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PEER COMMENTARIES

Dynamic systems and SLA: The wood and the trees

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A DST (Dynamic Systems Theory) characterization of L2 acquisition as an emergent process marks the coming of age of SLA research. It is an important theoretical maturation in that it brings together the many factors that interact in the complex system of language, learning, and use. It is an approach that has been budding for some time (Elman et al., 1996; Larsen-Freeman, 1997; MacWhinney, 1997; Ellis, 1998, 2003; Herdina and Jessner, 2002; Ellis and Larsen-Freeman, 2006), and recent symposia at AILA 2005, TESOL 2006 and AAAL 2006 conferences, and special issues in *Applied Linguistics* (2006) and here leave us heady with the scent of its blossom. What of fruition; what harvest shall we reap?

De Bot, Lowie and Verspoor (DBL&V) present a persuasive case for language as a complex dynamic system where cognitive, social and environmental factors continuously interact, where creative communicative behaviours emerge from socially co-regulated interactions, where there is little by way of linguistic universals as a starting point in the mind of *ab initio* language learners or discernable end state, where flux and individual variation abound, where cause-effect relationships are non-linear, multivariate and interactive, and where language is not a collection of rules and target forms to be acquired, but rather a by-product of communicative processes. Usage-based approaches (Ellis, 2003; P. Robinson and Ellis, in press 2007) view the regularities of language as emergent phenomena: the rule-like regularities captured by linguists are mere descriptions, explananda not explanans ("grammar is usage and usage is grammar", in Bybee's terms). DBL&V add that the stages of interlanguage development captured by SLA researchers are nomothetic generalizations, statistical abstractions that fail to characterize any of the individual growth paths which constitute these averages, that "the general developmental stages individuals go through are much less similar than we have assumed so far".

Each of these statements is well attested (Ellis and Larsen-Freeman, 2006), and each is a reaction too. Fractally, current SLA theory is no more a static representational system than is L2 interlanguage. Both are states of being in evolving dynamic systems. And each of the statements is an opposition to prior theories. DBL&V enumerate some of these – Information Processing models, Universal Grammar, language transmission metaphors, aptitude theories, and monocausal magic-bullet explanations. It is good to state the old and to illustrate the alternative in its extreme, thus to clarify the contrast. But the truth usually lies somewhere in between in the complementary nature of things, in the dynamics of the dialectic (Ellis and Larsen-Freeman, 2006; Scott Kelso and Engstrøm, 2006). Let me use my reaction space to celebrate some old chestnuts of SLA research. They are worth remembering still.

Long (1990) set out the agreed core findings constituting the least a second language theory needs to explain. These include:

> Interlanguages exhibit systematicity and variability… The systematicity manifests itself in many ways, including the regular suppliance and non-suppliance of both targetlike and nontargetlike features in certain linguistic contexts and in the persistence of the same errors … Interlanguages, that is, are, or at least appear to be, rule-governed. Much of the variability they also reveal turn out to be systematically related to such factors as task …, interlocutor, and linguistic context. (p. 658)

> With some differences for first language background … learners of different ages, with and without instruction, in foreign and second language settings, follow similar developmental sequences. (p. 659)

His primary conclusion concerning adequacy of explanation was:

> Common patterns in development in different kinds of learners under diverse conditions of exposure means that a theory that says nothing about universals in language and cognition is incomplete, or, if considered complete, inadequate. (p. 659)

It's not enough to highlight individual variability or that there are no magic bullet solutions. We still have to explain the regularities. And if we find it difficult to credit these as innately given, then we have to come up with some viable alternative, and we know that input will not suffice:

> Interlanguage systematicity, including adherence to regular developmental sequences and systematic production of nontargetlike forms never modeled in the input indicates a strong cognitive contribution on the learner's part and means that environmentalist theories of SLA are inadequate. (p. 660)

There are regularities. They are not prewired. They are not learned by simple imitation and memorization. This is why we must cultivate emergentist explanations.

DBL&V focus on variation in the "morpheme order studies" that investigated the order of L2 acquisition of the grammatical functors, progressive *-ing*, plural *-s*, possessive *-s*, articles *a*, *an*, *the*, third person singular present *-s*, and regular past *-ed*. They are right to point out that no one cause, be it frequency, perceptual salience, semantic complexity, morphophonological regularity, or syntactic category, is sufficient to account for the systematicity of developmental order. Nevertheless, there is a remarkable commonality of order of acquisition across different learners. And when these factors are all taken into account, as Goldschneider and DeKeyser (2001) did in their meta-analysis of 12 studies, while each independently explains only a small part (16–36%) of the developmental order (e.g. perceptual salience $r = 0.63$, frequency $r = 0.44$, morphophonological regularity $r = 0.41$), the combination of five predictors jointly explains a substantial 71% of the variance. There is pattern, then, in the acquisition of these morphemes, and promise too in a process account involving aspects of usage frequency, language form, and form-function mapping (Ellis, 2006a, pp. 3–10). DBL&V note modulations to the general order of morpheme acquisition associated with learners' L1. Explanations of such transfer in terms of "learned attention to language" (associative learning factors such as blocking, overshadowing, cue competition and perceptual learning) account for still more of these regularities in development (MacWhinney, 1997; Ellis, 2006a, pp. 22–24). Cognitive factors such as attention, working memory, implicit categorization and tallying, interference, consciousness and explicit learning are the heart of SLA (Ellis, 2002, 2005), as social, affective, and cultural motivations are its soul (Kramsch, 2002). I share a CREED (Ellis, 2006b) with DBL&V that these are important forces that dynamically interact in language. For the broad sweep, I trust that the limited end-state typical of adult L2A is the result of dynamic cycles of language use, language change, language perception, and language learning in the interactions of members of language communities. High frequency use of grammatical functors causes their lenition and erosion. Lower salience cues are harder to perceive and show reduced associative learning because of blocking and overshadowing. Hence the "Basic Variety" of interlanguage, an attractor state that can only be escaped by the social recruitment of the dynamics of learner consciousness, attention and explicit learning. The challenge is to test the details of this faith, how do these patterns emerge from the interaction of these forces integrated over the processing of each and every utterance and exemplar of language?

All said here about patterns of interlanguage development applies to patterns of language too – patterns sufficiently apparent to have allowed generations of linguists to describe their categories and rules of combination, yet obscure enough to prevent agreement. Linguistic categories are not absolute and logical, they too are schematic abstractions with prototypical structure and fuzzy peripheries. Again, if we believe that these systematicities are neither the behest of Universal Grammar nor simple imitation, then we must look to emergentist explanations, most promisingly in the liaison of CONSTRUCTION GRAMMAR (Goldberg, 2003; Tomasello, 2003), COGNITIVE (Taylor, 2002; Croft and Cruise, 2004; P. Robinson and Ellis, in press 2007), CONNECTIONIST (Elman et al., 1996; Christiansen and Chater, 2001), EMERGENTIST and COMPETITION MODEL (MacWhinney, 1987, 1997, 1999), PROBABILISTIC (Bybee and Hopper, 2001; Ellis, 2002; Bod, Hay and Jannedy, 2003) and CORPUS (Biber, Conrad and Reppen, 1998) linguistic approaches.

Finally, on method. The development of new cultivars is always to be welcomed, especially if, like the competing resource precursor model developed by van Geert, these techniques address temporal processes. Nevertheless, there are many spurious associations to be picked up over time. Provision of higher education in the UK followed a period of rapid growth then leveling off of the railroad network. Children typically show a "vocabulary burst" towards the end of their second year which follows a milestone typical of an 18 month old where they "read" board books on their own. Yet in analyzing either of these time series, conclusions of cause and effect might be ill-founded. It takes a lot more than identification of cross-lagged correlation to demonstrate causality. Replication and experimental manipulation are necessary too. B. F. Robinson and Mervis (1998) is impressive and thoroughly deserving in its impact. Yet we should remember that it analyses the relationship between vocabulary spurt and plural use (as an index of grammatical development) in one child over a period of months. While I believe their account, and hold dear both the critical vocabulary mass theory of grammar development and resource limitation models, we are a long way yet from proof. The standards of empirical rigor and the controlled logic of research methodology still hold. Furthermore, it is likely that many of the resource competitions that determine language acquisition occur in the timescale not of months but of tenths of seconds in contention for attentional resource in working memory and in election to the content of consciousness (Ellis, 2005). How to investigate such competitions has been taxing cognitive science for fifty years, and a range of techniques (dual task methods, connectionism, brain imaging, etc.) contribute to their determination and incremental construct validation.

Like DBL&V and Savage-Rumbaugh before them, W. B. Yeats was a great one for the dance (S. C. Ellis, 1999). His poem *Among School Children* (Yeats, 1989, originally published 1928), questions both his own lifelong search for a unity of being and modern regimented curricula that deny creative individuality. He later revised this work, lightening the pessimism by adding a final

stanza that sees hope of understanding the whole in terms of the unity of dynamics and complexity: He asks "How can we know the dancer from the dance?" and "O chestnut tree, great rooted blossomer, Are you the leaf, the blossom, or the bole?" In recognizing variation, individuality, and contextualization in time and space, we too must not lose sight of the wood for the trees.

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