First Person Singular

Just learning

Diane Larsen-Freeman

Learning from the beginning

I have always been interested in learning. I chose to study psychology as an undergraduate because it was in my psychology courses that I got to study theories of learning. I learned that the psychologists couldn't agree on what the EXPLANANDUM was. Some thought it was human behavior; others argued for mental competence. It was only later that I found my own focus: I became interested in understanding the learning of LANGUAGE (although the issue of behavior versus mental competence persisted).

My interest arose during two years' service with the U.S. Peace Corps, for which I volunteered following graduation. The experience literally opened the world to me. After three months' intensive training in Hilo, Hawaii, I was sent to Sabah, Malaysia to teach English in a government secondary school. Both my own language training and my teacher training in Hawaii were thoroughly grounded in the audiolingual method. I memorized dialogues, engaged in pattern practice, and was totally immersed in Bahasa Melayu for four hours a day, six days a week. While I cannot say that I developed communicative fluency, to this day if you give me the first line of any of the dialogues, I can complete the rest of the dialogue flawlessly. To be sure, I also gained some productive oral ability, an ability I never had despite my years of studying Spanish in school via what I later learned was the Grammar Translation method.

As a teacher trainee, I learned to conduct repetition, substitution, and transformation drills. In Malaysia, I used a green book with dialogues and a red student book with picture prompts for drill responses, which I was later to learn were written and published at the University of Michigan. I could drill with the best of them, but found doing so distinctly unsatisfying. In fact, I think some of my most productive lessons took place during the rainy season when I had to create other activities for my students to do due to the fact that the torrential rains on the corrugated tin roofs of our open air classrooms rendered any oral communication inaudible.

So there I was in North Borneo, and while I never heard my students question it, I wondered why they needed to learn English, let alone learn to write a précis (which I had never had to do in all my years of schooling). I was learning alongside my students, as teachers do, and although I could make the lexical shift of *lorry* for *truck*, *flat* for *apartment*, and *lift* for *elevator* easily enough, my British colleagues teased that I was really teaching American, not English. Later I learned that in the interest of promoting national identity, the Malaysian

government redirected its resources from English teaching to teaching the national language. While it is not my place to judge this decision, I did take note some years ago when the government, deploring the lack of English skills of Malaysian students and spending a great deal of money trying to recoup their English proficiency, regretted letting the English teaching infrastructure languish.

One of the felicitous decisions I made early on in my two years in Sabah was to teach swimming to anyone who wanted to learn. I had been a swimming instructor during my undergraduate years, and I put this experience to good purpose. My town was right on the Celebes Sea; yet few of my students knew how to swim. Swimming was something I did know how to teach, and I found doing so rewarding. I also knew from the experience of teaching swimming that success in learning to swim was mainly, if not wholly, dependent on trust, and that each learner would (or would not) develop this on his/her own. I also witnessed the individual paths to learning to swim that the learners took, an observation that would stay with me during my long career.

Following my two years as a Peace Corps Volunteer, I decided to study for a master's degree in linguistics, prompted to do so by my conviction that there had to be a better way to teach languages than what I had been doing for two years. I chose the University of Michigan, initially oblivious to its being the source of my teaching materials, selecting it instead because of its strong academics in general and its fine reputation in applied linguistics.

Second language acquisition: The early days

Anyone reading this essay will not be surprised to learn that my questions about language learning and optimal teaching methods only met with further questions, and no definitive answers. However, during my years in Ann Arbor, I was privileged to teach in an adult community language learning program and at the famed English Language Institute and to learn from such Michigan notables as Joan Morley. In addition, my professor in teaching methods, H. Douglas Brown, was editing the journal *Language Learning* at the time, and I learned much from him about what was breaking new ground in applied linguistics. Indeed, I will never forget one day when he came to class and explained that he believed an article that had just been published in *IRAL*, 'Interlanguage' (Selinker 1972), would revolutionize the field. His foresight proved sound. Most scholars today consider that article and S. Pit Corder's publication on learner errors (Corder 1967) to be landmark texts in the establishment of the discipline of second language acquisition (SLA). Little did I know that 40 years hence, in 2012, I would have the opportunity to speak at a conference commemorating Selinker's publication, where I argued, as had others, that we should not think of the endpoint of the interlanguage continuum as being isomorphic with native speaker competence (Larsen-Freeman 2014).

In any case, I was fortunate that my academic coming of age coincided with the early stirrings of interest in SLA. Those of us privileged to be present in January 1975 in Ann Arbor for the Sixth Conference on Applied Linguistics (the papers later published as *Papers in second language acquisition*, special issue #4, *Language Learning*, January 1976) realized that a sea

change was taking place: a shift from research that exclusively focused on language teaching to research that investigated language learning. The conference participants were a mix of professors and graduate students, both experienced and inexperienced researchers, but what was clear was that we were drawn together out of our mutual interest in SLA.

It was a heady (pardon the pun) time. Noam Chomsky's theory in linguistics had contributed to the cognitive revolution that was sweeping not only linguistics, but psychology and anthropology as well. Especially relevant to SLA research was early work by first language (L1) acquisition researcher Roger Brown (1973), who claimed to have found an order of morpheme acquisition for children acquiring L1 English. That finding, along with Corder's notion of a built-in or internal syllabus, was electrifying. When the search for such a natural order/syllabus extended to SLA (Dulay & Burt 1973), and with it reports of universality, I was truly excited. It reignited my interest in learning theories from some years earlier. It seemed to me that the possibility of teaching in a way that harmonized with learning, rather than contrary to it, was within reach. Inspired by this prospect, I decided to direct my dissertation research to the morpheme acquisition order of adult second language (L2) learners of English. While I found some evidence of commonality among learners with different language backgrounds, I also found some differences due to the influence of their L1s and to the demands of the different tasks in my study. Nevertheless, my most significant and enduring finding was that there was a positive correlation with all the orders and with the frequency of occurrence in native speaker speech (as I could best estimate in those days before readily available corpora).

While I recognized the order to be an accuracy order, not an acquisition order (Larsen-Freeman 1975, 1976), I was at first distressed by my discovery. A positive correlation with frequency could be seen to provide evidence for stimulus-response learning, and I was concerned lest my finding spur another round of teaching by mechanical drilling. However, I soon realized that a cognitive interpretation was also possible: the more times learners encountered a particular item, the more rapidly they could work out the rule. In other words, the same finding lent itself to both interpretations. The fact that the data supported both interpretations impressed upon me how theory-dependent the interpretation of research findings is.

This impression was reinforced some time later. I had observed in the research for my dissertation that particular nouns and verbs were more likely than others to be inflected by the participants in my study. For example, certain verbs were more likely to take the past inflection than other verbs where it would also have been appropriate to use past tense. I wasn't sure what to make of this observation at the time, but later with the aid of a new theory, a usage-based one, I could make sense of the data. I realized that it wasn't rules that were being acquired, certainly not ones that were applied across the board; instead, the participants in my study were using the items monomorphemically, i.e., as fixed lexical items bound with their morpheme as intact units—not analytically composed as verb + a morpheme. This interpretation turned upside down the assumption that language learning consisted of rule learning, replacing it with an understanding of language learning as emerging bottom-up from learners' experience with frequently-occurring forms.

For a while, I pursued a research agenda in which I searched for an L2 index of development, in vain as it turned out (Larsen-Freeman & Strom 1977; Larsen-Freeman 1978, 1983). I was motivated to search for a developmental yardstick because of the disagreement among researchers as to how much influence the L1 had on the learning of the L2. I reasoned

that part of what made researchers' findings disparate, which led to the internecine feuding, could be attributed to the fact that learners of differing L2 proficiencies were being compared. In any case, as I say, the search proved fruitless, although again I came away having learned an important lesson. I found that I could identify measures that applied to groups of learners, e.g., certain measures of linguistic sophistication (such as the length of error-free T-units) could discriminate among groups of learners of different levels of proficiency, but no measure that I tried worked for all individuals. There were always outliers. I was later to discover that this phenomenon had a name: non-ergodicity (Molenaar & Campbell 2009), in which intra-individual variation cannot be generalized from inter-individual variation.

After earning my doctorate in linguistics at Michigan, I accepted an appointment at the University of California, Los Angeles (UCLA) to the teaching English as a second language (TESL) Section of the English Department. Section Chair, Russell Campbell, made his offer more attractive by telling me that it was his intention to make UCLA the Michigan of the future. Another incentive was the opportunity for me to teach Bahasa Indonesia in order to showcase teaching practices for MA in TESL students, which I did for three years. John Schumann arrived at UCLA the same year I did. On the faculty already were many distinguished applied linguists, including SLA researcher Evelyn Hatch (whose work on discourse analysis inspired my first book in 1980—an edited collection called *Discourse Analysis and Second Language Research*). Already present at the University of Southern California (USC) were Jackie Schachter, Bill Rutherford, and Steve Krashen (who had arrived in Los Angeles just before John and I did). So, all in all, there were quite a few of us interested in SLA. We resolved to get together, accompanied by our graduate students, every two weeks, alternating between our two campuses. At first we professors gave informal presentations, and learned from the feedback we received. Later, our graduate students did the same. I recollect it was Evelyn Hatch who put forth the idea of inaugurating an SLA conference, which would be student organized, patterned after the Child Language Acquisition Conference at Stanford University. Thus began the Second Language Research Forum (SLRF), which was hosted by students at UCLA or USC for its first seven years and then moved on to other venues/universities. This was the origin of SLRF, which has been ongoing more or less annually ever since 1977.

Later, when Chris Candlin invited me to write a book on SLA, I approached an outstanding student in my SLA course: Mike Long. The result was our co-authored *An introduction to second language acquisition research*, published in 1991. I am certain that others could find flaws in the book; however, I believe that no one could fault us for not being comprehensive. We covered the field, such as it was at the end of the 1980s. When we were encouraged a few years later to write a second edition, neither of us wanted to take it on. Even in a few short years, there had been a surge of new research, such that the books that followed ours, such as Rod Ellis' in 1994, were real tomes.

Grammar: form, meaning, and use

Speaking of tomes, another book that was to come out of my experience teaching at UCLA was *The grammar book: An ESL/EFL teacher's course,* co-authored with Marianne Celce-Murcia,

which was 600+ pages in its first edition (1983). Marianne and I had been assigned to teach a pedagogical grammar course to MA in TESL students (in which Kathi Bailey was my first Teaching Assistant), and we quickly discovered that there was no textbook for such a course. We began by creating handouts for our students. After several iterations using these materials, and with the benefit of feedback from students and colleagues, our handouts became our textbook in manuscript form. With its most recent edition (2015) at 900+ pages, people have asked why the book keeps growing and why new editions are needed. They wonder if grammar has really changed all that much to warrant such an effort.

The answer is that language IS changing all the time. I said to my students recently that I could easily name two dozen grammar rules that have changed radically during my professional lifespan. Then, too, research on grammar continues to unearth interesting and relevant facts about English, especially as new theories come along to make a contribution. The theory that informed much of the first edition of our book was Transformational Grammar (TG). Besides its dominance at the time, what made TG attractive to me was its claim of dynamism. Its dynamic quality was evidenced by the fact that the surface structure (form) of a sentence needed to be derived from its deep structure (where meaning was said to reside) through a series of steps called transformations. So even though it was the apparatus that was dynamic, not the language it was purporting to describe, I was attracted to its dynamism, an attraction that became a major reason why Complexity Theory (CT) (also known as Dynamic Systems Theory and now often referred to as Complex Dynamic Systems Theory (CDST)) was so satisfying to me later, as I discuss below.

It was also in the process of writing *The grammar book* that I came to realize that all the allusions to form and meaning pairings as the target of language learning did an injustice both to grammar and to those attempting to learn it. It was in discussing this issue with Marianne one day at a teachers of English to speakers of other languages (TESOL) Summer Institute (Toronto 1983), that I realized that there were actually THREE dimensions of grammar to be learned, which I subsequently captured in a three-wedged pie chart. Inside each of the wedges was a dimension of language: form (which dealt with accuracy), meaning (with captured the essential semantics of the structure), and use (the pragmatics or appropriateness of a structure in context/co-text). The three dimensions were defined by answers to three *wh*-questions: How is it (a structure or construction) formed?, What does it mean?, When/Why is it used? Two-headed arrows connected the adjacent wedges in the pie chart to indicate the permeability of the boundaries; nonetheless, it was obvious that the three were learned differently and therefore should be taught differently. This understanding became the basis for *Grammar dimensions: Form, meaning, and use*, a four-level grammar course for ESL students, which I directed, but did not write (being fully aware of my own limited experience in this regard).

I had gotten off to such a good start at UCLA that I was reluctant to leave. However, living in Los Angeles was beyond our means, and so when we decided to have a family, we moved to Vermont when I was invited to join the faculty of the School for International Training (SIT). I had known about SIT (now called the Graduate SIT Institute) for some time, having noted the enthusiasm with which its alumni discussed their graduate education when I would meet them in conferences around the world. We were not disappointed. SIT is a fine institution, Vermont is beautiful, and I sometimes muse that the environmental awareness of its denizens was one reason I later embraced an ecological theory—more on this anon.

Learning teaching

But, perhaps the most accurate appraisal I can give to my Vermont experience is that SIT is where I learned teaching. With its emphasis on experiential learning, internationalism (it was founded as a Peace Corps training site), social justice, reflective, inquiry-based teaching, its connection with some of the leading methodologists in our field (Earl Stevik, Caleb Gattegno, John Rassias, all of whom served as founding members of the MAT (Master of Arts in Teaching) advisory board), and the outstanding teachers among the faculty, I learned so much. It was impossible not to. We were continually asking our students to reflect on what they had learned from a particular experience; it was natural that we would do the same. Then, too, I was challenged by my students that first year in a way that I had never been before. I will never forget the student who asked me a few weeks into the first semester why I had scheduled a mid-term exam. Startled by the question, I mumbled back something about needing to know what they were learning, but I knew even as I was answering his question that there were other ways of assessing my students' learning. There was a series of such challenges throughout my first year at SIT, forcing me to become clear on what I believed and how I put these beliefs into practice. SIT students, mostly mature and experienced professionals themselves, are respectful, but not unduly impressed by academic titles and credentials. The true measure of your worth in the eyes of the students is how good a teacher you are.

My experience teaching the methods/approaches course at SIT was the basis for my 1986 book *Techniques and principles in language teaching*, which Russ Campbell and Bill Rutherford invited me to write. True to the educational philosophy of SIT, the designers of the methods course gave students an experience learning another language through a given method, usually taught by the originator of the method himself or someone committed to the method. From this experience, the principles and techniques were identified. Students were then encouraged to reflect on them and their experience and to micro-teach using the method. Ultimately, they used the combination of these experiences and reflections to craft their own teaching philosophy and practice. To this day this approach makes so much sense to me and was so meaningful to our students that I find the talk about our being in a post-method era baffling. Of course, no one wants to impose a method on any one else; however, I have personally witnessed the power of exposing students to diverse methods, which in essence are others' codified views on and values concerning the nature of language, language learning, and teaching, and having students use these views as a foil to clarify their own thinking and values. The power comes from students being exposed to different thinking and to being encouraged to experiment with different techniques. The power is also derived when students come to see a method as a coherent set of theory-action links and use these as models to help them to create and justify their own approaches.

Complexity

I taught happily at SIT for over 20 years, but I still kept ties with Michigan. In fact, I was only in Vermont a short while when I received a telephone call from University of Michigan Professor Alexander Guiora, inviting me to edit the journal *Language Learning*, which is published at the

university. It was ties like this and also my eagerness to learn more about Complexity Theory that drew me back to Michigan. I knew that the University of Michigan had a Center for the Study of Complex Systems, and further that John Holland, famous for his work on genetic algorithms and emergence, was affiliated with it. When I was invited to accept a position as a professor at the University of Michigan and to direct its English Language Institute (ELI), the lure of returning to my alma mater, leading the renowned institute where I once was a Teaching Fellow, and the opportunity to learn more about CT proved irresistible. With our children already on their own as young adults by then, my husband and I returned to Ann Arbor where we had met years earlier.

There was much fine work being done at the ELI when I returned. My immediate predecessor, John Swales, had worked with the faculty to enhance its outstanding reputation in English for academic purposes. Then, too, there was a great deal of test development activity. For decades, the ELI had developed and administered several highly-regarded tests of English language proficiency and their use was expanding rapidly. In addition, an important corpus resource, the Michigan Corpus of Academic Spoken Discourse (MICASE), had been created and made freely available to the research community worldwide. My contribution to this vibrant teaching and research community was two-fold: to introduce a focus on SLA research, for which I invited Nick Ellis to come to Michigan to assist us in doing, and to initiate a focus on language teacher education. With regard to the latter, I reckoned that our veteran faculty had much to offer aspiring teachers and that, in turn, teaching teachers would provide professional development for ELI faculty. This reciprocal goal was accomplished by joining forces with colleagues in the School of Education to begin a new state-approved ESL endorsement program, to aid teachers in meeting the needs of the large influx of English language learners who were dispersing throughout the state of Michigan.

As for my own research, my application of CT to SLA was aided by regular meetings and collaboration with John Holland, Nick Ellis, and Jinyun Ke. Nick and I organized a colloquium on emergence at an American Association for Applied Linguistics conference (Ellis & Larsen-Freeman 2006) and a special colloquium to commemorate the 60th Anniversary of the journal *Language Learning* (both of us being former editors), which would later appear as a special issue of the journal, entitled *Language as a complex adaptive system* (Ellis & Larsen-Freeman 2009).

Of course, my interest in complex systems had originated years earlier. I had read James Gleick's book, *Chaos: Making a new science* (1987). Gleick did not deal directly with issues of concern to applied linguists, yet I found that his descriptions of complex, nonlinear, dynamic systems inspired me to think about language in a new way. On page 24 of the book, I came across a statement that set this thinking in motion: 'Nonlinearity means the act of playing the game has a way of changing the rules.' This sentence (and much of the book thereafter) challenged what I had been taught about language, which was that it was a bounded rule-governed system. I knew that the subfield of diachronic linguistics dealt with language change over time, and also that the subfield of linguistic processing was concerned with sentence processing in real time, but the nexus between over time change and real time processing, what I came to call 'organic dynamism,' struck me as being a useful way to frame SLA research.

But more than this, CT offered a systems perspective. It challenged the notion that we could come to understand SLA in a piecemeal, atomized way. It suggested that even if we could identify important independent variables in the SLA process, we could not determine their influence in any absolute sense because what was relevant was their interaction. Besides, it maintained that the contribution of any one of them changed over time and was context dependent. For this reason, attempting to predict outcomes was ill-advised (Larsen-Freeman 2009). In fact, it went further and called into question any reductionist approach, which sought to identify THE causal factor in SLA. In short, CT is an ecological theory.

I found these insights to be contrary to the way I had thought about the nature of research, but they made a great deal of sense to me, and I was eager to share them. My first paper on CT was presented at SLRF in Montreal in 1994, and later published in the journal *Applied Linguistics* (Larsen-Freeman 1997). To be truthful, I was disappointed that although there was a ripple of interest in the paper, there was no widespread endorsement. I suppose it was naïve of me to think there would be (adoption of a new theory is, after all, a nonlinear process!), but I remained convinced that CT was a powerful theory of and for our time, and I was pleased that my enthusiasm for its application to SLA was shared by others, initially Kees de Bot, Marjolijn Verspoor, Wander Lowie, Zoltan Dörnyei, and Nick Ellis. CT's explanations for the mutable shape and behavior of complex, dynamic, nonlinear phenomena struck me as eminently applicable to language, its use, its evolution, and its acquisition (although due to CT, I now prefer to call it language development (Larsen-Freeman 2015a)), and I find the growing support for it these days heartening.

Complexity and teaching

Since my early awareness, I have come even more to appreciate the value of adopting a metaphor of language as a complex system for language teaching. And I have written a great deal about it, most extensively in my co-authored book with Lynne Cameron, *Complex systems and applied linguistics* (Larsen-Freeman & Cameron 2008). For one thing, seeing language more organically seemed to me to partially ameliorate what I had come to call (adopting Alfred North Whitehead's term) 'the inert knowledge problem.' The inert knowledge problem has been commonly observed by language teachers in classrooms all over the world. It occurs when students appear to have learned something in the classroom that later, when the students want to use it for their own purposes, is unavailable. I have been concerned with this lack of 'transfer' for some time (Larsen-Freeman 2013a), eventually coming to the conclusion that transfer, as a transportation metaphor, is inappropriate for what is actually a transformational process. Among other things, this insight led me to coin the term 'grammaring,' to suggest that a partial solution to the inert knowledge problem lay in teaching grammar in a more dynamic way, one that was transfer-appropriate (Larsen-Freeman 2003).

I coined the term for other reasons as well. It was helpful to think of grammar as a skill, rather than declarative knowledge. It also instantiated a process that I had increasingly identified as important in both language use and language learning—namely, the creation of new forms to make new meaning. One of the aspects of TG that I had found most appealing was Chomsky's attempt to account for how it was that speakers could create and understand novel utterances. He argued that they do so because language is rule-governed, and it is in

the application of the rules that creative production and comprehension are accomplished. However, from a CT perspective, I came to see that in Chomsky's explanation there was no room for the innovation that 'broke' the rules (Taylor 2012), and yet, surely this was the source of language change—creating new forms to convey new meanings. As CT would have it instead: new forms are emergent through language use.

Another issue of pedagogic consequence that the distinction between creativity and innovation raised was how to deal with learners' unconventional (nonstandard) forms. Indeed, in the new edition of *The grammar book* (Larsen-Freeman & Celce-Murcia 2015), we wrestled with the notion of 'errors.' In previous editions we asked our readers to identify errors in learner utterances we had collected. However, with our heightened awareness, due to the English as a Lingua Franca movement, among other influences, we could find no linguistic reason to distinguish between native speaker neologisms and learner errors. Besides, it became clear that not all learners wanted to or needed to conform to standard language norms, although some did. Our solution was to avoid calling learner utterances erroneous and instead to ask our readers to say what they would do if their own language students produced the utterances we had collected. In other words, we made it a local matter.

Other pedagogical insights that were inspired by CT have to do with iteration and adaptation. Complex systems are built up through iteration as they move through space-time, visiting the similar territory again and again. I realized that iteration was very important in learning, but I was careful to distinguish iteration from repetition and from recycling (Larsen-Freeman 2012b). Adaptation to the environment is another activity of complex systems. Here, too, I reasoned, rests another important pedagogical premise. It seems to me that we should be teaching our students to mold their current language resources to changing circumstances—for, after all, isn't that what we all do when we communicate? Perhaps, though, we shouldn't assume that our students know how to do so in another language. Although I am still working out the particulars, I believe adaptation is teachable. One way is by putting into practice Earl Stevick's notion of 'technemes' (Larsen-Freeman 2013b). A techneme is a portmanteau, combining the first syllable of 'technique' with the suffix 'eme' as in 'phoneme.' Stevick created the term to make the point that even a small change in a technique can be meaningful to students, challenging them anew and giving them further practice. It seems to me that with each variation of a technique, students receive practice in adapting their language resources to meet a new challenge.

As I stated earlier, I believe that CT is a theory of and for our time. With its underlying message of interconnectedness, while at the same time respecting individual differences and discouraging reductionist generalizations, it seems that CT has a message that we can benefit from in these troubled times in our world. I am currently working with Philip Herdina of the University of Innsbruck on another book on language and complexity, which takes up all these themes further and relates them more broadly historically and across other disciplines.

A world in transition

As I write this, there is great unrest in the world. Certainly, educators are not immune from the turmoil. There are populations on the move, terrorist threats and tragic events, justifiable concerns over global warming, the rise of nationalism, and the promises and the warnings of

the perils of technology. While none of these serious problems can be resolved by any sector of society alone, that does not absolve us language educators of doing what we can. For one thing, we might begin by doing a better job of educating the general public about the value of knowing more than one language, as there remains an ideology of monolingualism, at least in certain parts of the world. And an ideology of monolingualism can breed a parochialism that is unhelpful when it comes to solving problems that go beyond borders. Moreover, the migrations of thousands of refugees, increasingly numerous and more diverse populations of adults and youth as language learners, call for monumental efforts from us all to help these, often traumatized, individuals become settled and acclimated. And, beyond the dire forecasts for what climate change augurs for our collective future, there is also the fact that an increase in climate-change-related natural disasters can affect linguistic diversity, when island states, such as Vanuatu disappear due to rising sea levels (Foltz 2015). So, both as caring human beings and as language professionals, we have our work cut out for us.

However, there is also positive change afoot. Partly as a result of the European Union's promotion of plurilingualism, and perhaps also for the less noble reason that languages have value in the global marketplace, it seems that there is more interest these days in learning languages and in such innovative practices as intercomprehension. However, it remains a fact that policy makers and educational authorities need more information that will help them make informed decisions when it comes to providing quality language instruction (Larsen-Freeman & Tedick 2016).

Continuing on a positive note, the future clearly lies in learning how to exploit technology-enhanced language learning. Technology can afford many benefits, including differentiated instruction and the opportunity to learn to adapt. There are two ways of thinking about the affordances of technology. One, from environmental biology, is that the environment affords opportunities for action by a particular organism. For example, technology affords access to authentic language use. The second, my preferred way, is a more nuanced, relational one: an affordance only becomes an affordance when it is perceived as such by an agent. This explains, in part, why in CT the same cause can produce different effects. We know that teaching doesn't cause learning, and one reason for this is that different learners perceive different affordances (Larsen-Freeman 2006). We need to know more about how to use technology for both adaptation and for the affordances that are perceived by learners.

I also think that a positive influence would result from our perceiving language learning in a more transdisciplinary way (Larsen-Freeman 2012a), a way that can lead to the creation of new ways of knowing (Halliday & Burns 2006). Complex problems require working across disciplinary boundaries, seeking integrative solutions (Ortega 2013; The Douglas Fir Group 2016). A CT perspective suggests that we benefit when we adopt a convergent heuristic, looking for what connects as well as what distinguishes (Larsen-Freeman 2007; 2017).

We have much to contribute to and to gain from reaching out to other disciplines, and this reciprocity is beginning to take place. I may feel this way because I confess to being a bit of a science-phile. One of my distinct memories of having to argue about the value that a scientific perspective brings to our discipline came during the final plenary session, concluding the international TESOL Convention in Chicago. It was a 'great debate.' The proposition, or rather the question, before the debate contestants was 'Is teaching an art or a science?'. I had been assigned to defend the proposition that teaching was a science. (In

actual fact, I think that that might be the more difficult position to uphold.) The obvious argument to make for teaching as a science is that teaching should be based on 'scientific' research; however, firstly, I don't believe that (Larsen-Freeman 2015b), and secondly, it wasn't a very compelling core argument.

Then, one day, when I was driving home from school, I listened to an interview of an entomologist from Montana State University. His specialty was beetles. He claimed that beetles were the most common species in the animal kingdom. The interviewer was incredulous. "Really? How come we rarely see them, then?" The entomologist replied: "Ah, but you have to learn to look." And, I thought, "That's it." Good scientists and good teachers have both learned to look. They have educated their awareness, so that they are attuned to phenomena that others don't see. In the case of teachers, these are the individual learner differences and their patterns of engagement that lead to learning. And that was the argument I made that day in Chicago (Larsen-Freeman 2000).

The learning continues

And now, just to bring this self-indulgent piece up to date, I should acknowledge that though I have retired from the University of Michigan, I have not stopped teaching. Although I originally went to the University of Pennsylvania to assist colleagues there who needed someone to teach second language development, I have had the good fortune to remain teaching one term a year at Penn for the past six years. The truth is that I would find it difficult to stop teaching entirely. Some years ago, in an introspective talk I gave at a TESOL Italy conference (Larsen-Freeman 1998), I described three stages in the development of my career as a teacher: (1) Learning to teach, (2) learning teaching, and (3) just learning. There is no fourth stage—teaching begins with learning, and the learning continues—and that is fine with me.

References

Brown, R. (1973). *A first language*. Boston, MA: Harvard University Press.
Celce-Murcia, M. & D. Larsen-Freeman (1983). *The grammar book: An ESL/EFL teacher's course*. Rowley, MA: Newbury House.
Corder, S. P. (1967). The significance of learners' errors. *International Review of Applied Linguistics* 5, 161–170.
Dulay, H. & M. Burt (1973). Should we teach children syntax? *Language Learning* 23.2, 245–258.
Foltz, A. (2015). When languages die, we lose a part of who we are. *The Conversation*. Downloaded 9 December, 2015. https://theconversation.com/when-languages-die-we-lose-a-part-of-who-we-are-51825
Gleick, J. (1987). *Chaos: Making a new science*. New York: Penguin.
Halliday, M. A. K. & A. Burns (2006). Applied linguistics: thematic pursuits or disciplinary moorings? A conversation between Michael Halliday and Anne Burns. *Journal of Applied Linguistics* 3.1, 113–128.
Larsen-Freeman, D. (1975). The acquisition of grammatical morphemes by adult ESL students. *TESOL Quarterly* 9.4, 409–419.

Larsen-Freeman, D. (1976). An explanation for the morpheme acquisition order of second language learners, *Language Learning* 26.1, 125–134.

Larsen-Freeman, D. (1978). An ESL index of development. *TESOL Quarterly* 12.4, 439– 448.

Larsen-Freeman, D. (ed.) (1980). *Discourse analysis and second language research*. Rowley, MA: Newbury House.

Larsen-Freeman, D. (1983). Assessing global second language proficiency. In H. W. Seliger & M. H. Long (eds.), *Classroom oriented research*. Rowley, MA: Newbury House, 287–304.

Larsen-Freeman, D. (1986). *Techniques and principles in language teaching*. New York: Oxford University Press.

Larsen-Freeman, D. (1997). Chaos/complexity science and second language acquisition. *Applied Linguistics* 18.2, 141–165.

Larsen-Freeman, D. (1998). Learning teaching is a lifelong process . . . and that's OK. *Perspectives* 14.2, 5–11.

Larsen-Freeman, D. (2000). An attitude of inquiry: TESOL as science. *The Journal of the Imagination in Language Learning* 5, 18–23.

Larsen-Freeman, D. (2003). *Teaching language: From grammar to grammaring*. Boston, MA: Heinle.

Larsen-Freeman, D. (2006). The emergence of complexity, fluency, and accuracy in the oral and written production of five Chinese learners of English. *Applied Linguistics* 27.4, 590–619.

Larsen-Freeman, D. (2007). Reflecting on the social-cognitive debate in second language acquisition. *Modern Language Journal* 91 (focus volume), 773–787.

Larsen-Freeman, D. (2009). Prediction or retrodiction? The coming together of research and teaching. In K. Losey & C. Pearson (eds.), *Spotlight on re-search: A new beginning. The selected proceedings of the 2008 MITESOL conference*. Raleigh, NC: Lulu Press, 5–16.

Larsen-Freeman, D. (2012a). Complex, dynamic systems: A new transdisciplinary theme for applied linguistics? *Language Teaching* 45.2, 202–214.

Larsen-Freeman, D. (2012b). On the role of repetition in language teaching and learning. *Applied Linguistics Review* 3.2, 195–210.

Larsen-Freeman, D. (2013a). Transfer of learning transformed. *Language Learning* 63, special issue, 107–129.

Larsen-Freeman, D. (2013b). Complex, dynamic systems and technemes. In J. Arnold Morgan & T. Murphey (eds.), *Meaningful action: Earl Stevick's influence on language teaching*. Cambridge: Cambridge University Press, 190–201.

Larsen-Freeman, D. (2014). Another step to be taken: Rethinking the endpoint of the interlanguage continuum. In Z.-H. Han & E. Tarone (eds.), *Interlanguage: Forty years later*. Amsterdam and Philadelphia: John Benjamins, 203–220.

Larsen-Freeman, D. (2015a). Saying what we mean: Making the case for second language acquisition to become second language development. *Language Teaching* 48.4, 491–505.

Larsen-Freeman, D. (2015b). Research into practice: Grammar learning and teaching. *Language Teaching* 48.2, 263–280.

Larsen-Freeman, D. (2017). Complexity theory: The lessons continue. In L. Ortega & Z.-H. Han (eds.), *Complexity theory and language development: In honor of Diane Larsen-Freeman*. Amsterdam and Philadelphia: John Benjamins.

Larsen-Freeman, D. & L. Cameron (2008). *Complex systems and applied linguistics*. Oxford: Oxford University Press.

Larsen-Freeman, D. & M. Celce-Murcia (2015). *The grammar book: Form, meaning, and use for English language teachers*. Boston, MA: Cengage Leaning/National Geographic Learning.

Larsen-Freeman, D. & M. H. Long (1991). *An introduction to second language acquisition research*. London: Longman.

Larsen-Freeman, D. & V. Strom (1977). The construction of a second language acquisition index of development. *Language Learning* 27.1, 124–134.

Larsen-Freeman, D. & D. J. Tedick (2016). Teaching world languages: Thinking differently. In D. Gitomer & C. Bell (eds.), *Handbook of research on teaching (5th edn.)*. Washington DC: American Educational Research Association.

Molenaar, P. C. & C. G. Campbell (2009). The new person-specific paradigm in psychology. *Current Directions in Psychological Science* 18.2, 112–117.

Ortega, L. (2013). SLA for the 21st century: Disciplinary progress, transdisciplinary relevance, and the bi/multilingual turn. *Language Learning* 63, suppl. 1, 1–24.

Selinker, L. (1972). Interlanguage. *International Review of Applied Linguistics* 10.1–4, 209–232.

Taylor, J. R. (2012). *The mental corpus: How language is represented in the mind*. Oxford: Oxford University Press.

The Douglas Fir Group. (2016). A transdisciplinary framework for SLA in a multilingual world. *The Modern Language Journal* 100, supplement 2016.

DIANE LARSEN-FREEMAN is Professor Emerita of Education, Professor Emerita of Linguistics, and Research Scientist Emerita and former Director of the English Language Institute, all at the University of Michigan, Ann Arbor. She is also a Professor Emerita at the Graduate SIT Institute in Brattleboro, Vermont and a Visiting Senior Fellow at the University of Pennsylvania. Her most recent books are *Teaching language: From grammar to grammaring* (2003), *Complex systems and applied linguistics* (2008, with L. Cameron), the third edition of *Techniques and principles* (2011, with M. Anderson), and the third edition of *The grammar book: Form, meaning, and use for English language teachers* (2015, with M. Celce-Murcia).

In 1999 Dr Larsen-Freeman was named one of 30 ESL pioneers in the twentieth century by *ESL Magazine*. The following year she received the Heinle/Cengage Lifetime Achievement Award. The complex systems book received the 2009 Kenneth W. Mildenberger prize from the Modern Language Association. Also in 2009, the Hellenic American University conferred on her an honorary Doctoral Degree in Humanities. She was awarded a Fulbright Distinguished Chair at the University of Innsbruck in 2010 and the American Association for Applied Linguistics' Distinguished Scholarship and Service Award in 2011. Dr Larsen-Freeman is a former Editor of *Language Learning* and currently serves as Chair of the Board of Directors for the journal.