Different time-scales, common mechanisms: toward an eco-cognitive account of language dynamics

ENRICO TORRE

Lancaster University

No consensus on the nature of language change: Formal vs Functional approaches

- Formal approaches to language change:

  major linguistic changes are due to discontinuity in transmission from one generation to another one, in particular during language acquisition (e.g. Lightfoot 1991; Fischer et al. 2000; Crain et al. 2006).

- Functional approaches to language change:

  linguistic change is gradual and driven by communicative functions, practical needs, and everyday experience in the socio-cultural environment (e.g. Bybee 2003; Hopper and Traugott 2003; Ellis and Larsen-Freeman 2010).

The present perspective

I will adopt an <u>empiricist</u> approach which exploits:

- notions from <u>Cognitive Linguistics</u> and the <u>usage-based model</u> (e.g. Langacker 1987; Goldberg 1995; Croft 2001; Tomasello 2003; Croft and Cruse 2004; Evans and Green 2006) at a <u>descriptive level</u>;

- principles of <u>Dynamic Systems Theory</u> (e.g. Thelen and Smith 1994; Kelso 1995, 2008; Port and Van Gelder 1995; Ward 2002; Spivey 2007) at an <u>explanatory level</u>;

- the founding assumptions of <u>Ecological Psychology</u> (e.g. Reed 1997; Gibson and Pick 2000) as a <u>general background</u>.

Basic tenets in Cognitive Linguistics

- The only primitive constituent of language is the <u>construction</u>: any symbolic unit coupling form and meaning (Croft 2001; Langacker 2008).

- Language is an ever-changing <u>network</u> of interrelated constructions of different levels of complexity, which is constantly updated and revised as a result of <u>usage events</u> (Croft 2001; Tomasello 2003; Goldberg 2006).

- Language is governed by <u>general cognitive principles</u> and is interconnected with other facets of cognition (Lakoff 1987).

- <u>Variation</u> in language is the norm. As language is inherently dynamic, diversity should be taken as a starting point (Croft 2001; Haspelmath 2003; Cristofaro 2009).

Main mechanisms of linguistic change

- <u>Sound change</u>: a change in the way members of a speech community pronounce particular sounds. It takes place slowly but constantly, and results in phonological change. An example of sound change is the syncope, which takes place when an unstressed vowel is deleted from the interior of a word (see e.g. Brinton and Arnovick 2006: ch. 3; Shukla and Connor-Linton 2006).

  1. Vulgar Latin *fabulare* > Spanish *hablar*, "to speak"

     (cfr. Portuguese, Galician *falar*)

Main mechanisms of linguistic change

- <u>Reanalysis</u>: the form of a morphological, morphosyntactic, or syntactic construction remains identical, but there is a change in the internal structure or in meaning. Compare:

  2a. *Sylvia is going$_{VERB\ OF\ MOTION}$ to watch the match.*

  2b. *Sylvia is going$_{FUTURE\ AUXILIARY}$ to watch the match.*

  Reanalysis can take place when more than one analysis of a given construction is possible (adapted from Campbell 2004).

Main mechanisms of linguistic change

- <u>Analogical extension</u>: the process through which individual speakers note resemblances between forms and (although not fully consciously) decide to make them even more alike (Winters and Dirven 2004).

  Originally, *be going to* could only occur with verbs which could be complements in the purposive and motion verb constructions. The new construction was extended to other complement verbs (Campbell 2004).

  3. *It's going* _{FUTURE AUXILIARY} *to rain in Luton.*

Main mechanisms of linguistic change

- <u>Borrowing</u>: a linguistic construction is borrowed from another language via contact. An example is the following syntactic calque in Spanglish (4a, Gerulová 2005) compared to Standard Mexican Spanish (4b):

4a. *Te   llamo   para   atrás.*

   2sg.acc   call:pres.1sg   for   backwards.

4b. *Te   regreso   la   llamada.*

   2sg.dat   return:pres.1st   the.fsg   call.sg.

   "I'll call you back"

A metatheoretical framework: Dynamic Systems Theory

- <u>Dynamic System</u>: a complex of aspects all evolving in a continuous, simultaneous, and mutually determining fashion.

- <u>State</u>: a set of variables that may change as a function of time.

- <u>Phase space</u>: the set of all possible values these variables can take.

- <u>Trajectory</u>: the sequence of states generated by the dynamics.

- <u>Flow</u>: the set of all possible trajectories.

- <u>Attractor</u>: a stable small set of the phase space toward which all nearby trajectories converge.

- <u>Basin of attraction</u>: a set of points converging to the attractor over time.

A metatheoretical framework:
Dynamic Systems Theory

- <u>Self-organization</u>: the process whereby coordination arises from the interaction of the components of the system.

- <u>Bifurcation point</u>: a point at which the trajectory undergoes a sudden change of direction, upsetting the stability of the attractor.

- <u>Catastrophe</u>: an abrupt change in the state of a continuous system.

- <u>Phase shift</u>: the transition of a system from an attractor to another.

- <u>Multistability</u>: the alternation between two or more mutually exclusive states over time.

Language acquisition from the present perspective

- At first, children's learning proceeds in an <u>item-based fashion</u> (e.g. Tomasello 2003).

- Later, a more <u>abstract schema</u> is derived via a generalization process driven by categorization principles (Langacker 1987, 2008; Bybee 2001; Taylor 2003; Goldberg 2006).

- This schema, emerged from the process of exemplar-learning, is <u>immanent</u> in the sum of the similarities between individual learned exemplars (Langacker 2000, 2008; Cristofaro 2008).

- Higher type-frequency leads to the <u>entrenchment</u> of the schema (Langacker 1987).

Language acquisition:
a couple of examples from English

- The canonical SVO word order is initially only used with verbs which are heard frequently occurring with this syntactic pattern. The productive use of this construction comes later in grammatical development.

- The WH-question pattern is initially learned with particular wh-words and auxiliary verbs: *what does X do?* Only later is the [Wh-word Auxiliary] pattern abstracted (Abbot-Smith and Tomasello 2006).

Language acquisition in dynamic systems terms

- Initially, each item (e.g. each English transitive construction or each wh-question) can be seen as digging its own <u>attractor</u>.

- Later, as the result of a process of generalization based on similarities, each item can be seen as <u>a state in the basin of attraction</u> of a single attractor, represented by the general pattern (e.g. the SVO word order or the wh-question pattern).

- Increasing type-frequency strengthens the schema to become productive, i.e. the magnetic force of the attractor becomes so strong that novel items (e.g. novel transitive constructions or novel wh-questions) converge to it.

Language change in ontogenesis

- Language is not learned once and for all, though. A speaker's network of interconnected constructions is slowly, but <u>constantly re-shaped</u> with each language use.

- An individual's linguistic system can be seen as emerging from the <u>complex interaction</u> of formal, semantic, pragmatic, cognitive, affective, socio-cultural, and contextual forces which operate during experiences of language use.

- Each linguistic event contributes to an <u>accumulation</u> of small changes which (more or less) slightly modify a speaker's construction-network (see Bybee and McClelland 2005).

Language change in ontogenesis in dynamic systems terms

- The individual speaker habitually recognizes and uses a linguistic construction, which represents the <u>attractor</u>;

- Then, they experience the same construction used in a different way or another construction used in the same way. Initially, it represents <u>a state outside the basin of attraction</u>;

- Repeated exposure to the new construction (solution trajectory) creates a new attractor, leaving us at a <u>bifurcation point</u>;

- The system is in a phase of <u>multistability</u>: the speaker uses both constructions. At this point, there are two possibilities: one of them will eventually die out, or both will be retained. In the latter case, one of them will probably undergo a process of specialization.

Language change in phylogenesis

- Language, with reference to its collective dimension, can be seen as a <u>network</u> of the interconnected individual construction-networks. It is strictly interrelated to the other facets of human cognition.

- Public language structures <u>adapt</u> to the cumulative impact of the complex interaction of the processes which shape each linguistic event (e.g. Ellis and Larsen-Freeman 2010).

- It is not the case that each linguistic event has the same weight in the spread of language change though, as <u>several kinds of factors</u> come into play (cfr. Cameron and Deignan 2006).

Language change in phylogenesis in dynamic systems terms

- A linguistic construction is shared within a community of speakers – <u>attractor</u>;

- Then, a group of people begin to use this construction in a different way or another structure in the same way. Initially, it represents <u>a state outside the basin of attraction</u>;

- The spread of the new construction (solution trajectory) creates a new attractor, leaving us at a <u>bifurcation point</u>;

- The system is in a phase of <u>multistability</u>: it is possible to find both constructions within the same linguistic community. Again, one of the two structures will eventually die out, or both will be retained. In the latter case, one of the two will probably undergo a process of specialization.

An example from the history of English
(Smith 1996; Hartman 1997; Hoffer 2005)

- Lexical borrowing and specialization:

  5a. OE *scyrte*, "shirt" > ME *shirte* > ModE *shirt*

  5b. ON *skyrta*, "shirt" > ME *skirta* > ModE *skirt*

An example from a Uto-Aztecan Language (Campbell 2004)

- Syntactic borrowing and replacement.

  Compare Spanish (6a) and Pipil, spoken in El Salvador (6b):

  6a. *esa mujer es* **más** *linda * **que** *tú/vos.*

   that.f woman is more pretty.sg than pron.2sg

  6b. *ne siwa:t * **mas** * galá:na * **ke** * taha.*

   the woman more pretty than pron.2sg

   "That woman is prettier than you are"

An example from a Uto-Aztecan language (Campbell 2004)

- Pipil used to have several different comparative expressions before its contact with Spanish, but these have been eliminated, replaced by this borrowed comparative construction.

  Spanish *más... que* > Pipil *mas... ke*, "more... than"

Different time-scales, common mechanisms

- At both time-scales, language change occurs <u>gradually</u>, (unless a catastrophe occurs, see e.g. Wildgen 2009).

- An <u>alternative</u> to the established structure emerges and progressively gains strength through repetition.

- As a result, variation arises, where the new and the previously existing structures <u>co-exist</u>.

- <u>Two possibilities</u>: one of the two structures will eventually die out, or both will be retained. In the latter case, there will often be a specialization.

Different time-scales, common mechanisms

- There is a <u>constant tension and interplay</u> between the individual and the collective dimension of language and between the generality and the specificity of information (e.g. Bybee and McClelland 2005; Rączaszek-Leonardi and Kelso 2008).

- This tension seems to be governed by the principle of <u>causal circularity</u> (e.g. Kelso 1995; Wallot and Van Orden 2011): linguistic interactions between individuals shape the trajectory of the socially shared language, while at the same time the latter places significative constraints on the former, in a <u>metastable</u> fashion (see Kelso 2008).

A simple mathematical formalization (see Van Geert 2003)

A slightly modified version of the logistic map:

$$L_t +_{\Delta t} = L_t * rate_{\Delta t} * (1-L_t/K_t)$$

$L_t +_{\Delta t}$: the next state of the variable

L_t: the preceeding state of the variable

$rate_{\Delta t}$: rate of change that applies to the time-interval Δt between the next and the preceeding state

K_t: the set of resources that apply to the variable at issue

A challenge for the future: does language display a fractal architecture?

- The <u>same mechanisms</u> seem to be operating at <u>both time-scales</u> (cfr. Rączaszek-Leonardi 2010).

- Also, the same forces appear to be working in <u>all linguistic areas</u> (phonology, morphology, morphosyntax, syntax, lexicon, etc.).

- Therefore, language seems to show a <u>self-similar</u> architecture: its facets structurally and functionally resemble <u>each other and the system as a whole</u>, also following the same mechanisms of change at different levels (cfr. Van Orden et al. 2010).

- Since the same fact has been observed to apply to other cognitive functions (e.g. Ward 2002: chs. 16-19), the same conclusion may be extended to <u>cognition as a whole</u>.

Conclusion:
toward an eco-cognitive account of language dynamics

- Language is a <u>primarily intersubjective</u> process grounded in everyday perception and action whose development depends on the constant interaction of human beings (irreducible body-mind couplings) with the physical and socio-cultural world, in <u>an interplay</u> which leaves <u>signs on both poles</u>.

- This perspective applies to <u>both the ontogenetic and the phylogenetic dimension</u> of language, which stand in a relation of <u>mutual influence</u>.

- It is therefore necessary for the language sciences to embrace the <u>self-organizing nature</u> of language, recognizing its status as a <u>process "in motion"</u> which constantly interacts with other cognitive and social processes, thus abandoning the long-standing view of it as a self-contained system made up of symbols and rules.

References

- Abbot-Smith, Kirsten, and Michael Tomasello. (2006). Exemplar-Learning and Schematization in a Usage-based Account of Syntactic Acquisition. *The Linguistic Review* 23: 275-290.

- Brinton, Laurel J., and Leslie K. Arnovick. 2006. *The English Language. A Linguistic History*. New York: Oxford University Press.

- Bybee, Joan. 2001. *Frequency of Use and the Organization of Language*. New York: Oxford University Press.

- Bybee, Joan. (2003). Cognitive Processes in Grammaticalization. In M. Tomasello (ed.), *The New Psychology of Language. Cognitive and Functional Approaches to Language Structure*. Mahwah, NJ: Lawrence Erlbaum Associates. 145-168.

- Bybee, Joan, and James L. McClelland. (2005). Alternatives to the Combinatorial Paradigm of Linguistic Theory based on Domain General Principles of Human Cognition. *The Linguistic Review* 22: 381-410.

- Cameron, Lynne, and Alice Deignan. (2006). The Emergence of Metaphor in Discourse. *Applied Linguistic* 37 (4): 671-690.

- Campbell, Lyle. 2004 (2nd ed..). *Historical Linguistics. An Introduction*. Cambridge, MA: MIT Press.

- Crain, Stephen, Takuya Goro, and Rosalind Thornton. (2006). Language Acquisition Is Language Change. *Journal of Psycholinguistic Research* 37 (1): 31-49.

References

- Cristofaro, Sonia. (2008). A Constructionist Approach to Complementation. Evidence from Ancient Greek. *Linguistics* 46 (3): 571-606.

- Cristofaro, Sonia. (2009). Grammatical Categories and Relations. Universality vs. Language-Specificity and Construction-Specificity. *Language and Linguistic Compass* 3 (1): 441-479.

- Croft, William. 2001. *Radical Construction Grammar. Syntactic Theory in Typological Perspective*. New York: Oxford University Press.

- Croft, William, and Alan D. Cruse. 2004. *Cognitive Linguistics*. Cambridge, UK: Cambridge University Press.

- Ellis, Nick C., and Diane Larsen-Freeman (eds.). 2010. *Language As a Complex Adaptive System*. Chichester: Wiley.

- Evans, Vyvyan, and Melanie Green. 2006. *Cognitive Linguistics. An Introduction*. Edinburgh: Edinburgh University Press.

- Fischer, Olga, Ans van Kemenade, Willem Koopman, and Wim van der Wurff. 2000. *The Syntax of Early English*. Cambridge, UK: Cambridge University Press.

- Gerulová, Victoria. (2005). El Spanglish (El Espanglish). *Actas del IX Encuentro de Profesores de Español de Eslovaquia*.

References

- Gibson, Eleanor J., and Anne D. Pick. 2000. *An Ecological Approach to Perceptual Learning and Development*. New York: Oxford University Press.

- Goldberg, Adele E. 1995. *Constructions. A Construction Grammar Approach to Argument Structure*. Chicago: University of Chicago Press.

- Goldberg, Adele E. (2003). Constructions. A New Theoretical Approach to Language. *Trends in Cognitive Sciences* 7 (5): 219-224.

- Goldberg, Adele E. 2006. *Constructions at Work. The Nature of Generalizations in Language*. New York: Oxford University Press.

- Hartman, Melissa. (1997). The True Sense of a Word. *Imagine* 5 (2): 4-5.

- Haspelmath, Martin. (2003). The Geometry of Grammatical Meaning. Semantic Maps and Cross-linguistic Comparison. In M. Tomasello (ed.), *The New Psychology of Language. Cognitive and Functional Approaches to Language Structure*, vol. 2. Mahwah, NJ: Lawrence Erlbaum Associates. 211-242.

- Hoffer, Bates L. (2005). Language Borrowing and the Indices of Adaptability and Receptivity. *Intercultural Communication Studies* 14 (2): 53-72.

- Hopper, Paul, and Elizabeth C. Traugott. 2003 (2nd ed.). *Grammaticalization*. Cambridge, UK: Cambridge University Press.

References

- Kelso, Scott. 1995. *Dynamic Patterns. The Self-Organization of Brain and Behavior*. Cambridge, MA: MIT Press.

- Kelso, Scott. (2008). An Essay on Understanding the Mind. *Ecological Psychology* 20: 180-208.

- Lakoff, George. 1987. *Women, Fire, and Dangerous Things. What Categories Reveals about the Mind*. Chicago: University of Chicago Press.

- Langacker, Ronald W. 1987. *Foundations of Cognitive Grammar*, vol. 1. *Theoretical Prerequisites*. Stanford, CA: Stanford University Press.

- Langacker, Ronald W. (2000). A Dynamic Usage-based Model. In M. Barlow and S. Kemmer (eds.), *Usage-based Models of Language*. Stanford, CA: CSLI Publications. 1-63.

- Langacker, Ronald W. 2008. *Cognitive Grammar. A Basic Introduction*. New York: Oxford University Press.

- Lightfoot, David. 1991. *How to Set Parameters. Arguments from Language Change*. Cambridge, MA: MIT Press.

- Port, Robert F., and Timothy Van Gelder (eds.). 1995. *Mind As Motion. Explorations in the Dynamics of Cognition*. Cambridge, MA: MIT Press.

References

- Rączaszek-Leonardi, Joanna. (2010). Multiple Time-Scales of Language Dynamics. An Example from Psycholinguistics. *Ecological Psychology* 22: 269-285.

- Rączaszek-Leonardi, Joanna, and J.A. Scott Kelso. (2008). Reconciling Symbolic and Dynamic Aspects of Language. Toward a Dynamic Psycholinguistics. *New Ideas in Psychology* 26 (2): 193-207.

- Reed, Edward S. 1997. *Encountering the World. Toward an Ecological Psychology*. New York: Oxford University Press.

- Shukla, Shalipram, and Jeff Connor-Linton. (2006). Language Change. In R.W. Fasold and J. Connor-Linton (eds.), *An Introduction to Language and Linguistics*. Cambridge, UK: Cambridge University Press. 275-305.

- Smith, Jeremy J. 1996. *A Historical Study of English. Function, Form, and Change*. New York: Routledge.

- Spivey, Michael J. 2007. *The Continuity of Mind*. New York: Oxford University Press.

- Taylor, John R. 2003 (3rd ed.). *Linguistic Categorization. Prototypes in Linguistic Theory*. New York: Oxford University Press.

- Thelen, Esther, and Linda B. Smith. 1994. *A Dynamic Systems Approach to the Development of Cognition and Action*. Cambridge, MA: MIT Press.

References

- Tomasello, Michael. 2003. *Constructing a Language. A Usage-based Model of Language Acquisition*. Cambridge, MA: Harvard University Press.

- Van Geert, Paul. (2003). Dynamic Systems Approaches and Modeling of Developmental Processes. In J. Valsiner and K. Connolly (eds.), *Handbook of Developmental Psychology*. London: SAGE. 640-672.

- Van Orden, Guy C., Christopher T. Kello, and John G. Holden. (2010). Situated Behavior and the Place of Measurement in Psychological Theory. *Ecological Psychology* 22: 24-43.

- Wallot, Sebastian, and Guy C. Van Orden. (2011). Grounding Language Performance in the Anticipatory Dynamics of the Body. *Ecological Psychology* 23: 1-28.

- Ward, Lawrence M. 2002. *Dynamical Cognitive Science*. Cambridge, MA: MIT Press.

- Wildgen, Wolfgang. (2009). The "Dynamic Turn" in Cognitive Linguistics. In *Studies in Variation, Contacts, and Change in English* 3. Online: http://www.helsinki.fi/varieng/journal/volumes/03/wildgen/.

- Winters, Margaret, and René Dirven. (2004). Language Across Time. Historical Linguistics. In R. Dirven and M. Verspoor (eds.), *Cognitive Exploration of Language and Linguistics* (2nd ed.). Amsterdam and Philadelphia: John Benjamins.

THANK YOU!

e.torre@lancaster.ac.uk