The Emergence of Complexity, Fluency, and Accuracy in the Oral and Written Production of Five Chinese Learners of English

DIANE LARSEN-FREEMAN

University of Michigan

Seeing language as a complex, dynamic system and language use/acquisition as dynamic adaptedness ('a make-do' solution) to a specific context proves a useful way of understanding change in progress, such as that which occurs with a developing L2 system. This emergentist shift of perspective provides another way of understanding previously observed characteristics of learner language, that is that its development is not discrete and stage-like but more like the waxing and waning of patterns; that, from a target-language perspective, certain aspects of the behavior are progressive, others, regressive; that change can be gradual and it can be sudden; and that the latter notably heralds the emergence of a new order qualitatively different and novel from earlier organizations. In addition, when group data are disaggregated, it is clear that there are many paths to development. By closely examining the oral and written production of five Chinese learners of English, the emergence of complexity, fluency, and accuracy can be seen, not as the unfolding of some prearranged plan, but rather as the system adapting to a changing context, in which the language resources of each individual are uniquely transformed through use.

INTRODUCTION

One of the challenges of working on second language acquisition (SLA) is to capture the ongoing emergence of complexity, fluency, and accuracy in learner language. The desire to investigate 'motors of change' (Thelen and Smith 1994) contributes to the challenge. While much has been learned about the SLA process since its inception, most researchers in the field have operated within a 'developmental ladder' metaphor (Fischer et al. 2003) and under certain assumptions and postulates that follow from it, assumptions concerning linguistic competence that we have inherited from linguistics and postulates arising from first and early second language acquisition research, in particular that:

1. there are fixed, homogeneous native and target languages;
2. SLA is a process of increasing conformity to a uniform target language;
3. there are discrete stages through which learners traverse along the way;
progress can best be defined in terms of one dimension of one subsystem, i.e. accuracy in morphosyntax (as opposed to, say, the dimensions of fluency or complexity, and the subsystems of lexis, phonology, and discourse, or more likely, the interaction of all the above);

language is purely a cognitive resource;

learners move through the process in a fairly consistent manner; indeed, that

it is possible to adopt a two-phase research agenda, concentrating first on understanding learning and later on accounting for learners’ differential success.¹

Of course, no single researcher may subscribe to all these assumptions and postulates. In fact, many of these assumptions have been challenged over the years, and here I can but cite a few examples. For instance, Bley-Vroman (1983) argued some years ago that it was inappropriate to adopt a target-centric perspective and assume that learners’ language develops through a series of stages, each of which more closely approximates the target language. Then, too, it has long been known that any putative stages in SLA are not discrete, but rather characterized by ‘scouting’ and ‘trailing’ behavior (Stauble and Larsen-Freeman 1978; Huebner 1985). Furthermore, more recently, there have been forceful arguments made for a more socially-constructed view of SLA (e.g. Lantolf 1994; Firth and Wagner 1997). Finally, right from the beginning, despite the two-pronged nature of its research agenda (split between foci on learning and on learners), Selinker warned that ‘A theory of second language learning that does not provide a central place for individual differences among learners cannot be considered acceptable’ (Selinker 1972: 213, fn. 8).

While at least some of the assumptions have thus been challenged, and others likely will as the field evolves, emergentism (at least one that is informed by the chaos/complexity theory perspective on it that I hold²) does so wholesale, rather than piecemeal. In other words, it does not refute these assumptions one by one, but rather, from the beginning, adopts a different metaphor or supra-theory (Larsen-Freeman and Cameron forthcoming), one in which development is seen as a complex process of dynamic construction within multiple ranges in multiple directions (Fischer et al. 2003).

In contrast to the seven assumptions stemming from the developmental ladder metaphor, the assumptions underlying a complex, dynamic systems view are as follows:

¹ Language is not fixed, but is rather a dynamic system. Language evolves and changes in the dynamics of language use between and among individuals. This is true for both the language of native speakers and for the L2 of language learners (Larsen-Freeman 1997). Language grows and organizes itself from the bottom up in an organic way, as do other complex systems. Adaptation in local communities produces emergence of
certain variegated stabilities of structure, meaning and pragmatics, but overall there is little that is fixed about language. Therefore SLA is not a matter of conformity to uniformity (Larsen-Freeman 1997, 2003). Language as a homogeneous, static system is a normative fiction (Klein 1998).

Although progress in SLA may be viewed as the degree to which a language learner’s interlanguage aligns with the target language (TL), there will never be complete convergence between the two systems. For one thing, there may be little reason for a learner to attempt to emulate native-speaker norms (Cook 2002; Seidlhofer 2004), and for another, there is no fixed, homogeneous target end state to language evolution or development (Larsen-Freeman 2005). That is not to say that there are no constraints operating to define the trajectory of language development. Since many complex systems exhibit sensitive dependence on their initial conditions, language is likely to be shaped by certain substantive universal principles, which, when combined with their specific instantiation in the L1, exert a powerful influence on L2 development (Larsen-Freeman 1997). However, the process of second language acquisition is also likely to involve morphogenesis, the creation of novel forms (Larsen-Freeman 2003), one in which learners actively transform their linguistic world, not just conform to it (Donato 2000).

There are no discrete stages in which learners’ performance is invariant, although there are periods where certain forms are dominant, periods that have been referred to as stages in the acquisition of certain grammatical structures. There appears to be a need for the necessary building blocks to be in place in sufficient critical mass to move to a period where a different form dominates (Marchman and Bates 1994). The dominance of certain structures may arise through a gradual building up process or through a period of fluctuation among competing forms, followed by a phase shift in the system when a certain critical threshold is crossed, and some wider reorganization is triggered. The sudden discontinuity of the phase shift illustrates the nonlinearity of complex systems.

Because language is complex, progress cannot be totally accounted for by performance in any one subsystem. What is evident at any one time is ‘the interaction of multiple complex dynamic systems, working on multiple timescales and levels (Larsen-Freeman 1997; Lemke 2000)’ (Cameron and Deignan, this issue). Furthermore, there are also many dimensions to language proficiency—accuracy, fluency, and complexity being three that are theorized to have independent status in L2 performance in that learners can have different goals at different times when performing in an L2 (Skehan 1998; Robinson 2001). Linguistic subsystems, dimensions of language proficiency, and even individual elements of language interact in ways that are supportive, competitive,
and conditional (van Geert and Steenbeek 2005a). They are supportive in that development in one of these subsystems, dimensions, or elements might depend upon the development in another. We see this in first language acquisition, for example, in the relationship between lexical spurts and grammatical development. Seeing the two subsystems as ‘connected growers’ (Robinson and Mervis 1998) is important to understanding not only static relations between variables, but also relations that change throughout the course of development. However, while mutual, the relationship is not necessarily symmetrical, in that after a while, the development in one subsystem may have a competitive relationship with development in another. The competition is due to the inherent limited resources that humans can and will invest in learning a new skill or solving a task (Robinson and Mervis 1998), such as humans’ limited working memories, attention, and time-on-task (MacWhinney 1999; van Geert 2003), so that, for example, at one point in time, higher performance on one dimension of proficiency, say accuracy, can seemingly detract from performance in others, say fluency and complexity.

5 Language is both a cognitive and a social resource (Larsen-Freeman 2002; Atkinson 2002). The view of language as a cognitive resource has been long-standing in SLA since it arose in its modern form with the cognitive revolution in linguistics. More recently, the case has been made for viewing language as a social resource (Firth and Wagner 1997). That language is social in nature stems from the fact that it is used for social action within a context of language use, where pressures and affordances, learners’ identities, goals and affective states will all have a profound effect on language performance (van Lier 2004; Cameron and Deignan, this issue).

6 Learners do not progress through stages of development in a consistent manner. There is a great deal of variation at one time in learners’ performances and clear instability over time. Variation and fluctuation are important characteristics of dynamic systems (Thelen and Smith 1994; van Geert and van Dijk 2002) and should not be dismissed as measurement error. The fluctuation and variability is in part because language learners dynamically adapt their linguistic resources to the context, and the context is always changing (Tarone 1979). Thus, there is a dynamic interplay between a person’s abilities and context affordances (Clark 1997; van Geert and Steenbeek 2005a). While it is possible to separate context and person for the purpose of analysis, such separation requires the untenable assumption that the two are independent (van Geert and Steenbeek 2005a). Therefore, performance is by nature contingent and ‘a make-do’ solution to the situation at hand (Thelen and Smith 1994). The persistent instability of complex systems (Percival 1993) is due to the fact that a person’s use of language resources changes them.
Individual developmental paths, then, each with all its variation, may be quite different one from one another, even though in a ‘grand sweep’ view, these developmental paths appear quite similar (de Bot et al. forthcoming). One consequence of this is that generalizations about learning are elusive and not likely to hold regardless of individual differences (Larsen-Freeman 1985). Some of the individual differences naturally follow from the fact that individuals tend to actively select and manipulate the contexts in which they function (van Geert and Steenbeek 2005a). In fact, it could be said that individuals not only determine what aspects of the outside world are relevant to them, but they actively construct a world around themselves and are constantly altering it (Lewontin 2000).

Once again, we have a situation where other SLA researchers have made similar points. In addition to those I have already referred to above, let me acknowledge Tarone (1979, 1988), R. Ellis (1985, 1987), and Young (1991) for their work pointing to the importance of variability in learner performance, McLaughlin (1990) for his important observation that at certain points in development, interlanguages undergo a phase shift and restructure, and Pienemann (1998) for demonstrating that development depends on the availability of prior cognitive resources.

However, to reiterate what I wrote earlier, what is being presented here is not a piecemeal weighing of these assumptions, but a wholesale perspective shift, from a developmental ladder to an emergentist perspective, one that sees linguistic signs not as ‘autonomous objects of any kind, either social or psychological,’ but as ‘contextualized products of the integration of various activities by [particular] individuals in particular communicative situations. It logically follows that they are continually created to meet new needs and circumstances’ (Toolan in Leather and van Dam 2003). The dynamism of language central to this position frames questions concerning SLA in a rather different way.

THE STUDY

Having made a theoretical commitment, I acknowledge that the issue of finding a suitable methodology with which to capture and investigate the ‘fuzziness’ (van Geert and Steenbeek 2005b) and dynamism of language development is a challenging one. For assistance, I turned to van Gelder and Port (1995), who offer three approaches to the study of dynamical systems: quantitative modeling, qualitative modeling, and dynamical description. In this issue of Applied Linguistics are articles whose authors have adopted a modeling approach. The third approach, dynamical description, is one that I have employed in the study I report here. Dynamical description ‘provides a general conceptual apparatus for understanding the way systems—including, in particular, nonlinear systems—change over time’ (van Gelder and Port 1995: 17).
This study is a first attempt to grapple with the conceptual apparatus and tools to understand complex systems in action in second language learning. Of course, I am not the only one who is working on this problem (see, for example, de Bot et al. 2005), and there are others, especially in L1 acquisition, on whose work I have drawn (Robinson and Mervis 1998; van Geert and van Dijk 2002).

METHOD

For a dynamical description, it is desirable to use a time-series design, that is a series of observations of participants that are frequent enough to capture the relevant properties underlying the developmental process (van Geert and Steenbeek 2005b). To this basic design, I have added the feature of having students perform the same task at different points in time.

I concede that a repeated-task design makes it difficult to distinguish performance differences due to task repetition from those of more general language development. Bygate (2001), for instance, has demonstrated how complexity and fluency (but not accuracy) improves when learners repeat a task, and Yuan and Ellis (2003), among others, have shown how planning time affects task performance. However, using the same task several times was one way of dealing with the fact that ‘even subtle differences in a task can affect performance profoundly’ (Thelen and Corbetta 2002: 61), leaving unanswered the question of whether the subject has control over the language resources or not. I wanted to be able to look at performance variability that might be an ‘important harbinger of change, or indeed the manifestation of the very process of change’ (Thelen and Corbetta 2002: 61), not variable performance that could be due to differences in tasks or contexts. Still, of course, I had no control over how the participants chose to engage with or carry out the task, their fluid attitudes and motivation being part of the changing context.

Participants

The participants in my study were five learners of English from the People’s Republic of China. Here they will be referred to by the letters R, U, Y, H, and L. The learners were all female, with ages ranging from 27 to 37. They were all professionals, who were partners of graduate students at a large mid-west university in the United States. Their English language proficiency could be characterized impressionistically as high intermediate. They were keen to improve their English since their professional careers were put on hold as they accompanied their spouses to the United States.

Their instruction consisted of a class meeting once a week for two and a half hours over a 10-month period. In addition, once a month the teacher
met with each student in a private tutorial, lasting one hour. A communicative grammar textbook was used in class, and the instructional program had 2 basic grammatical foci: the verb tense–aspect system and article usage. Between classes, students had homework from the textbook, which consisted of reading grammatical focus boxes and completing the corresponding exercises. Other between-class assignments included 5 minutes a day of work on pronunciation (listening to the radio or eavesdropping and concentrating on a particular word or sound that was said differently from the way the student might say it), free reading for 15 minutes a day, one hour of daily listening to the radio or watching television, and every other week, reading a magazine article for the purpose of identifying unfamiliar words.

**Procedures**

The participants were asked to carry out the same tasks 4 times over a six-month time period, or in other words, to do the same tasks once every six weeks. The participants were asked to write a narrative about a past episode that they wanted to share, without worrying about whether or not it was in perfect English and without consulting a dictionary. Three days after writing each story (i.e. the same story each time), the participants were asked to tell the story orally. Both renditions were untimed. Furthermore, the participants received no feedback on their performance. Their oral performance was recorded and transcribed, but the data being reported on here will largely be drawn from the written narratives.

**Expectations**

As this is an exploratory study, there are no hypotheses being tested. Nonetheless, there are expectations about what might be found. Among them, I expected to find:

1. some stable patterns and some variation in learner production; the stability, of course, does not have to be native-like;
2. different learner orientations in terms of the subsystems and dimensions of proficiency in which they progress and regress from a target-centric perspective;
3. the use of a variegated set of language patterns, since I am making no assumption that what is psycholinguistically real for learners is identical to what is descriptively real for linguists;
4. the waxing and waning of such language patterns; language learning is an iterative process (de Bot et al. forthcoming) and is more like a spiraling process, revisiting the same territory again and again, instead of a linear, additive process;
5. a smoother, ascending line at the group level than I would find at the individual level, with a great deal of intraindividual (within one
individual on different measures) and interindividual (between individuals on one measure) variation; furthermore, I would expect that both types of variation would change over time because in a complex, dynamic system, certain factors can have almost negligible effects at certain points in time, and much more dramatic ones at others;

6 nonlinearity, evidenced by sudden shifts in the use of forms, despite no change in the effort expended—for example, because the learners worked on the English verb tense–aspect system does not mean that the ‘amount’ of verb tense–aspect learning would be commensurate with the effort put forth; of course, because of the interconnectedness of the subsystems of language, other dimensions of language might benefit or suffer from the attention given to a different part of the system;

7 competition among subsystems, proficiency dimensions, and language elements, in that two or more of these will be competing for the same limited resources and so for the limited duration of this study, these may see differing amounts of ‘air time’;

8 no linguistic rigor mortis—even if a certain stability were achieved by learners in this study with regards to one aspect of language, I would expect some instability once parameters in the context shift, for example, if the learner’s audience changes.

DATA ANALYSES

From a complex systems perspective, I needed to be concerned with both macro- and micro-level perspectives. At the macro-level, I used quantitative measures to see in a general way how the system changes and organizes over time. At the micro-level, I examined learner performance from a qualitative standpoint, concerned with the details of how the use of language changes to yield new performances.

Quantitative

Measures calculated for all five participants’ written stories were fluency (average number of words per t-unit, a t-unit being a minimal terminal unit or independent clause with whatever dependent clauses, phrases, and words are attached to or embedded within it), grammatical complexity (average number of clauses per t-unit), accuracy (the proportion of error-free t-units to t-units), and vocabulary complexity (a sophisticated type–token ratio—word types per square root of two times the words—that takes the length of the sample into account to avoid the problem that regular type–token ratios are affected by length (Ellis and Barkhuizen 2005). These indices have been determined to be best measures of second language
development in writing (see, for example, Larsen-Freeman and Strom 1977; Wolfe-Quintero et al. 1998).

**Qualitative**

Both the written and the oral narratives were analyzed into ‘idea units’, mostly full clauses, ‘a message segment consisting of a topic and comment that is separated from contiguous units syntactically or intonationally’ (Ellis and Barkhuizen 2005: 154). Arraying the corresponding idea units side by side for each telling of the story reveals how the narrative is constructed each time and how it differs over time.\(^4\) In order to allow for comparability, the most syntactically succinct idea unit was entered into the table first, and then the other ideas units were mapped against this one. This means that the succinct anchor unit in one telling of the story might be realized as several idea units in another version of the narrative; nonetheless, the single idea unit and the multiple idea units were entered side by side in single rows of the table in order to facilitate comparability. Two researchers divided the data into idea units. While inter-rater reliability was not calculated, any differences were discussed and reconciled.

Of course, sometimes the idea in an idea unit is not conveyed from one telling to the next. When this occurs, there are open cells. At other times, the same idea unit is present, but it is not told in exactly the same chronological order from one telling to the next, making it difficult to align and compare idea units. Fortunately, in this particular set of data, this did not occur very often, and when it did, the cells next to the discontiguous idea units were left empty. Despite these difficulties, arraying the data in this way shows how participants use their linguistic resources at one time and how they are employed differently over time.

**RESULTS**

**Quantitative**

Foreign language teachers and learners can take heart. Group averages on the four measures, shown in Figure 1, indicate that learners are making improvements in each. Over the six-month period of this study, participants are writing more fluently and accurately, and their writing has become more complex in grammar and in vocabulary. Of course, it is well known that group averages can conceal a great deal of variability, which can be seen by the standard deviations mapped onto Figure 1.

Viewing the data in this way shows that averaging group data as I have done has its limitations. Group data may often describe a process, or a functional relation, that has no validity for any individual (Sidman 1960). Thus, if we were to disaggregate the data, we would see a rather different picture.
Interindividuation variability

Interindividuation variability is clearly reflected in the different trajectories in Figure 2. Whereas group averages can be represented by a more or less smoothly ascending curve, some individual performances regress and progress, and others remain somewhat unchanged over time.

Figure 1: Group averages (±1 SD) over time on four indices using written data
Figure 2: Interindividual variation over time and the average for five participants on four indices using written data
The graphs in Figure 2 show that the assumption of progressive conformity to target language norms does not pertain. In its place, we see that different participants are following different routes to SLA. Even in L1 acquisition, of course, this is the case.

Although [developmental milestones] may characterize the timing and sequence of events on the average (‘the modal child’; Fenson et al. 1994: 1), the reality is that there is massive variation in both when and how children move through these important language milestones’. (Marchman and Thal 2005: 145)

Such variation is only magnified in SLA, where there is an influential L1, not to mention a cognitive and experiential maturity on the part of learners that affect the process. Thus, although it could be said that the learners were exposed to similar instructional procedures during the course of this study, they actually exhibit diverging patterns of development, due perhaps to the way that individuals have chosen to allocate their limited resources.

Intraindividual variability

Traditionally, intraindividual variability was seen as a form of measurement error. However, from a complex dynamic systems approach, intraindividual variability is an important source of information about the underlying developmental process (van Geert and Steenbeek 2005b; Bassano and van Geert unpublished manuscript).

To highlight the intraindividual differences at differing data collection points, let me display the data collected for this present study from yet another vantage point. This time, I show each subject’s performance on the written version of the story over time, transforming the performance measures to z-scores in order to ensure the comparability across the four indices of fluency, grammatical complexity, vocabulary complexity, and accuracy (Figure 3). Averaged data may obscure individual differences, but averaged data within the individual, on the other hand, do at least provide a true description of the behavior of the individual within the limits of the measure employed (Sidman 1960).

Clearly, viewing the learner profiles this way shows the distinctive orientations and paths that learners exhibit over time. However, although there is intraindividual variability from one time to the next, it is also possible to identify attractors or preferred paths within individual performances. This can best be seen by mapping the performance of the five participants on two of the indices. When grammatical complexity is plotted against vocabulary complexity (Figure 4), for example, it is clear that subject L has focused on vocabulary complexity (whether consciously or not) while all the others were doing the same with grammatical complexity, although meeting with varying degrees of success.
Plotting fluency against grammatical complexity (Figure 5) shows that participant L improved in fluency, subject U made more gains in grammatical complexity, and the others fell somewhere between.

Thus, L, a 27-year-old with a master’s degree in biology earned in the PRC, has improved in what might be called an expressive dimension (fluency

Figure 3: Intraindividual variation over time for five participants on four indices using written data

Plotting fluency against grammatical complexity (Figure 5) shows that participant L improved in fluency, subject U made more gains in grammatical complexity, and the others fell somewhere between.

Thus, L, a 27-year-old with a master’s degree in biology earned in the PRC, has improved in what might be called an expressive dimension (fluency
Figure 3: Continued

Figure 4: Change of grammatical complexity compared with vocabulary complexity for five participants using written data
and vocabulary complexity), whereas subject U, a 37-year-old engineer, appears to have developed in grammatical complexity, while her level of expressiveness—fluency and vocabulary complexity—have remained rather unchanged.

In sum, the quantitative analyses reveal that while overall the group is making progress, at least if progress is defined as becoming more fluent, accurate, and complex from a target-language perspective, each member of the group is following a somewhat different path.

Since this study is exploratory, I decided to borrow techniques from L1 researchers and display these same data from other perspectives. Although no significant gains were made between data collection points (an unsurprising finding), it was interesting, nevertheless, to calculate the rate of change over time. This is calculated by setting the first data collection point (i.e. June) as the baseline, with a value of 0. The rate of change is then calculated by taking the difference between the next point (here August) and the previous point and dividing it by the previous data point. For example, as can be seen in Figure 2, U’s accuracy score in June is 0.32. In August, it is 0.65, so the rate of change is (0.65–0.32)/0.32 = 1.04, which is plotted as the second data point in the graph, that is for August. The results can be seen in Figure 6.

It seems, therefore, that the rate of change fluctuates for different participants at different times. Figure 6 also reveals that the largest rate change occurs for accuracy. This sensitivity could be due to many factors, such as the fact that the participants were receiving language instruction, their differential valuing of accuracy over fluency and complexity, etc. It is also possible that measures of fluency and complexity show less change, perhaps because these speakers are close to asymptote in the development in these dimensions. With children acquiring their L1, on the other hand, we
Figure 6: Rate of change on four indices for five participants over time using written data
might obtain an entirely different picture, with vocabulary and grammatical complexity growing more rapidly.

**Qualitative**

Space will not permit a comprehensive analysis of the qualitative data; therefore, I will draw selectively on the data to illustrate the approach and to call attention to certain language performance features that one would expect to find, given a complex systems approach.

The first set of data comes from R, a 28-year-old Chinese speaker who has lived in the United States for two years. She has earned a bachelor’s degree in mathematics from a university in the PRC and a master’s degree in statistics from a university in the USA. Table 1 contains the first nine idea units from her written story, reproduced from handwritten versions of the story and arrayed in tabular form to facilitate comparisons. All features of the original, including misspellings, have been preserved.
Table 1: Participant R—Written story data at four times (first nine idea units)

<table>
<thead>
<tr>
<th></th>
<th>June</th>
<th>August</th>
<th>October</th>
<th>November</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Five years ago, my husband came to the U.S to persue his Ph.D. degree, then after two months, I also came to meet him.</td>
<td>Five years ago, my husband went to the United State to pursue his doctoral degree.</td>
<td>More than five years ago, I followed my husband’s step to pursue Ph.D. degree in physics, so I had to company him overseas.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>On September 30th, 1999, I came to the United States by myself.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I was so excited when I saw my husband who was waiting for me on the exit gate in the airport.</td>
<td>When I saw my husband at the airport, I was so excited.</td>
<td>When I saw him at the airport, I was very excited, because we would begin our new live in the new land.</td>
<td>However, I did not want to live here because of my poor English.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Before we left our country, my husband had already made a plan for me.</td>
<td>The plan was that I passed the TOEFL first, then attend a graduate school.</td>
<td>Before we came here, my husband and I discussed about my future.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>I didn’t like this plan actually, since I was not good at English.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The most salient difference is that the October and November written narratives contain idea units that are absent in the June and August versions. Another salient difference is in the time line of the narrative, with the October and November stories having a more complex time line and point of
view from that of earlier versions. The more complex time line shows clearly in idea units #5 and #6, where the narrator is at a time now, looking back beyond ‘we left our country,’ which was 5 years ago. Notice the accurate and meaningful use of the past perfect in #5 in October. It is made clear that from that point in past time, there was a future plan, which included taking the TOEFL and attending graduate school. The use of ‘would’ in idea unit #8 for the November story reflects a sophisticated use of a modal to look to the future from the past, and there are other such usages throughout the October and November stories.

Clearly, if morphosyntactic sophistication were the sole criterion of success, then R is making progress. However, there are other interesting changes going on as well, perhaps best appreciated by adopting a more emic perspective. When one does, one also sees a shift in the way that R chooses to orient herself with regard to her husband and to how she reports the circumstances in the story. For instance, the data in R’s narrative reveal a deictic shift in the choice of the verb from the country of current residence (‘came’) to the country of origin (‘went’). Notice, too, that the orientation that is adopted is maintained fairly consistently within a story. For instance, in October, when ‘went’ is used in idea unit #1, China as the reference point is maintained in idea unit #5, ‘Before we left our country . . .’. This contrasts with the perspective in the story told in November, where the story teller says ‘Before we came here . . .’

Interestingly, there is also a shift in subjectivity in idea unit #1 (from ‘My husband’ as agent in August and October to ‘I followed my husband . . .’ in November). Later, in idea unit #5, the way the story is portrayed shifts from R’s husband having made a plan for her (October) to her and her husband discussing her future together (November). Given that this is a story-telling task, where the teacher is the intended reader, R may be using language to gain the approbation of the teacher by granting herself a greater role in determining her future with successive iterations of the tale.

There are other segments of idea units that persevere from one telling to the next. For instance, the opening time phrase (‘Five years ago’) in idea unit #1 is identical in August and October, and slightly altered in November (‘More than five years ago’). Then, too, in idea unit #4, notice the use of the same clauses ‘I was so excited’ and ‘when I saw my husband,’ although their sequence differs, appropriately so, given the need to maintain the theme–rheme relationship with the preceding clause in idea unit #2.

It is probably worth mentioning at this point that the differences that I am calling attention to are variegated—morphemes, words, phrases, clauses, partial utterances, abstract semantic categories, etc.—as there is no way to know which, if any, of these are psychologically real units for the learner (Tomasello 2000). We should not therefore limit ourselves to analyzing learner language into conventional linguistic units of one type (although admittedly it is difficult to resist doing so) assuming that learners’ units are isomorphic with those of linguists.
Another pattern prevalent in SLA is the appearance in performance data of an ephemeral language form, which may be an L1 or L2 form or which may differ from both the L1 and the L2. What follows are possible examples of both types of variation in the first five idea units in the written story of learner, Y, a 31-year-old accountant (Table 2).

The motivation for the shift from ‘get married’ in idea unit #1 in the June, August, and October versions of the story to ‘marry’ in the November story is not clear as both forms are acceptable in the L2. However, perhaps the shift in idea unit #2 from ‘many money’, a form not found in the L1 or the L2, to ‘much money’ between the August and October versions of the story can be said to represent a reorganization of the system. For one thing, ‘much money’ is used again in December.

Further evidence of this being the result of an internal restructuring comes from examining the same idea unit #2 in the oral data. Notice that ‘many money’ is used in the first two versions of the story, consistent with the
written version of the story. Then, just as with the written version, in the oral versions of the story told in November and December, Y uses the target phrase ‘much money’ (Table 3).

Other differences over time (although not always the motivation for them) can be easily seen, but space will not permit a detailed account of them. As for using language for social action, it is interesting to note that in the oral renditions of the story in October and November, Y frames the genre for the listener in idea unit #1. She says, ‘My story is about . . .’ in October, and ‘I am gonna tell . . .’ in November. Perhaps Y is motivated to do so in an attempt to increase intersubjectivity with the audience (the teacher) who is present in the immediate spatial and temporal context.

Table 3: Participant Y—Oral story data at four times (first four idea units)

<table>
<thead>
<tr>
<th>June</th>
<th>August</th>
<th>October</th>
<th>November</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 My husband and I had been dating for 5 years before we decided to get married.</td>
<td>My husband and I had been dating before we decided to get married.</td>
<td>My story is about how my husband and I got our marriage certificate for about four years before we decided to get married.</td>
<td>Today, I’m gonna to tell story about how I got my marriage certificate. My husband and I had been dating for 4 years before we decided to get married.</td>
</tr>
<tr>
<td>2 Because at that time we were both students so we were pretty poor without many money.</td>
<td>At that time, we were both students so we were poor and didn’t have many money.</td>
<td>At that time, were both students, so we didn’t have too much money and wanted to save every penny.</td>
<td>At that time we were both students. We didn’t have much money so we tried to save every penny.</td>
</tr>
<tr>
<td>3 I remember the day when we went to apply marriage certificate. Was a terrible cold.</td>
<td>I remembered when we went to the government office to apply our marriage license it was winter and it was terrible cold.</td>
<td>I remember it was winter when we went to apply marriage certificate.</td>
<td>I remember it was winter when we decided to apply for the marriage certificate.</td>
</tr>
<tr>
<td>4 So we ride a bicycle for half hour to get the office . . .</td>
<td>Because we didn’t want to spend money on cab we decided to ride bike to the office.</td>
<td>The office was about one hour away from our place and my husband and I rode bike to there, because we didn’t want to spend money on cab.</td>
<td>The office was about one hour from our place. We rode our bikes to there because we didn’t want to spend money on a cab.</td>
</tr>
</tbody>
</table>
In any event, it is easy to see other differences among the different versions of the story. What one would like to know as an applied linguist is if any of this variation is indicative of the bifurcations that signal the instability alluded to earlier, the instability that precedes a phase shift in the system. It is here where a pedagogical intervention might be optimal. This may be especially true when the variation that is taking place within a short period of time (i.e. within the three days between the writing and telling of the story) mirrors that over the six months of this study. For instance, the alternation in use of the prepositions ‘in’ and ‘at’ by U, a 37-year-old engineer (Tables 4 and 5), suggests that she might benefit from focused instruction on the difference between using the two prepositions in locative phrases. Such a pattern invites a microgenetic experiment, ‘where the researcher deliberately facilitates (or even retards) the discovery of...new ways’ of behaving ‘through coaching, training, practice, or scaffolding support’ (Thelen and Corbetta 2002: 6) to see what effect it has on the system.

Of course, had a successful pedagogic intervention taken place with U, there is no guarantee that it would necessarily work with the other learners. Depending on when it occurs and with whom, a similar intervention can lead to highly diverging patterns of development (de Bot et al. 2005: 14). Teachers know this, and researchers also know this from the many classroom-based SLA studies, such as those using focus-on-form interventions. In any case, the alternation between ‘in’ and ‘at’ illustrates the ‘effect of competition between sometimes deeply entrenched rivals’ (Sharwood Smith and Truscott 2005: 237), such as that that obtains here where the native language does not make the distinction at all.

### Table 4: Participant U—Written story data at four times (first idea unit)

<table>
<thead>
<tr>
<th></th>
<th>June</th>
<th>August</th>
<th>October</th>
<th>November</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Two years ago, I lived <strong>in</strong> Detroit.</td>
<td>Two years ago, I lived <strong>at</strong> Detroit.</td>
<td>I lived <strong>in</strong> Detroit two years ago.</td>
<td>When I came to the U.S.A three years ago, I lived <strong>at</strong> Detroit.</td>
</tr>
</tbody>
</table>

### Table 5: Participant U—Oral story data at four times (first idea unit)

<table>
<thead>
<tr>
<th></th>
<th>June</th>
<th>August</th>
<th>October</th>
<th>November</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Two years ago, I lived <strong>at</strong> Detroit...</td>
<td>When I came to United States three years ago I lived <strong>in</strong> Detroit.</td>
<td>Three years ago I came to the United State and I lived <strong>in</strong> Detroit.</td>
<td>When I came to the United States I lived <strong>at</strong> Detroit.</td>
</tr>
</tbody>
</table>
I will use an image from chaos/complexity theory, that of a fractal, to make one final point. A fractal is a geometric figure that exhibits self-similarity at different levels of scale or magnifications. One important dimension of the self-similarity is that it suggests that even when things appear to be static at one level, there may be continuous dynamics within the system at another level, just as we might not see a tree growing if we watch it, even for a long time, yet we know, in fact, that at another level of scale, there is a great deal of growth taking place. It is clear that across participants in this study ‘in’ and ‘at’ are in competition, and no growth seems to be taking place. This is true also at the individual level over time. At least for U, there appears to be a bi-modal attractor (Bassano and van Geert unpublished manuscript) operating, with ‘in’ dominating at one time, giving way to a dominant ‘at’ at another time. However, when we take the level of magnification one level lower, to one subject at a single point in time, we see that the system is not as fixed as it might seem. What might at first be called free variation, with ‘in’ and ‘at’ competing for ‘air time’, lessens when we examine the instances of ‘in’ and ‘at’ one by one. There still is some variation that is not easily explicable; for instance, in June, U uses ‘in Detroit’ in writing twice, but ‘at Detroit’ in speech once. From a target-centric perspective, she also incorrectly puts ‘in’ in the phrase ‘in that celebration’ in June. However in this same month, U uses ‘in’ correctly when it is in a fixed phrase. She says ‘keep in touch,’ at one point in the oral telling of her story. Also, when she uses ‘at’ correctly in June, she does so where there could be no other logically semantic alternative, that is she says ‘sit down at a table’ and ‘stared at me’. ‘In’ simply would not work semantically in these contexts, although here again, these two might also have been learned as fixed forms, (i.e. the co-occurrences of verb + preposition) instead of through any sort of semantic generalization. What this approach does show is that U has some pieces that might allow her to build toward a more target-like system. It also shows what insights can be obtained by careful analysis at different levels of magnification, including at the level of individual performance over time of the sort that Bardovi-Harlig (2000) has done with the English tense–aspect system.

DISCUSSION
The eight expectations I laid out earlier were all met. When the quantitative data were averaged and plotted on graphs for the five participants in this study, the graphs showed curves over time that differed from those of individuals. It is not uncommon in SLA to compare macro-level group averages at different points in time, and if reliable differences are found in mean levels of performance, to conclude that development has occurred. The micro-level description of the individual’s development is not always addressed. We have seen from the graphs in this study that it is necessary to ask if individual participants follow the same developmental pathway as does the group. Although cross-sectional research can be useful in helping to
define the tightness of the constraints on the process and in terms of group development, in a dynamic or complex systems developmental approach, one must also view the ‘individual and his or her behavioral changes over time’ (Thelen and Smith 1994: 97–98).5

Of course, using a time-series design with participants who speak the same L1 and are at roughly the same language proficiency, as I have done here, is not new to SLA research. It is clear, though, that cross-sectional and case study research are complementary. The former can only give us a picture of the ‘grand sweep of development’ where global structure and similarities across participants can be seen. We need, in addition, to take in ‘a view from below’ where the ‘messy little details’ lie. It is by looking at these that we see that behavior is variable and context dependent (van Dijk cited in de Bot et al. forthcoming). Further, ‘it is very well possible that if we look close enough that the general developmental stages individuals go through are much less similar than we have assumed so far’ (de Bot et al. 2005: 24), and may, instead of being governed by rules, be ‘pastiches of various kinds of item-based constructions’ (Tomasello 2000: 76).

Whether or not the messy little details, the continuities and discontinuities, are indicative of lasting development is, of course, unclear.6 The differences might be due to a range of factors other than learning, for example the fading of memory of the previous story, recent language experiences that influence the narrator’s telling, changing opinions of the events as time passes, etc. Still, a traditional way of looking at improved learner performance on repeated tasks is to say that a learner is increasingly able to perform his or her competence, whereas the approach that I am putting forward in this article argues for a dynamic view of performance/competence. If a student shows improvement on a particular task over time, then what we can say is that the student has developed greater language resources with which to accomplish the task. The important question remains, of course, as to whether improvement on a task can be generalized to other language use situations. The point not to be missed, however, is that from the vantage point of a complex systems approach, improved performance is not merely a question of a learner’s enhanced access to his or her steady-state competence. A learner/user’s language resources (competence, if you must) change synchronously with their use.

In addition, I have speculated that some of the variation can be attributed to (social) factors outside the linguistic system and some to internal restructuring of the system.7 As an example of the former, I pointed out how R’s report of her own agency in the development of future plans increased from one telling of her story to the next. As for the latter, there may be little apparent change in interlanguage, until one day, given sufficient probabilistic input, the system spontaneously self-organizes (as we saw with ‘many’ changing to ‘much’), and under certain conditions, may even enter attractor states never before experienced. One of the tenets of this approach is that it is at the bifurcations or discontinuities, when the process
is relatively unstable or chaotic, that the organism is free to explore new behaviors in response to task demands. Indeed, it is the flexibility to discover new solutions that is the source of novel forms (Thelen 1995). However, the system may self-organize with respect to one area of language only. ‘Presumably there are oscillating cycles of lesser and greater chaos going on elsewhere in the system’ (Larsen-Freeman 1997: 151), and ‘extended periods where alternative forms exist side by side’ (Sharwood Smith and Truscott 2005: 237) as we saw with the alternation in use of ‘at’ and ‘in’.

How the variability and specific adaptations of ‘make-do’ solutions at one time lead to the instability and stability of over-time development is of course the central concern of SLA and will remain so. But to study this, we will need individual micro-developmental studies, which seek to understand the mechanisms by which learners ‘forgo old ways of behaving and adapt new ones’ (Thelen and Corbetta 2002: 60). Micro-development studies require much denser data collection intervals than I have managed here. From these micro-developmental studies, one would also hope that both functional or unsupported performances, as I report on here, could be compared with optimal performances such as those that are scaffolded by others. Indeed, Fischer and Yan (2002) maintain that it is the discontinuities in optimal performance that are true indicators of ‘stage-like’ changes (see, for example, Lantolf and Poehner 2004 on dynamic assessment).

CONCLUSION

I have presented a different view concerning what language is and how SLA transpires, a view which I believe will make an important contribution to applied linguistics. For one thing, a structural theory of static competence does not easily lend itself to explanations of developmental change.

Within the framework of structural theory, developmental studies have the following typical form: older and younger children are tested in a task and the mean performances at the two age levels are calculated. The typical finding is that younger children perform less well than older children. These mean differences in performance are considered to be the developmental facts to be explained. There are other kinds of data that could be the principal data of developmental psychology—the trajectories of change of individual children... or the magnitude of between-subject variability and changes in that variability with task and age.... However, these sorts of data are not the relevant data for structural theorists to find the global order—the common structure—that transcends individual uses of presumed knowledge structure. (Smith and Thelen 1993: 155)

I have argued that we need a more dynamic view of language and of its learning. We need to look at the ‘messy little details’ that make up the ‘here and now’ of real time. We need to take into account learners’ goals and
intentions. We need to consider the tasks that we ask them to perform and to consider each performance anew—stable and predictable in part, but at the same time, variable, flexible, and dynamically adapted to fit the situation. The messiness is not ‘noise’, but rather a natural part of dynamically emergent behavior assembled by the individual with a dynamic history of engaging in such tasks, with his or her own self-identified (or jointly identified) target of opportunities for growth. And, we likely need the tools of multivariate analysis to help us sort all this out. It should be noted in closing that many of the phenomena that I have called attention to in this exploratory study have been attested to as characteristic of interlanguage systems previously. It could, therefore, legitimately be asked if the tools and perspective that I have brought to bear on these data yield any significant new results. A more important question at this point, however, might be to ask if viewing language and its learning in this way allows us to understand SLA in a different, more compelling and potentially more fruitful way. If so, applied linguists may soon find ourselves explaining SLA in the following way:

Patterns in interlanguage emerge from the complexity and frequency in the L1 and L2 and their energetic status, shaped by individual learner orientations and contextual variables. As such, no particular subsystem of language has a priori priority, and no dimension of language proficiency has a priori privilege ‘since it is the particular coalition of elements [and dimensions] from which the coherence arises’ (Thelen and Bates 2003: 381). The patterns are variegated, and ‘softly assembled’, that is the product of dynamic adaptation to a specific context (Tucker and Hirsch-Pasek 1993). They are ‘created and dissolved as tasks and environments change’ (Thelen and Bates 2003: 381). Some patterns are preferred; others are more ephemeral. Thus, developmental change seems ‘not so much the stage-like progression of new accomplishments as the waxing and waning of patterns, some stable and adaptive and others fleeting and seen only under special conditions’ (Thelen and Bates 2003: 380).

Intrinsic to this view is the idea that individual developmental paths, each with all its variation, may be quite different from one another, even though in a ‘grand sweep’ view these developmental paths are quite similar. I will let Marchman and Thal (2005) make the point that:

language learning can be viewed as a complex and dynamic process in which various components emerge at various levels, to various degrees, and at various times. Individual differences are a natural consequence of learning within such a framework because of the dynamic and multi-faceted nature of the emergent system. Slight differences in the relative rate, strength, or timing (chronotopic constraints) of the component achievements can result in relatively significant differences between individuals in behavioral outcomes.... Instead, from an emergentist view, children differ in language learning skill not because of
domain-specific knowledge that they either have or don’t have, but because of variations in how and when the pieces of the process were put together during learning. (Marchman and Thal 2005: 150)

Therefore, it seems to me, as Alton Becker (1996), in his impressive collection of essays, has written:

If we are interested in language in full context—real language—we must take care not to exclude the individual voice, which is the only place where self-correction, that is, change, happens—where the living organism interacts with the environment. (Becker 1996: 300)

I will call upon two women, Liz Bates and Esther Thelen, whom, sadly, we have lost recently, but who had been so helpful in giving me the language to express emergentist assumptions, to have the final word:

Every new state depends on the states that preceded it... the ideas of ‘soft-assembly’ and historical contingency offer a way of conceptualizing both the global and universal changes in development as well as the local, variable, and individual pathways. (Thelen and Bates 2003: 382)

Final version received July 2006

NOTES

1 With regard to this last point, I note that from the genesis of the field of second language acquisition, the study of SLA was to: (1) account for the acquisition process, and (2) account for the differential success of learners (Hatch 1974). These two foci have been widely interpreted by the research community as constituting two separate research agendas.

2 I should acknowledge that much of my earlier work was conducted from the developmental ladder perspective, and it has only been during the last decade or so, since discovering chaos/complexity/dynamic systems theories that my thinking has been transformed.

3 Roger Brown, whose research in first language acquisition provided the impetus for much initial SLA work, observed that in L1 acquisition, ‘the learning involved must be conceived of as generally gradual change in a set of probabilities rather than the sudden acquisition of general rules (1973: 388) [Brown, R. 1973. A First Language. Cambridge, MA: Harvard University Press]. Nonetheless, he reported his findings as a criterion-driven series of stages’ (Berdan 1996: 237).

4 I thank Lynne Cameron for suggesting this approach. Let me also acknowledge Agnieska Kowaluk’s assistance with data collection and transcription,
Jinyun Ke’s contribution to the figures, and Nick Ellis and two anonymous reviewers for their helpful comments on an earlier draft of this paper.

5 I suppose that socio-cultural theorists would make that case for the unit of analysis being the individual interacting with others.

6 Presumably, multivariate analyses will help us sort this out (Tarone, personal communication).

7 Of course it is not the case either that variability has been ignored in SLA development; researchers operating from a sociolinguistic point of view have accorded it important theoretical status all along (e.g. Tarone 1988; R. Ellis 1987; Young 1991), although some (e.g. R. Ellis 1985) have called it a problem.

8 See, for example, Larsen-Freeman 1976; N. Ellis 2002.

REFERENCES


Bassano, D. and P. van Geert. Unpublished manuscript. ‘Modeling continuity and discontinuity in utterance length: A quantitative approach to changes, transitions, and intra-individual variability in early grammatical development.’


