

CONCEPTUAL REVIEW ARTICLE

Whorf's Lost Argument: Multilingual Awareness

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Debates about linguistic relativity commonly focus on one question: Does language affect thought? This yes-or-no question does not do justice to the complexity of Whorf's ideas and skirts several issues of great importance to Whorf. My first aim in this article is to recover the arguments that got lost in translation of Whorf's ideas into the Sapir-Whorf hypothesis. I will show that, for Whorf, languages were also one of the ways in which we think, scientists were not immune to language effects, and the key to advancement of Western science was multilingual awareness. My second aim is to draw on these insights to articulate a Whorfian agenda for the field of second language acquisition (SLA) that asks new questions about second language learning and cognition and expands the boundaries of the field and the scope, duration, and locations of SLA research.

Keywords Sapir-Whorf hypothesis; linguistic relativity; second language learning; multilingual awareness

Introduction

We are all familiar with the traditional articulation of the Sapir-Whorf hypothesis (SWH): The languages we speak affect the way we think. The job of the scientist as an independent observer is to document the presence or absence of "Whorfian effects." The locus of these effects has been hotly debated—one popular view treats nonverbal cognition as the only domain where the influence

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of language on thought can be proved or disproved. This view is also adopted by two of the editors of this special issue whose program for the study of linguistic relativity in second language acquisition (SLA) differentiates “between linguistic relativistic phenomena (i.e., nonverbal behavior) and phenomena related to speech production and comprehension (i.e., verbal behavior)” (Bylund & Athanasopoulos, 2014, p. 954). Few remember, however, that the SWH was not articulated by Whorf—for him, language was also one of the ways in which we think, and scientists were not objective bystanders but experiencers of language effects. And while nonverbal behavior on novel tasks in the lab is undoubtedly interesting and worthy of attention, this focus does not do justice to the complexity of Whorf's ideas,¹ nor does it exhaust their potential for SLA, an interdisciplinary field focused on verbal behavior.

I will begin by rereading Whorf's writings and their analyses by Schulz (1990), Lucy (1992a), and Lee (1996) in order to recover the arguments that were lost when two psychologists, Brown and Lenneberg, transformed Whorf's ideas into the SWH. Then, I will focus on the argument of particular relevance to SLA—multilingual awareness—and articulate an agenda that asks new questions about second language (L2) learning and cognition and expands the boundaries of the field and the scope, duration, and locations of SLA research.

First, however, I need to outline three caveats. To begin with, I do not aim to offer yet another review of research on linguistic relativity (for comprehensive reviews, see Everett, 2013; Pavlenko, 2014). Second, *linguistic relativity* is used here as an umbrella term that embraces the study of the relationship between linguistic diversity and thought and the many competing views of this relationship (Evans, 2010; Everett, 2013; Leavitt, 2011; Lucy, 1992a, 1997a, 2016; McWhorter, 2014; Sidnell & Enfield, 2012; Slobin, 1996). Third, the research agenda for SLA presented here is a personal interpretation and not a channeling of Whorf. His comments on L2 learning are scarce and, when it comes to the research agenda, I rely on my own judgment regarding the logical implications of his arguments.

Lost in Translation: Whorf's Ideas and the SWH

Today, discussions of linguistic relativity often reduce presentation of Whorf's ideas to a single quotation from his paper “Science and Linguistics”:

We dissect nature along lines laid down by our native languages. The categories and types that we isolate from the world of phenomena we do not find there because they stare every observer in the face; on the

contrary, the world is presented in a kaleidoscopic flux of impressions which has to be organized by our minds—and this means largely by the linguistic systems in our minds. We cut nature up, organize it into concepts, and ascribe significances as we do, largely because we are parties to an agreement to organize it in this way—**an agreement that holds throughout our speech community** and is codified in the patterns of our language. The agreement is, of course, an implicit and unstated one, **BUT ITS TERMS ARE ABSOLUTELY OBLIGATORY; we cannot talk at all except by subscribing to the organization and classification of data which the agreement decrees.** (Whorf, [1940a] 2012, p. 272; emphasis added)

This quotation is often used to justify the focus on nonverbal behavior in the study of linguistic relativity, yet Whorf's own text, focused on talk and speech communities, resists a narrow interpretation. Whorf readily acknowledged that many cognitive processes are nonlinguistic and “the evidence that he believed that language directly influences perception is slender and inconsistent” (Lucy, 1992a, p. 42). His interest was in structural patterns that make linguistic categories invisible and psychologically real and, when he did turn to thinking without speaking, his focus was on linguistic thinking: “It is not words mumbled, but **RAPPORT** between words, which enables them to work together at all to any semantic result. It is this rapport that constitutes the real essence of thought insofar as it is linguistic” (Whorf [1936] 2012, p. 87).

Readers who reread the full text of “Science and Linguistics” will also discover that the focus of the paper, written for the general readership of *Technology Review*, is on the scientist who trusts the illusory objectivity of his own linguistic tools and, as a result, is “constrained to certain modes of interpretation even while he thinks himself most free” (Whorf, [1940a] 2012, p. 274). Whorf's aim was to convince his audience that scientific study of linguistic diversity was key to the advancement of Western science, because it raised awareness of the provisional nature of our own linguistic categories and could help us transcend the boundaries of what he termed Standard Average European (SAE). The best way to raise this multilingual awareness—or, in today's terms, metalinguistic awareness—was to study non-Indo-European languages: “the best approach is through an exotic language, for in its study we are at long last pushed willy-nilly out of our ruts. Then we find that the exotic language is a mirror held up to our own” (Whorf [1941a] 2012, p. 178).

This argument is particularly prominent in one of his last articles, where terminally ill Whorf ([1941b] 2012) made a poignant plea for multilingual

awareness and preservation of linguistic diversity to the Old World already at war and the New World about to join in:

We handle even our plain English with much greater effect if we direct it from the vantage point of a multilingual awareness. For this reason I believe that those who envision a future world speaking only one tongue, whether English, German, Russian, or any other, hold a misguided ideal and would do the evolution of the human mind the greatest disservice. Western culture has made, through language, a provisional analysis of reality and, without correctives, holds resolutely to that analysis as final. The only correctives lie in all those other tongues which by aeons of independent evolution have arrived at different, but equally logical, provisional analyses. (p. 313)

So what happened to Whorf's concerns about scientists' objectivity and his emphasis on multilingual awareness? To understand where, how, and why we lost these arguments, I turn to the transformation of Whorf's ideas into the SWH in the decades after his death.

Transformation of Whorf's Ideas into the SWH: From the Field to the Lab

Whorf's provocative writings sparked heated debates at scholarly conferences and on the pages of academic journals. The publication of his collected writings in 1956 further intensified these debates, motivated by the inconsistencies in Whorf's "variant formulations of the main points" (Black, 1959, p. 228) and "a failure to find a means of adequately testing the hypothesis" (Gastil, 1959, p. 24). Some attempted to organize and systematize Sapir and Whorf (e.g., Black, 1959; Brown & Lenneberg, 1954; Fishman, 1960; Hoijer, 1954; Hymes, 1966; Trager, 1959), and others tried to use bilingualism and translatability to test their ideas (e.g., Carroll, 1963; Ervin & Bower, 1952–53; Ervin & Osgood, 1954; Gastil, 1959). The winning approach was put forth by two psychologists, Roger Brown and Eric Lenneberg (1954), who transformed Sapir's and Whorf's ideas into testable hypotheses. Their definitive form, now known as the SWH, appears in Brown's (1958) influential book, *Words and Things*:

Linguistic relativity holds that where there are differences of language there will also be differences of thought, that language and thought covary. Determinism goes beyond this to require that the prior existence of some language pattern is either necessary or sufficient to produce some thought pattern. (p. 260)

This articulation undoubtedly moved the study of language and cognition forward, yet scholars who study Whorf's work find "no evidence that Whorf intended to make either of the assertions" (Lee, 1996, p. 85). Analyses of Whorf's published and unpublished papers by Lee (1996) and Lucy (1992a) show that, in the process of translation from linguistic anthropology to psychology, the SWH departed from Whorf's arguments in several ways "inimical to the fair assessment of the relativity hypothesis" (Lucy, 1992a, p. 135). The first departure involves the locus of research. Whorf's interest was in structural patterns and their invisibility in our everyday lives. Brown and Lenneberg (1954) shifted the research focus from habitual thought—studied through fieldwork (e.g., Hoijer, 1954; Hymes, 1966; Silverstein, 1979, 1981)—to psychological processes, such as memory and perception, studied through artificial tasks. This shift engendered a decades-long split between linguistic relativity traditions in psychology and anthropology that was not bridged until the 1990s (Gumperz & Levinson, 1996; Lucy, 1992a, 1992b, 1997a).

Brown and Lenneberg also disregarded Whorf's arguments about backgrounding effects of covert grammatical categories. The ambiguous formulation "differences of language" allowed them to shift attention from structural patterns, such as aspect, to the lexicon and the denotational meanings that were tangible, measurable, and concrete. Lucy (1992a) argues that their adoption of English words *color* and *snow* as metalinguistic tools for crosslinguistic comparisons displays a profound misunderstanding of Whorf and the limits of their own awareness and suggests that "at some level Brown, Lenneberg and Roberts really did accept the naïve view" (p. 155). "When their disregard of grammatical structure is coupled with the use of English lexical categories as the metalanguage for comparative work, there is no room for discovering the sort of variance of interest to Whorf" (p. 159).

Together, the two shifts gave rise to the color research industry that, following Brown and Lenneberg (1954), conceives the engagement with the SWH as its main *raison d'être*, despite the fact that Whorf saw color perception—and visual perception in general—as an area not influenced by language (Whorf, [1940a] 2012, pp. 267–268; [1940b] 2012, p. 209). (For a contemporary criticism of the focus on color and shapes, see Gastil (1959, p. 26); for more recent critiques, see Leavitt (2011, pp. 172–174), Levinson (2001, 2012, p. xi, xviii), and Lucy (1992a, pp. 150–152; 1997b)). Given Whorf's preoccupation with the illusory objectivity of linguistic tools for the scientist, it is quite likely that he would have been less interested in the way speakers of different languages sort out Munsell color chips, and more in Western researchers' decision to treat an abstract SAE category of *color* as a meaningful universal category, despite the

evidence to the contrary from languages that do not possess a superordinate term for color and do not encode hue, brightness, and saturation independently of other properties, such as texture or freshness (Bricker, 1999; Kuschel & Monberg, 1974; Levinson, 2001; Lucy, 1997b; Turton, 1980).

The concern about the invisibility of linguistic tools in the scientific enterprise featured prominently in early debates about linguistic relativity and raised vociferous objections from Whorf's critics. As Fishman (1960) astutely noted, in highlighting the hold of SAE categories on Western minds, Whorf "impugns our objectivity and rationality":

When Whorf says that "there is a precarious dependence of all we know upon linguistic tools which themselves are largely unknown or unnoticed," he hits all of us where it hurts most—at the foundations of our certainty in our scientific findings. (p. 326)

Three decades later, Lakoff (1987) explained this objection in even stronger terms:

Many who view themselves as committed to science assume that scientific thinking requires an objectivist world view—a commitment to there being only one "correct" conceptual system. Even proposing that there may be many conceptual systems as reasonable as our own around the world is all too often taken as spitting in the eye of science. (p. 304)

Whorf's insistence that "linguistic relativity, if there is such, will not only lie *out there* in the object of investigation but will also penetrate right *into* the research process itself" (Lucy, 1992a, p. 2) makes for an uncomfortable lens, focused on "us" rather than "them," and it is not surprising that this was the first argument to get lost in debates about the SWH. The result was the foreclosing of an important line of linguistic relativity inquiry, replaced with two simplistic hypotheses that tended "to reduce or caricature the problem into a simplified form which can then be regarded as obviously true or obviously false" (Lucy, 1992a, p. 3).

Yet the replacement of Whorf's convoluted passages with a soundbite also had a major advantage—it domesticated Whorf's wild ideas and made linguistic relativity simple and easy to digest, argue about, and, ultimately, disprove through critique of minor points, such as the Eskimo words for snow (for discussion of the current consensus on Inuktitut terminology for ice and snow, see Krupnik & Müller-Wille, 2010). And it was this version of Whorf that ended up in textbooks, articles, and lectures by scholars who felt that Brown

and Lenneberg “really said all that was necessary” (Kay & Kempton, 1984, p. 66) and the question of what Sapir and Whorf really thought was interesting but “after all less important than the issue of what is the case” (p. 77). In fact, by the 1980s, Kay and Kempton were among the few who could trace the authorship of the SWH to Brown and Lenneberg. Others lost track because the two psychologists gave Sapir and Whorf credit for what should have been the Brown-Lenneberg hypothesis.

This is not to say that psychologists had no right to reconfigure Whorf's ideas to derive testable predictions. The argument made by Lucy (1992a, 1997a), Lee (1996), and Levinson (2012) is that Brown and Lenneberg “altered the terms of Whorf's problematic” (Lucy, 1992a, p. 261). The view that the only legitimate way to examine Whorfian effects is through novel nonverbal tasks in the lab is one such subversion—Whorf's (2012) own work offers no grounds for drawing such lines in the sand. The chief purpose of this article therefore is to draw attention to Whorf's lost ideas in order to encourage an interdisciplinary approach to linguistic relativity in SLA.

The SWH as a Monolingual Lens

This approach relies on two lost arguments relevant to SLA. The first is malleability of language. While Brown and Lenneberg (1954) saw languages as stable and bounded phenomena, Whorf was fully aware of the dynamics of language contact and change. In a fashion reminiscent of Vygotsky (1978, 1986), he argued that our linguistic systems evolve in response to our needs, so that new concepts come into existence in thought and then become codified in language:

The possibilities open to thinking are the possibilities of recognizing relationships and the discovery of techniques of operating with relationships on the mental or intellectual plane, such as will in turn lead to ever wider and more penetratingly significant systems of relationships. These possibilities are inescapably bound up with systems of linguistic expression. The story of their evolution in man is the story of man's linguistic development—of the long evolution of thousands of very different systems of discerning, selecting, organizing and operating with relationships. (Whorf, [1936] 2012, p. 107)

The second argument involves the malleability of the individual mind and multilingual awareness. The possibility that L2 learning could change how we think greatly resonated with Whorf's mentee, J. B. Carroll, and with Ervin

and her colleagues, who saw L2 learning and bilingualism as a perfect testing grounds for linguistic relativity (Carroll, 1963; Ervin & Bower, 1952–3; Ervin & Osgood, 1954; Walker, Jenkins, & Sebeok, 1954). Brown and Lenneberg disagreed. Pointing to Lenneberg, a German-English bilingual, Brown (1958) argued that the existence of “numerous bilingual persons and countless translated documents” was compelling evidence that the German mind is “very like our own” (p. 232). Ironically, Whorf would have agreed because German and English are Indo-European languages that belong to the same Germanic family. For Whorf, the way to transcend SAE was to study non-Indo-European languages, a treasure trove of information about different ways of parsing reality. By contrast, Brown dismissed the claims that “thinking is different in the Indian language” (p. 232) and—making a volte-face—advised his readers to distrust those who have the “unusual” characteristic of being bilingual:

There are few bilinguals, after all, and the testimony of those few cannot be uncritically accepted. There is a familiar inclination on the part of those who possess unusual and arduously obtained experience to exaggerate its remoteness from anything the rest of us know. This must be taken into account when evaluating the impressions of students of Indian languages. In fact, it might be best to translate freely with the Indian languages, assimilating their minds to our own. (p. 233)

His readers did not notice the contradiction in the treatment of bilinguals—numerous and trustworthy in the case of German and few and untrustworthy in the case of Native American languages. They also did not notice that the newly articulated SWH was predicated on the assumption that human beings are, for the most part, monolingual. To understand this selective blindness, we need to place the SWH in its sociohistoric context in academia and society at large. In North American academia, linguists no longer focused on indigenous languages, because the ascent of Chomskyan theory encouraged them to abandon linguistic fieldwork in favor of “theoretical modeling of fragments of well-known languages” (Evans, 2010, p. 222):

Prior to Chomsky, to be an American linguist almost obligatorily entailed one or two years of living among a minority language community and writing a grammar of their language. This was nearly a rite of passage in North American linguistics. But since Chomsky himself did no field research and apparently had learned more interesting things about language than any fieldworker, many students and incoming professors working under the influence of Chomsky’s assumptions understandably

believed that the best way to do research might be to work deductively rather than inductively—from the institution rather than the village, starting with an elegant theory and predetermining where the facts best fit. (Everett, 2008, p. 253)

The monolingual turn was also consistent with the social climate of the mid-20th century United States, where bilingualism was unusual (at least ideologically if not demographically), linguistic diversity was a problem to be solved, and different modes of thinking were incompatible with the notion of free speech (Pavlenko, 2014). Schulz (1990) argues that “complacent American monolingualism is, in fact, perhaps the single most powerful background factor accounting for the impact of Whorf's texts” (p. 230). It certainly explains the transformation of bilingualism from a testing ground into an argument against linguistic relativity (e.g., Macnamara, 1991).

The monolingual SWH lens created a methodological conundrum in studies of linguistic relativity, whereby early bilinguals were excluded from research as “unusual” or “messy” subjects, while late bilinguals were, and still are, treated as representative speakers of their first language (L1) or even as “monolinguals,” with nary a consideration of potential effects of the L2. The possibility of such confounding effects is usually argued away based on participants' age of L2 acquisition and/or levels of L2 proficiency. For instance, Munnich, Landau, and Doshier (2001) stated that their findings could not have been affected by the L2 English because their Korean and Japanese participants learned English after the age of 12, when their L1 naming patterns were already set and “even with substantial exposure to English, participants would not be expected to gain a nativelike proficiency in English” (p. 180). Loucks and Pederson (2011) similarly dismissed the possibility of L2 effects in their study of motion events, arguing that none of their bilingual participants “were exposed to English while growing up at home, and no participant had achieved nativelike fluency in English” (p. 118).

The assumption underlying such statements is that, for the L2 to affect the L1, (a) the L2 needs to be learned in childhood and (b) learners need to achieve nativelike proficiency. Yet nothing could be further from the truth: L2 effects on the L1 have been documented in speakers who learned the L2 after the age of 12, who are far from nativelike, and who had only 6 months to 2 years of L2 exposure (e.g., Cook, 2003; Jarvis & Pavlenko, 2008; Pavlenko, 2000, 2003, 2014; Pavlenko & Malt, 2011; Schmid, 2011; Wolff & Ventura, 2009). These findings set the groundwork for articulation of new agendas for the study of linguistic diversity and thought that treat languages as open, permeable, and

dynamic systems; take into consideration language contact and change; and view the undeniable bi- and multilingualism of the majority of the world's population as an opportunity, rather than a hindrance.

Whorfian Agendas in the Study of SLA

According to Whorf's ([1940a] 2012) own logic, genuinely Whorfian effects are found not in the sorting of color chips by members of exotic faraway tribes, but on the pages of academic publications, where English lexicon is equated with "the language of thought" (Fodor, 1975) and abstract SAE terms, such as *color*, *number*, or *emotions*, are treated as psychologically real universal categories and metalinguistic tools (see also Levinson, 2001; Lucy, 1992a, 1997b; Lutz, 1988; Wierzbicka, 2014). The key question to answer in studies of linguistic relativity in SLA is whether L2 learning can destabilize such language effects. If the categories of our native language(s) are psychologically real, what happens in L2 learning? Can we *unthink* and shed our background categories when we enter other people's linguistic worlds? Can we make new linguistic patterns and categories habitual and automatic? When, how, and under what conditions do we develop awareness of the relativity of our own categories?

Multilingual Awareness: Whorf's Insight or Whorf's Error?

Whorf's answer to the last question was that regular L2 learners may not develop such awareness—it was the prerogative of scientific linguists who study linguistic diversity:

Scientific linguists have long understood that ability to speak a language fluently does not necessarily confer a linguistic knowledge of it, i.e. understanding of its background phenomena and its systematic processes and structure, any more than ability to play a good game of billiards confers or requires any knowledge of the laws of mechanics that operate upon the billiard table. (Whorf [1940a] 2012, p. 271)

This argument, of course, was never completely lost. While multilingual awareness did disappear from SWH debates, the assumption that a superior understanding of a language can be achieved through linguistic analysis remained the cornerstone of linguistic fieldwork (e.g., Thieberger, 2012; but see Sakel & Everett, 2012, for attention to potential interference from crosslinguistic influence). Yet there is something slippery about Whorf contradicting his own logic: How pervasive and invisible could language effects be if we could be freed from them through analyses and arguments? Did Whorf underestimate the power of "Whorfian" effects?

The only way to deal with this dilemma, argues Schultz (1990), is to remember that Whorf's articles are not literal representations of his "thoughts" or "views"—they are, above all, well-crafted dialogic texts. The goal of the articles published in the *Technology Review* was to establish linguistics as a science in the eyes of other scientists. To convince his readers that they cannot free themselves from the bonds of language without the scientific linguist, Whorf used a variety of strategies, from oversimplification and positivistic discourse to hyperbole and satire. He also was not above a little self-contradiction. In the paper, "Linguistics as an Exact Science," Whorf ([1940c] 2012) highlights differences between English and French and argues that an American learner of French would be "fortunate to have his elementary French taught by a theoretic linguist" (p. 286), whose explanations of covert French patterns would lead to their acquisition in no time and "without inner opposition" (p. 286). By contrast, in "Science and Linguistics," he highlights the similarities between Indo-European languages and reminds the readers that "the ability to speak a language fluently," which some of them would have had, at least in European languages, "does not necessarily confer a linguistic knowledge of it" (Whorf, [1940a] 2012, p. 271). Schultz argues that this rhetorical move allows him to avoid "having to state explicitly that fluent multilinguals might gain the kind of language consciousness sufficient for breaking the bonds of grammar" (p. 69) and thus deflect counterarguments. Yet here is a catch: Whorf's articles, with their pictures and examples from Hopi and Shawnee, are a tour de force of multilingual consciousness. If he expects his lay readers to follow his logic, then multilingual awareness is not limited to linguists—all they have is superior analytic skills.

In light of the turn taken by North American linguistics after his death, Whorf's multilingual awareness may be his greatest insight and simultaneously his greatest error: He underestimated the strength of the inner opposition, that is, L1 transfer, which is not subject to conscious control, and overestimated the power of scientific linguistics. When the cognitive revolution spearheaded by Chomsky did make linguistics a science, linguists in pursuit of language universals did not hesitate to impose their own categories on the languages of others. It is only recently that linguists began to reorient from armchair linguistics back to the "dirty feet" field linguistics (e.g., Evans, 2010; Everett, 2008; Harrison, 2007) and acknowledge the failure of the search for linguistic universals and the concomitant nonuniversality of some of the key descriptive categories (e.g., Chafe, 2012; Evans & Levinson, 2009; Haspelmath, 2007).

The return to understanding indigenous languages on their own terms also signaled the return of multilingual awareness. My favorite example comes from

an Australian linguist, Nicholas Evans (2010), who vividly describes how he learned to pay attention to the points of the compass in order to properly use an Aboriginal Australian language, Kayardild:

I suddenly had to add a whole new channel of ongoing attention to how I thought about space. I needed to use “absolute reckoning,” orienting to the points of the compass for every waking moment, if I was to follow what was being said, and talk in a way that people would understand. . . . [The Kayardild] virtually never think, imagine, or even dream without orienting their mental scenes to the compass. . . . One aspect of speaking Kayardild, then, is learning that the landscape is more important and objective than you are. . . . It is not that I never thought by compass before learning Kayardild. Sometimes I had needed to do it, in occasional boy-scout mode, when orienteering, or navigating a city with a grid layout. . . . But the experience of speaking Kayardild was something quite different—an incessant need always to know the compass directions, and always to attend to them, or face an embarrassment equivalent to not knowing my wife’s name, or not noticing whether you are male or female. (pp. 163–165)

Undoubtedly, one could also speak a light version of Kayardild without paying attention to compass directions, yet Evans (2010) chose to adjust what he paid attention to in order to avoid embarrassment and “to follow what was being said, and talk in a way that people would understand” (p. 163). His comments show that the incentive for such adjustments is our desire to communicate with others, called by Rommetveit (1979) an accomplishment of intersubjectivity and by Whorf ([1940a] 2012) an agreement on the interpretation of shared social reality: “Whenever agreement or assent is arrived at in human affairs, and whether or not mathematics or other specialized symbolisms are made part of the procedure, THIS AGREEMENT IS REACHED BY LINGUISTIC PROCESSES, OR ELSE IT IS NOT REACHED” (p. 271).

Yet, regular L2 learners also participate in such encounters, and Whorf may have underestimated their potential to develop multilingual awareness: Recent studies show that many bilingual writers and lay multilinguals are also conscious of distinct patterns that shape their respective linguistic worlds (Pavlenko, 2006, 2014; Pérez-Firmat, 2003). Whorf also may have overestimated the importance of explicit pattern instruction. The studies to date show that implicit L2 learning may also result in destabilization of entrenched L1 categories and cognitive restructuring and it is to these studies that I turn next.

L2 Learning and Destabilization of Entrenched Categories of the L1

Studies of SLA show that our first encounters with a new language are distinguished by attempts to impose the categories of the L1 (e.g., Jarvis & Pavlenko, 2008; Pavlenko, 2014). These attempts, known as L1 transfer, stem from superior entrenchment of L1 categories, favored in automatic processing. Eventually, L2 learning may trigger *destabilization* of entrenched L1 patterns, with the first symptom being increased variability in their use. Thus, Wolff and Ventura (2009) found that American L2 learners of Russian displayed higher variability in L1 English attribution of causality after 6 months of residence in Russia, while studies by Malt, Li, Pavlenko, Zhu, and Ameel (2015) and Malt, Jobe, Li, Pavlenko, and Ameel (in press) documented higher variability in L1 naming patterns of Chinese-English bilinguals and American learners of L2 Russian.

Destabilization and bidirectional transfer may also result in *in-between performance*, distinct from the L1 and the L2. Evidence of such performance was found in spatial concepts of Korean-English bilinguals (Park & Ziegler, 2014); motion event descriptions by Spanish-English bilinguals (Hohenstein, Eisenberg, & Naigles, 2006), Turkish-German bilinguals (Daller, Treffers-Daller, & Furman, 2011), Japanese-English bilinguals (Brown & Gullberg, 2008, 2011), and Russian-English bilinguals (Wolff & Ventura, 2009); granularity of event construals by Spanish-Swedish bilinguals (Bylund, 2011a, 2011b); and temporal frames of Czech-English and Hungarian-English bilinguals (Vanek & Hendriks, 2015).

The studies to date also provide evidence of *approximation* and *internalization of L2 patterns and categories*, evident in descriptions of motion events by Turkish-German (Daller et al., 2011) and Russian-English (Pavlenko & Volynsky, 2015) bilinguals, in the use of emotion terms and other interpretive categories by English-Greek (Panayiotou, 2004a, 2004b), English-Russian, and Russian-English (Pavlenko, 2003, 2008) bilinguals, and in the L2 naming patterns of Chinese-English bilinguals and American L2 learners of Russian (Malt et al., 2015, in press).

Having internalized new patterns, some bilinguals manage to maintain two or more sets of language-appropriate patterns, categories, frames of reference, and foci of attention. Such *coexistence*—seen in targetlike performance in both languages—has been documented in color naming by Russian-English bilinguals (Andrews, 1994); emotion category similarity judgments by Russian-English (Stepanova Sachs & Coley, 2006) and Vietnamese-English (Alvarado & Jameson, 2011) bilinguals; temporal structuring of events by Spanish-Swedish bilinguals (Bylund, 2011b); and the use of interpretive

frames by Portuguese-French (Koven, 1998, 2007), Greek-English (Panayiotou, 2004a), and Chinese-English (Wang, Shao, & Li, 2010) bilinguals.

The maintenance of two competing patterns, however, requires an additional cognitive effort because it involves dual cognitive load. Attempts to decrease the cognitive load may result in convergence of L1 and L2 patterns, seen in contexts where bilinguals' performance differs from speakers of both the L1 and L2. In bilinguals residing in the L2 environment, this outcome—discussed earlier as in-between performance—may be temporary, reflecting destabilization, bidirectional influence, and ongoing restructuring. In contrast, in zones of language contact, bilinguals may display stabilized *convergence*, that is, new categories that arose in the process of language change, triggered by the need to reduce the cognitive load of maintaining two distinct patterns. Evidence of such convergence comes from studies of naming patterns for household containers among French-Dutch bilinguals in Belgium (Ameel, Malt, Storms, & Van Assche, 2009; Ameel, Storms, Malt, & Sloman, 2005) and construals of “putting” events by Romansh-German bilinguals in Switzerland (Berthele, 2015).

The need to reduce dual cognitive load may also result in *L2 influence on L1* categories or patterns of selective attention, documented in the structure of color categories of Vietnamese-English bilinguals (Alvarado & Jameson, 2002; Jameson & Alvarado, 2003); naming patterns of Chinese-English (Malt et al., 2015) and Russian-English (Pavlenko & Malt, 2011) bilinguals; similarity judgments of emotion categories in Russian-English bilinguals (Stepanova Sachs & Coley, 2006); descriptions of motion events by Spanish-English (Hohenstein et al., 2006), Russian-English (Wolff & Ventura, 2009), and Turkish-German (Daller et al., 2011) bilinguals; and event construals by Spanish-Swedish bilinguals (Bylund, 2009; Bylund & Jarvis, 2011).

In the context of reduced exposure to the L1, bilinguals may also experience *attrition* of L1 categories. Studies to date have found evidence of such attrition in the weakening of obligatory color contrasts in Russian-English (Andrews, 1994), Greek-English (Athanasopoulos, 2009), and Japanese-English (Athanasopoulos, Damjanovic, Krajičević, & Sasaki, 2011) bilinguals; deactivation of interpretive categories in the domains of emotions (Pavlenko, 2002); and disappearance of absolute frames of reference from speakers of L1 Guugu Yimithirr dominant in L2 English (Levinson, 2003).

The studies to date also identify three factors that facilitate cognitive restructuring: context of L2 acquisition (CoA), length of L2 exposure (LoE), and age of L2 acquisition (AoA). (L2 proficiency is seen here as an outcome of cognitive restructuring.) Studies of CoA reveal systematic differences between

naturalistic and classroom learners and show that L2 immersion facilitates restructuring of emotion categories (Pavlenko, 2002; Pavlenko & Driagina, 2007) and motion event construals (Daller et al., 2011; Treffers-Daller & Ziyan, 2016) and internalization of interpretive frames (Pavlenko, 2003). Among the advantages of immersion are multiple affordances for noticing, generalization across exemplars, and statistical learning (Treffers-Daller & Calude, 2015; Treffers-Daller & Ziyan, 2016). Immersion also offers opportunities for integration of information from multiple modalities with affect and autobiographical memories; this integration, in turn, facilitates strengthening and consolidation of memory traces in the bilingual mind (Jared, Poh, & Paivio, 2013; Pavlenko, 2014). In contrast, in the typical foreign language classroom, L2 forms are processed out of context and in the absence of their real-world referents, affective relevance, or meaningful communicative demands. In online processing, these new patterns of activation are easily preempted by entrenched L1 patterns.

Studies of LoE show that speakers who reside longer in the L2 environment are more likely to approximate L2 patterns, be it in artefact naming (Malt & Sloman, 2003), attribution of causality (Wolff & Ventura, 2009), or motion event construals (Treffers-Daller & Calude, 2015). This advantage is linked to greater exposure to positive and negative evidence in the input (Treffers-Daller & Calude, 2015) and repeated coactivation of linguistic forms and new multimodal representations, which strengthen the newly established patterns (Pavlenko, 2014).

Earlier AoA also facilitates cognitive restructuring: Studies of color (Andrews, 1994) and object naming (Malt & Sloman, 2003; Pavlenko & Malt, 2011), and construal of motion events (Bylund, 2009; Bylund & Jarvis, 2011; Hohenstein et al., 2006) show that early (AoA 1–6 years) and childhood bilinguals (AoA 7–12 years) are more likely to internalize L2 categories and display L2 influence on L1 than late bilinguals (AoA > 12 years). Such findings are often linked to assumed decrease in neural plasticity after puberty. Brain activation studies show that later acquirers display a greater amount of activation in the L2, interpreted as less automatic and more effortful processing (Higby, Kim, & Obler, 2013). Berken, Chai, Chen, Gracco, and Klein (2016) also found that simultaneous bilinguals display greater functional connectivity between language and cognitive control regions than later or sequential bilinguals and linked this pattern to more efficient brain activation during speech. At the same time, findings of destabilization of L1 and approximation of L2 patterns in late acquirers (AoA > 15 years) (Malt et al., 2015) and convergence of patterns of brain activation in late acquirers with high levels of L2 proficiency (Higby et al., 2013) suggest that we maintain some ability to inhibit established patterns of

activation and form new neural pathways, with differential outcomes explained by context affordances and differences in inhibitory ability and neural systems recruited for processing.

The limitations of this work, including my own studies, involve an almost exclusive focus on Indo-European languages (and thus privileging of SAE), disproportionate focus on lexical categories, reliance on synchronic comparisons in the here and now, and the lack of attention to multilingual awareness. Yet, despite these limitations, the findings to date do suggest that there is more to L2 learning than acquisition of form—it can also lead to destabilization of the L1 meanings and eventual restructuring of linguistic categories and patterns in such diverse areas as event construal; categorical perception; numerical, temporal, and spatial cognition; and interpretive framing. These initial findings indicate productive directions for future research on linguistic diversity and L2 learning and thought; yet to make home for this line of research, we may need to reimagine SLA and its relationships with other fields.

Reimagining SLA: A Neo-Whorfian Research Agenda

Whorf's key concern was with “the validity of generalizing to others on the basis of own experience” (Lucy, 1992a, p. 5). Taking us outside of our comfort zone, this line of questioning forces us to ask: Do theories articulated on the basis of data that privileges speakers of SAE and a few high prestige non-SAE languages, such as Arabic, Chinese, and Japanese, apply across the board? In other words, can explanatory constructs, such as attitude, motivation, identity, or willingness to communicate explain what goes on in multilingual contexts, like Papua New Guinea or West Africa, where speakers may use six or seven different languages on any given day (for a glimpse at crosscultural differences in assumptions about language learning, see Evans, 2010; Moore, 2009; Sakel & Everett, 2012)? What are the similarities and differences between L2 learning of languages like English, that underwent simplification through language contact and indigenous languages that may be higher in linguistic complexity (e.g., Dahl, 2004; McWhorter, 2008; Perkins, 1992) and lower in the range of uses and outside prestige?

Our first option is to disregard these questions, deciding, implicitly or explicitly, that our theories do apply across the board. The second option is to limit current SLA theories to a subset of more or less “Western” contexts. Yet neither is fully satisfactory from the point of view of advancement of science. The third option is to address the issue empirically by expanding the locations of SLA research from the classroom, the lab, and the neighborhood to the field and the focus from participants to researchers. Working alongside linguists engaged

in language documentation and revitalization efforts, we could put our expertise in service of creation of indigenous language curricula and training of language teachers. At the same time, working with speakers of indigenous languages as coauthors and collaborators, rather than as simple objects of Western gaze, we could conduct longitudinal studies—and autoethnographies—of L2 learning in a greater variety of languages than we have to date, and with the focus on researchers and heritage language speakers. As seen in the few existing autoethnographies of L2 learning of non-SAE languages (e.g., Everett, 2008; Moore, 2009; Simon-Maeda, 2011), an explicit focus on our own practices is a threat to our face, authority, and legitimacy. Yet it is also a long awaited response to concerns about the process by which interactions with L2 speakers are transformed into “linguistic facts” and the need to articulate better practices for monolingual fieldwork and L2 learning in the field (Borchgrevink, 2003; Moore, 2009; Sakel & Everett, 2012).

We also need to examine the relationship between multilingual awareness and cognitive restructuring: Can one take place without the other? This question highlights the larger issue to be addressed, namely the processes by which languages “program” the mind (Lupyan & Bergen, 2015) and make linguistic structures psychologically real. The field of SLA stands to make a major contribution to this inquiry by comparing psychological reality of linguistic categories in the L1(s) and in the languages learned later in life, with automaticity being one of the key indices of such reality. My own hunch is that one of the key sources of the illusory objectivity and psychological reality of L1 categories is native language embodiment, with effects being particularly strong in people who grow up speaking a single language or typologically related languages with long histories of language contact. Research shows that languages learned early in life automatically trigger imagery, autobiographical memories, affective processing, embodied simulations, and implicit knowledge of situations to which they apply while, in languages learned later in life, this is not the case (Bergen, 2012; Keysar, Hayakawa, & An, 2012; for an overview, see Pavlenko, 2012). “Part of what makes learning a second language so difficult,” argues Bergen, “is precisely this: the commitment one made early on in life to a particular cutting up of the world at its joints is hard to see as merely one possible commitment among many, and just as it is hard to let go of” (p. 194; see also Lupyan & Bergen, 2015, for discussion of embodiment). Languages learned later in life may be less embodied and, as a result, experienced as less real.

Far be it from me, however, to suggest that neurolinguistic and psycholinguistic studies are the only way to address these questions. I also see great potential in the agenda for linguistic relativity research mapped out by Sidnell

and Enfield (2012), who focus on naturally occurring conversations and their collateral effects in situated action (à la Whorf's empty drums). Another way to examine the process of naturalization of linguistic patterns and categories is to follow Whorf's ([1941a] 2012) own lead and consider the effects of linguistic analogy, which groups together different aspects of reality. His favorite example of analogy was *objectification*, the treatment of imaginary entities, such as *time*, as concrete perceptible objects, such as *days* (see also Lucy, 1992a, pp. 50–54). Recently, this process has been explored by discourse analysts who highlight the reifying effects of nominalization that make abstract terms appear real and link the increasing productivity of nominalization and passivization in English with the rise of objective science and media discourses (Billig, 2013; Halliday, 2006).

The change in productivity of linguistic patterns takes us to another area ripe for an exploration of Whorf's ideas—the study of language change (Evans, 2003). Research shows that grammatical categories have a limited shelf life: Some vanish (e.g., case endings in English) and others emerge through the process of grammaticalization (e.g., numerals reinterpreted as indefinite articles; e.g., Dahl, 2004; Evans, 2003; McWhorter, 2008; Perkins, 1992). This process may occur over hundreds of years or in the span of one generation, as seen in creation of new auxiliary forms in Light Warlpiri (O'Shannessy, 2011). The literature on the SWH has never addressed “what its implications would be for how a language has changed over time” (McWhorter, 2008, pp. 148–149), yet integration of language change is fundamental for any theory of a relationship between linguistic diversity and thought. If grammatical categories can emerge or disappear, what does it say about their hold on our minds? And what are the mechanisms by which cultural preoccupations are transformed into linguistic structures (Evans, 2003)?

Conclusion

Highlighting the interdisciplinary nature of Whorf's insights, the present-day neo-Whorfian revival triggered a “re-envisioning of what work on this topic should consist of” (Everett, 2013, p. 22). Yet it also reminded us that a dialogue between disciplines is often fraught with complications due to differences in disciplinary traditions and assumptions. Evans (2010) argues that linguists and psychologists (one might also add anthropologists) “make uncomfortable bedfellows”:

Psychologists, in general, are rarely interested in strange languages, and like nice tidy experimental designs with plenty of experimental subjects

and in carefully controlled experimental settings—none of which sits well with fieldwork in small chaotic communities. Linguists, particularly of the field variety, are usually naïve about statistics, happy to sail with their intuitions from key texts and speakers, and buck at the straight jacket of picky experimental designs. Getting linguists and psychologists to talk to each other and plan crucial experiments, let alone work together in remote field settings, is thus a matchmaker's nightmare, so it is no surprise that collaborations have been limited. (p. 180)

This special issue is a critical step in initiating such collaboration on issues related to SLA. The purpose of this article was to ensure that this collaboration continues to dismantle, rather than reinforce, disciplinary boundaries and does not reduce Whorf's insights to a single paradigm or type of Whorfian effects. As a field situated at the crossroads of linguistics, psychology, and ethnography, SLA stands to make a major contribution to the study of linguistic relativity. To make this contribution, we may need to expand the scope and locations of SLA research, but doing so will also benefit the field, both in terms of theory construction and in terms of interaction with and impact on other areas of social sciences and humanities.

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Note

- 1 Over the past two decades, I have incurred a tremendous intellectual debt to John Lucy, whose work has greatly influenced my understanding of Whorf even when it takes us in different directions.

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