University Press.

Levinson, Stephen C. 2022. *A grammar of Yélî Dnye: The Papuan language of Russel Island*. Berlin, Boston: De Gruyter Mouton.

Maiden, Martin. 2011a. Morphological innovation. In Martin Maiden, John Charles Smith & Adam Ledgewa (eds.), *The Cambridge history of the romance languages, volume I: Structures*, 216–317. Cambridge: Cambridge University Press.

Maiden, Martin. 2011b. Morphological persistence. In Martin Maiden, John Charles Smith & Adam Ledgewa (eds.), *The Cambridge history of the romance languages, volume I: Structures*, 155–215. Cambridge: Cambridge University Press.

Marzi, Claudia, Marcello Ferro & Vito Pirrelli. 2019. A processing-oriented investigation of inflectional complexity. *Frontiers in Communication* 4. 48.

Matthews, Peter Hugoe. 1972. *Inflectional morphology: A theoretical study based on aspects of Latin verb conjugation*. Cambridge: Cambridge University Press.

Milin, Petar, Filipović Dušica Đurđević & Fermin Moscoso del Prado Martín. 2009. The simultaneous effects of inflectional paradigms and classes on lexical recognition: Evidence from Serbian. *Journal of Memory & Language* 60(1). 50–64.

Milin, Petar, Benjamin V. Tucker & Dagmar Divjak. 2023. A learning perspective on the emergence of abstractions: The curious case of phone(me)s. *Language & Cognition* 15(4). 740–762.

Pirrelli, Vito, Claudia Marzi, Marcello Ferro, Franco Alberto Cardillo, Harald R. Baayen & Petar Milin. 2020. Psycho-computational modelling of the mental lexicon. In Vito Pirrelli, Ingo Plag & Wolfgang U. Dressler (eds.), *Word knowledge and word usage: A cross-disciplinary guide to the mental lexicon*, 23–82. Berlin, Boston: De Gruyter Mouton.

Ramscar, Michael, Melody Dye & Stewart M. McCauley. 2013. Error and expectation in language learning: The curious absence of "mouses" in adult speech. *Language* 89(4). 760–793.

Rescorla, Robert A. 1988. Pavlovian conditioning: It's not what you think it is. *American Psychologist* 43(3). 151–160.

Romain, Laurence, Adnane Ez-zizi, Petar Milin & Dagmar Divjak. 2022. What makes the past perfect and the future progressive? Experiential coordinates for a learnable, context-based model of tense and aspect. *Cognitive Linguistics* 33(2). 251–289.

Talmy, Leonard. 2008. Grammatical construal. In Dirk Geeraerts (ed.), *Cognitive linguistics: Basic readings*, 69–108. Berlin, New York: De Gruyter Mouton.

Widrow, Bernard & Michael A. Lehr. 1990. 30 years of adaptive neural networks: Perceptron, madaline, and backpropagation. *Proceedings of the IEEE* 78(9). 1415–1442.