distant future in which each household has a kitchen appliance that creates food from frozen cubes. The machine can create foods that are identical to those found in nature—for instance, an avocado, or a grapefruit—but it can also be programmed to combine textures and flavors in completely new ways, allowing you to design a food with the oily consistency of an avocado, but a taste halfway between a carrot and a mango. The people who live in this world have developed a rich vocabulary to describe this space of possible flavors and food textures.

Now, imagine that this future society sends an anthropologist back to our time with a tray of 1,024 taste samples. She finds that while we "natives" can distinguish between the various tastes, when asked to provide a name for each sample, we come up with only the crudest distinctions, like "sweet" or "sour," or "it's a bit like an X," where X is the name of some natural food. The anthropologist is flummoxed; since we can obviously taste the difference between the samples, why is our language so defective? As Deutscher explains:

> Let's try to help her. Suppose you are one of those natives and she has given you a cube that tastes like nothing you've ever tried before. Still, it vaguely reminds you of something. For a while you struggle to remember, then it dawns on you that this taste is slightly similar to those wild strawberries you had in a Parisian restaurant once, only this taste is ten times more pronounced and blended with a few other things you can't identify. So finally, you say, very hesitantly, "it's a bit like wild strawberries." Since you look like a particularly intelligent and articulate native, the anthropologist can't resist posing a meta-question: doesn't it feel odd and limiting, she asks, not to have precise vocabulary to describe tastes in the region of wild strawberries? You tell her that the only things "in the region of wild strawberry" that you've ever tasted before were wild strawberries, and that it has never crossed your mind that the taste of wild strawberries should need any more general or abstract description than "the taste of wild strawberries." She smiles with baffled incomprehension.

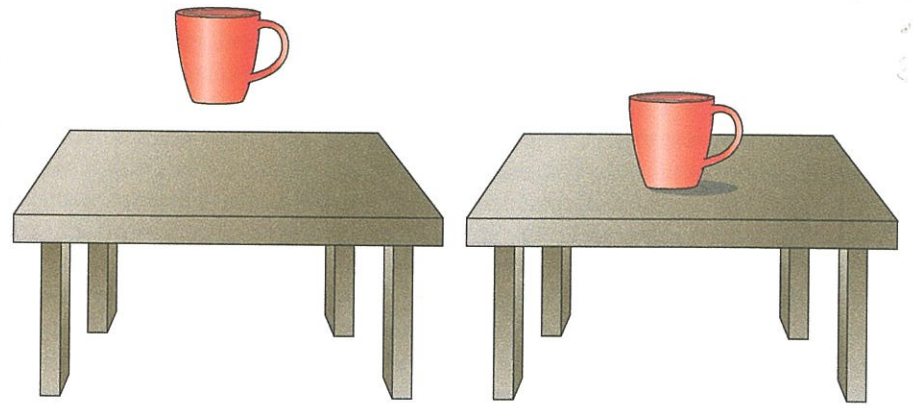
Word-to-culture mismatches

Detailed vocabulary within a specific domain, then, might reflect something about how much a culture cares about communicating certain conceptual distinctions. On the other hand, it's also not hard to come up with examples where differences in language don't seem to be related in any obvious way to cultural values or practices. For instance, Norwegian pronouns differentiate between the masculine and feminine third-person singular (*han* versus *hun*), while Farsi, spoken in Iran, uses the same word (*u*) for both. Are we to conclude from this that distinguishing between males and females is less culturally important to speakers of Farsi than it is to Norwegians?

Other examples abound. Words that describe spatial relations are also subject to a lot of crosslinguistic variation, for no clear cultural reasons. Why, for example, does English need the different words *in* and *on*, while Spanish is content with the single word *en*? Or why does English require speakers to distinguish between the concepts of above and on (see **Figure 12.8**), while Korean does not? In some cases, a language's lexical inventory does seem to contain elements of arbitrariness.

WEB ACTIVITY 12.3

Words and culture In this activity, you'll explore some examples of crosslinguistic differences in the mapping of words to concepts. You'll be asked to generate hypotheses about which crosslinguistic differences are likely to be motivated by possible cultural differences, and which are likely to be arbitrary.



English:
The cup is **above** the table.

Korean:
cup-i thatka wi-e issta
cup table top be
or
cup-i thatka wi-e ette issta
cup table top floating be

English:
The cup is **on** the table.

Korean:
cup-i thatka wi-e issta
cup table top be
or
cup-i thatka wi-e putte issta
cup table top sticking be

Figure 12.8 Examples of spatial relationships that *must* be linguistically distinguished in English, but may or may not be distinguished in Korean (see Munnich et al., 2001).

There are other good reasons to doubt that the words of a language transparently reflect a culture's most important concepts. Languages tend to be a lot like houses: live in the same one long enough, and you'll accumulate piles of objects that you once bought to serve a specific need, but that now just hang around because you figure you still might use them every now and then. There may be family heirlooms that don't reflect your own tastes and values, but that seem too valuable to throw out. You may have collections of exotic objects from your various travels, chosen less for their usefulness than their novelty. Your house becomes less of a reflection of your needs and priorities right now than a historical record of your entire life.

This analogy is a reminder that the language of any existing culture reflects a linguistic code that has accumulated (usually) over a long period of time. Though it's subject to constant adjustments and tinkering, most of its elements are preserved from one generation to the next. You can see this in the way that some languages, such as English, French, or Spanish, have fanned out across very diverse cultures, and yet don't seem to have undergone dramatic reorganization in a way that reflects the scope of the cultural differences of their speakers. For the most part, English speakers in the United States make use of the same collection of words as English speakers in Australia or Singapore. Though it's true that new words are sometimes introduced to meet a culture's needs when there are glaring gaps (for example, *filibuster, outback, jackeroo, hillbilly*), most of the words in the lexicon of any English speaker are inherited from long-dead ancestors rather than invented anew to meet the needs of speakers at a particular time and place.

It's also important to keep in mind that just because a language hasn't dedicated a particular word to a concept, this doesn't mean its speakers have no way to express the concept. In English, the word *grandfather* refers to either your mother's father or your father's father, but this doesn't mean you can't use language to make the distinction—in fact, I just did. (Alternatively, you could use *maternal grandfather* or *grandfather on my mother's side*.) And while German has the handy word *schadenfreude*, which we English speakers sometimes borrow, we have no

trouble using our own language to describe the feeling of glee at another person's misfortune—we just go about it in a slightly more roundabout way.

Whether a language uses a single word or a phrase to express a certain concept depends to some extent on the machinery that exists within the language for building new words. For example, the German language is unusually enthusiastic when it comes to creating complex words such as *Freundschaftsbezeigung* (meaning "demonstration of friendship") or *Unabhaengigkeitserklaerungen* ("declarations of independence"). This fact led the American humorist Mark Twain (1880) to observe: "These things are not words, they are alphabetical processions. And they are not rare; one can open a German newspaper at any time and see them marching majestically across the page—and if he has any imagination he can see the banners and hear the music, too."

In its compounding zeal, English falls somewhere between German and French; where English speakers use a word like *housecoat*, French speakers would use the expanded phrase *robe de chambre* (literally "dress for a bedroom"). All things being equal, then, a complex concept is most likely to become coined as a single word in German, and least likely to be coded as a single word in French.

It's too simple, then, to conclude that just because a particular word exists in a language, it reflects an important concept for the people who speak it, or conversely, that the absence of the word reveals that speakers are indifferent to the concept. This may be true in cases of highly specialized vocabularies, but clearly, a number of factors complicate the picture.

Do words help organize thoughts?

Let's now turn to the second common assumption about the relationship between language and culture: that a language's inventory of words has an effect on how its speakers think about or perceive the world. This notion is referred to as the **Whorf hypothesis**, after the linguist Benjamin Lee Whorf (1897–1941), or sometimes as the Sapir-Whorf hypothesis, to include Whorf's contemporary Edward Sapir (1884–1939).

In light of the previous discussion, it seems extremely unlikely that the absence of a word from a speaker's lexicon would *block* him from grasping a particular concept—after all, the concept behind *schadenfreude* is perfectly intuitive, even in its English paraphrased version, and there's nothing intrinsically difficult about the notion of a maternal grandfather, despite the fact that it requires two words to express it. Hence, we should be highly suspicious of the claim that speakers of languages that lack a single word for the notion of accountability are inevitably hampered in their efforts at public reforms. As linguist and blogger Mark Liberman (2011) notes, cheek swollen with tongue:

> In fact, it's possible that only English speakers can grasp the concept of accountability, at least if we accept that no one could possibly understand an idea that they need an expression longer than one word to name, or some context to interpret. The French, for example, would need to talk about having "comptes à rendre," requiring three or even four words. This same limitation may explain why it's so difficult for us English speakers to get our minds around things like reforming the health insurance system, since we need five or six words even to refer to the issue.

Whorf hypothesis The hypothesis that the words and structures of a language can affect how the speakers of that language conceptualize or think about the world.

But there are more nuanced (and realistic!) ways in which to develop the idea that words leave an imprint on thought. For example, you might think of the relationship between words and concepts as analogous to the relationship between phonemic categories and the speech soundscape. As you saw in Chapter 4, babies are able to distinguish between a great many speech sounds very early in their lives. But experience with language soon leads them to impose phonemic categories on these speech sounds. As phonemic categories are formed, babies learn to pay more attention to the differences between sounds that fall into different categories, and less attention to sounds that fall within the same category—for example, at some level, English babies (and adults) treat aspirated [p^h] and unaspirated [p] as equivalent, as demonstrated by classical categorical perception tests, but they're highly sensitive to the differences between /b/ and /p/. In many cases, a language will helpfully place a phonemic boundary at a "natural" juncture—that is, where the auditory system is already predisposed to detect differences between sounds. But whether these boundaries are natural or not, over time, babies' exposure to the phonemic categories that are evident in the language around them shapes their perceptual experience of the phonetic space.

Perhaps words impose category structure on conceptual space in a similar way. We don't want to say that words are *necessary* in order for concepts to be understandable, because, as we've seen, it's perfectly possible to grasp a concept even if your language doesn't have a word for it. (And, as discussed in Digging Deeper in Chapter 5, there's also some evidence that babies form certain conceptual categories well before they learn the meanings of words.) But perhaps words help to draw attention to some distinctions over others just as phonemic categories do.

WEB ACTIVITY 12.4

Testing the Whorf hypothesis

In this activity, you'll consider several examples of crosslinguistic differences in word-to-concept mappings, and you'll explore some possible ways in which you might test for the effects of language on conceptual organization.

A colorful case study

Some of the earliest questions about the relationship between language and thought arose in the domain of color. As a result, this topic has served as a magnet for crosslinguistic and experimental data.

You've already seen (in Box 12.3) some arguments that the color vocabulary of a language depends partly on universal constraints on color vision, and partly on the cultural importance of naming color as an abstract property. Regardless of whether a person's color vocabulary is large or small, though, people can usually detect many more color distinctions than they can name. Still, it's possible that a lifetime of naming colors in a particular way has made you slightly more sensitive to some color differences than others.

In 1984, Paul Kay and Willett Kempton tested whether speakers of English would have subtly different judgments about colors than speakers of Tarahumara, a language spoken in northern Mexico. Unlike English, Tarahumara has only one word, *siyo'name*, to refer to both green and blue. Are English speakers more sensitive to slight differences between colors that straddle the green/blue boundary than Tarahumara speakers? And if so, are English speakers more sensitive to small differences that cross the green/blue divide than they are to small differences between two shades of blue? An asymmetrical pattern like this would be reminiscent of the way in which English speakers "hear" the sounds [p] and [p^h] as highly similar, while "hearing" /p/ and /b/ as clearly distinct, even if the acoustic distance between the sounds is *objectively* the same for both pairs.

To create an experiment that mirrored the categorical perception studies with sounds, Kay and Kempton needed to have a way to capture the objective differences between colors. Fortunately, one had already been developed in the early twentieth century by Albert Munsell. (The Munsell color system serves as the basis for organizing color space by categorizing colors along the

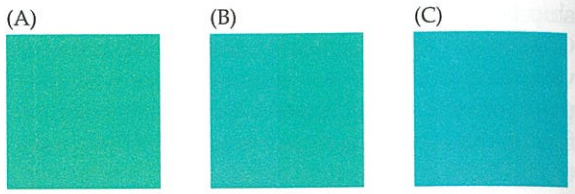


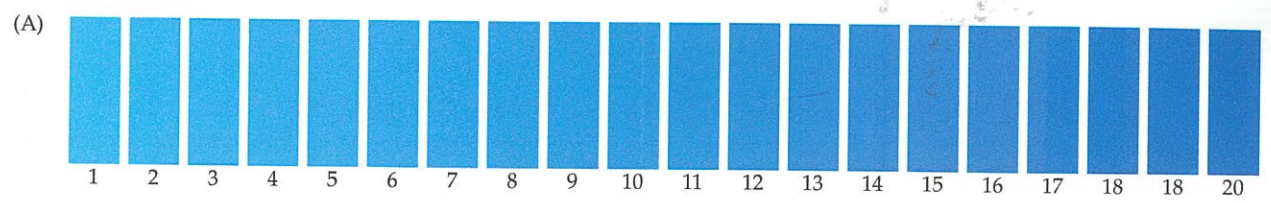
Figure 12.9 Example stimuli used by Kay and Kempton (1984) in the "odd one out" task for color perception. Subjects were asked to identify which of the color samples was more distant from the other two samples than those two were from each other. Speakers of English, but not speakers of Tarahumara, tended to exaggerate the distance between stimuli B and C, which span the English blue/green boundary.

dimensions of hue, brightness, and saturation.) For each of their experimental trials, Kay and Kempton chose three closely neighboring color chips from the Munsell chart. Subjects were told that two of the colors were very similar to each other, but that one was more distant from the other two; the subjects' task was to identify the "odd one out" (**Figure 12.9**). Based on the subjects' responses over a number of trials, the researchers calculated a score of perceived distance between critical pairs of color chips, and compared these to measures of objective distance. They found that the language spoken by subjects did have an effect on the perceived distances between colors. English speakers judged the distance between a "blue" and a "green" chip to be bigger than the distance between two shades of "blue," even if the objective distances were identical. (The boundaries between the English green and blue categories were previously established on the basis of responses from English speakers who did not participate in the "odd one out" task.) On the other hand, Tarahumara speakers did not exaggerate the distance between colors across the green/blue boundary.

Is this convincing evidence that having different labels for green and blue has warped the perceptual system of English speakers? Perhaps not. It's hard to know whether the subjects' behavior on the test is truly reflecting *perception*. Possibly what's happening is something like this: The test questions are very hard to answer with any certainty, based on perceptual information alone. Maybe when confronted with a trio of very similar colors, English speakers tell themselves, "Hmm, these all look so close to each other, it's hard to tell which one of them is slightly more different from the other two. Still, two of these would probably be called 'green' and one of them would probably be called 'blue,' so I'm going to guess that the 'blue' one is the odd one out." In this case, the availability of different labels may offer a handy strategy to resolve a tricky perceptual task, rather than directly affecting how the colors themselves are perceived.

What would it take to convince you that language truly does interfere with perception? Perhaps if we design a study in which subjects are made to respond to the perceptual test as quickly as possible, this would make it hard for them to invoke a fallback strategy based on color names. In fact, we could then use the response times themselves as evidence for whether color distinctions are easier to make across word boundaries.

This was exactly the strategy used by Jonathan Winawer and his colleagues (2007) in exploiting the differences in color vocabulary between English and Russian. English speakers are able to use a single word (*blue*) to describe all the shades of blue pictured in **Figure 12.10A**, but Russian speakers are required to be more precise and distinguish between light blue (*goluboy*) and dark blue (*siniy*). (And, as it turns out, Russian speakers make the cut between *siniy* and *goluboy* at about the same place on the blue spectrum as English speakers who are forced to decide whether a color is light blue or dark blue.) Winawer and his colleagues devised a simple timed task in which English- and Russian-speaking subjects saw three squares of color, with one square on top and two on the bottom, as in **Figure 12.10B**. In each trial, one of the bottom squares was identical in color to the one on the top; subjects were told to quickly press a button on



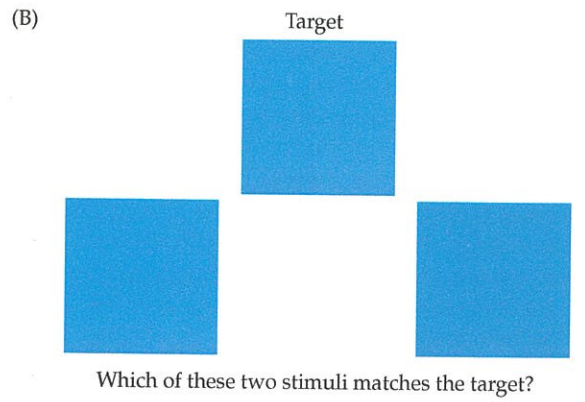


Figure 12.10 (A) Stimuli from the color perception study by Winawer et al. (2007). (A) All of these stimuli can be referred to by the English label *blue*. Russian speakers, however, divide the set up into *goluboy* (light blue) and *siniy* (dark blue), with the boundary between them typically occurring between stimuli 8 and 9. (B) An example trial from the study. To respond correctly, subjects had to press a button on the left to indicate that the lower left square matched the top square in color. (Adapted from Winawer et al., 2007.)

their left if the left square matched the top square, and a button on their right if the right-hand square was the correct match.

Not surprisingly, it took both groups of subjects longer to respond if the two bottom squares were very close in color than if they were further apart. But the Russian speakers performed a bit differently than the English speakers did: if a trial contained two colors that were very similar but sat on opposite sides of the *siniy/goluboy* fence, the subjects' responses were faster than if the two colors would both be classified as either *siniy* or *goluboy*. The existence of the two distinct words appeared to sensitize them to that particular distinction in color. English speakers, on the other hand, showed no advantage for colors that straddled the *dark blue / light blue* divide.

Evidence from reaction times is a fair bit more compelling than the judgment task used by Kay and Kempton. You may still not be fully convinced, though, that people's behavior in this task reflected an involuntary, *automatic* response to perceiving color rather than the use of verbal information to make a *decision* about color. The skeptics among you are invited to work through the details of the intriguing ERP study summarized in **Box 12.4**. In this study, effects of color vocabulary for English and Greek speakers were apparent within about 100 milliseconds of the presentation of colored stimuli. Thus, it's beginning to look like perhaps language truly does influence color perception.

12.4 Adjusting the Language Dial

How to silence the Whorf effect

There's a fascinating twist to the Whorfian story. In the study by Jonathan Winawer and his colleagues, there was one condition in which the Russian speakers performed just like the English speakers in that they were no better at detecting differences between stimuli that fell into different *siniy* versus *goluboy* categories than they were at noticing within-category differences. This happened when the subjects were saddled with an extra memory task: just before seeing each color trio, they read an eight-digit number that they knew they

BOX 12.4
ERP evidence for language effects on perception

An ERP study by Guillaume Thierry and his colleagues (2009) suggests that language influences on color perception can occur quickly and automatically, even in an experimental task in which subjects are not told to focus on color at all. In this experiment, EEG recordings were taken as English- or Greek-speaking subjects saw colored shapes, most of which were circles. Following instructions, the subjects monitored for the occasional square by pressing a button when they saw one. The squares, however, were simply decoys—the true stimuli of interest were circles that deviated in color from the majority of the other circles in the trial (**Figure 12.11**). The researchers anticipated that a circle of an unexpected color would trigger a visual mismatch negativity effect (vMMN), which is an ERP component that reflects the automatic detection of a change in the visual stimulus. It's generally assumed that the vMMN is a *preattentive* effect, that is, it occurs regardless of whether people are paying conscious attention to the aspect of the stimulus that changes, as a sort of unconscious registering of surprise.

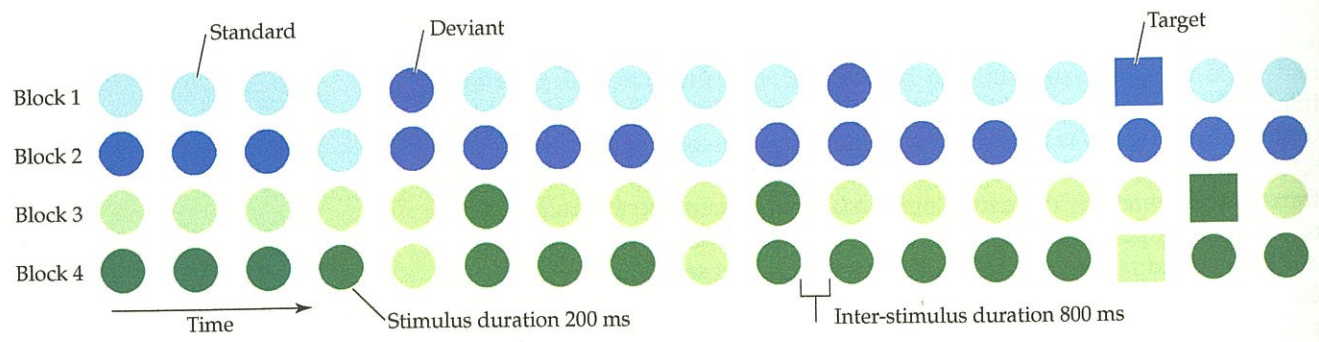


Figure 12.11 Examples of trials in the study by Thierry et al. (2009). For each of these four trials, subjects were instructed to press a button when they saw a square (the target). EEG data were recorded and analyzed for the subjects' responses to the deviant—circles that appeared in a different color than the majority of the items in that trial.

would have to correctly identify after responding to the color test. This meant that while performing the color test, they were mentally rehearsing the strings of digits and, presumably, clogging up their language system in the process. Somehow, blocking the possible activation of the color names eliminated the effects of color vocabulary on perception. And it really does seem to be that *verbal* interference was the culprit; when the Russian subjects had to remember spatial grid patterns instead of digit sequences, they once again showed heightened sensitivity to color differences across the *siniy/goluboy* boundary.

So, do color names alter the perception of color? Well, the answer seems to be yes, but apparently only if people can activate those linguistic labels while performing the perceptual task. This conclusion is supported by an inventive study carried out by Aubrey Gilbert and colleagues (2006), in which the researchers tackled the question from a very different angle.

As you'll remember from Chapter 3, words tend to be activated mainly in the left hemisphere of the brain—some evidence for this came from the classic experiments with split-brain patients that I described earlier. In those studies, patients whose hemispheres had been surgically disconnected were able to identify objects but not name them if the pictures of the objects appeared in the left visual field. Moreover, even in people whose hemispheres were properly connected, studies showed that words were recognized more efficiently when they were presented to sensory organs on the right side of the body, which are directly connected to the left hemisphere—for instance, in dichotic listening

BOX 12.4 *(continued)*

The critical question was whether the subjects' native language would affect the vMMN. As shown in Figure 12.11, the circles were either green or blue, and varied within trials as to whether they were light or dark shades of those two colors. In English, the same word *green* or *blue* can be used to apply to both light and dark versions of these colors, but Greek differentiates between light blue (*ghalazio*) and dark blue (*ble*), while using a single name (*prasino*) for light green and dark green. Hence, for Greek speakers, the perceived difference between the light and dark blues was expected to be greater than for light and dark greens, thereby eliciting a larger mismatch effect. English speakers, on the other hand, should show no difference in the size of the mismatch effect. This hypothesis is supported by the ERP results of the study (**Figure 12.12**).

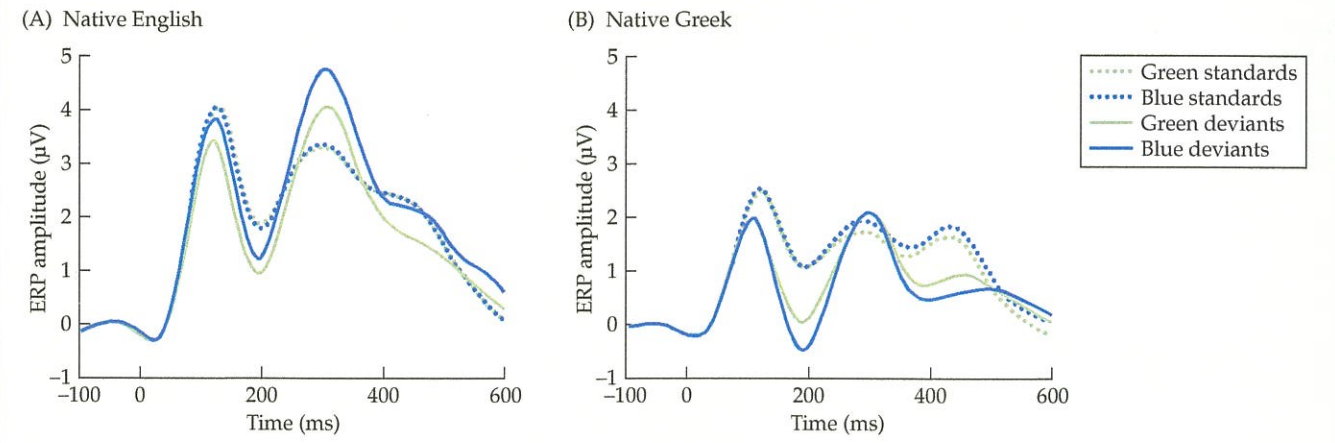


Figure 12.12 ERPs elicited by the standard and deviant circles, summarized over numerous recording sites. (A) Results for native English speakers. (B) Results for native Greek speakers. As predicted, the native Greek speakers showed a larger difference in brainwave activity at around 200 ms for standard versus deviant blues as compared with the difference for standard versus deviant greens. For native English speakers, the mismatch effect was the same for greens and blues. (Adapted from Thierry et al., 2009.)

tests, where subjects heard a different word in each ear, they had an easier time recognizing the words presented to the right ear.

Given that word representations are more active in the left hemisphere, Gilbert and his colleagues wondered whether a person's color vocabulary would influence perception differently depending on whether the stimuli were presented to the left or the right visual field. They devised a study in which subjects saw a ring of colored squares, with one "oddball" square of a slightly different hue than the others. As in the previous studies, the objective differences between the color squares were kept the same for all of the trials, but the squares could represent either two different linguistic categories (green and a nearby blue) or just one (two shades of blue, or two shades of green), as shown in **Figure 12.13**. The subjects' job was to quickly press one of two buttons to indicate whether the odd-colored square appeared on the left or right side.

When the target oddball square appeared in the subjects' right visual field (with the visual information being processed in the verbal left hemisphere), people were relatively fast at distinguishing it from the other squares if it fell into a different linguistic category (for example, a blue target square among a set of green ones); they were slower to respond if the oddball bore the same label (for example, a blue among slightly different blues). This showed, once again, that language can enhance sensitivity to certain subtle color differences. But when the oddball square appeared in the *left* visual field (with the visual in-

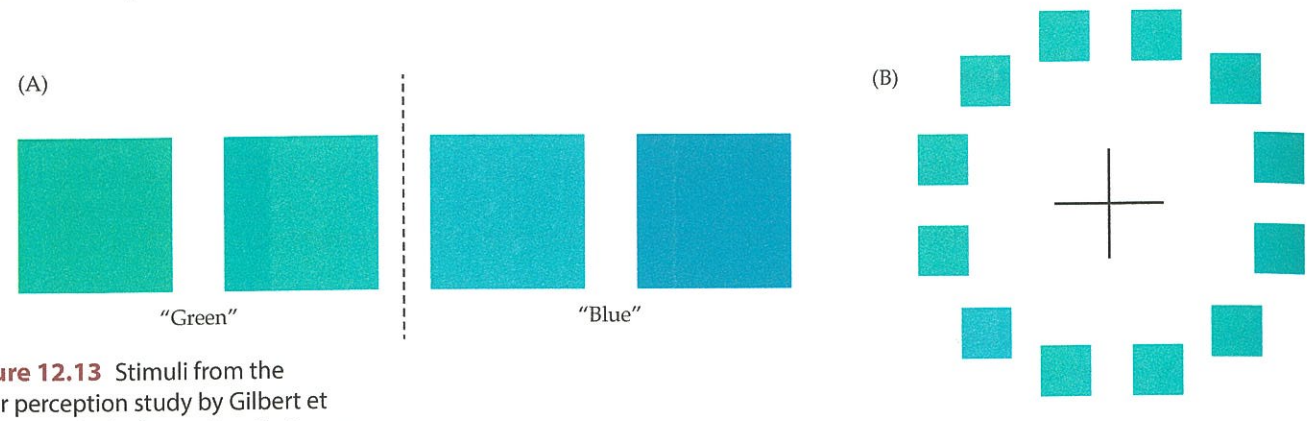


Figure 12.13 Stimuli from the color perception study by Gilbert et al. (2006). (A) The four colors that were used as stimuli, and the boundary that separates the greens from the blues. (B) The arrangement of stimuli in an example trial. All color squares in the circle were identical except for one "oddball" color that appeared either to the left or to the right of the cross in the middle, where subjects were instructed to focus their eyes. (From Gilbert et al., 2006.)

formation processed in the right hemisphere), the language effect evaporated, with no heightened sensitivity for different-named colors.

Results like these argue against a version of the Whorf hypothesis in which language has permanently altered the perception of color. Instead, language imposes itself on perception rather selectively—it appears that certain purely perceptual categories can exist and continue to operate outside of language's sphere of influence. But when the corresponding linguistic categories are highly active, they can play an important role in our perceptual experiences. You might think of language not so much as the teacher or guide of perception, but as an opinionated and vocal consultant. Under some circumstances, its opinions are muffled and perception carries on alone without the influence of language.

Beyond color words

Much of the Whorfian debate has been fought in the arena of color perception, and the abundance of experimental work on color has certainly helped to sharpen ideas about how language might influence perception or thought. But how much do the findings about color tell us about the relationship of language and thought more generally? Color perception by its nature involves making subtle distinctions about gradations of hue or brightness. But in other conceptual domains, categories might be much more sharply defined—think of giraffes and elephants, for example. In these cases, language might play a less important role in influencing judgments about categories. On the flip side, in more abstract conceptual domains, some categories could be more difficult to think about at all without the help of language—for instance, try to think *non*-linguistically of concepts such as a week, democracy, theory, or a contract.

Recent research suggests that the findings from experiments with color extend to at least some other concepts. In one study, Aubrey Gilbert and colleagues (2008) applied the same methods they'd used for studying color to look at concepts involving animal categories like cats and dogs. They used the same visual search task in which subjects were asked to identify one image that differed from others arranged in a ring (**Figure 12.14**). Just as in the color study, the images could come from different categories (an image of a cat appearing in a ring of dog images) or from the same category (two different images of cats). In general, subjects were faster to identify the oddball if it came from a different category than the surrounding images. But this cross-category advantage was greater if the oddball appeared in the right visual field than if it appeared in the left. This pattern makes sense if the rapid access of the *names* for cats and dogs in the left hemisphere allowed people to be faster at detecting the visual difference between the oddball item and its neighbors. In an intriguing variant of the experiment, the researchers tested a split-brain patient, who

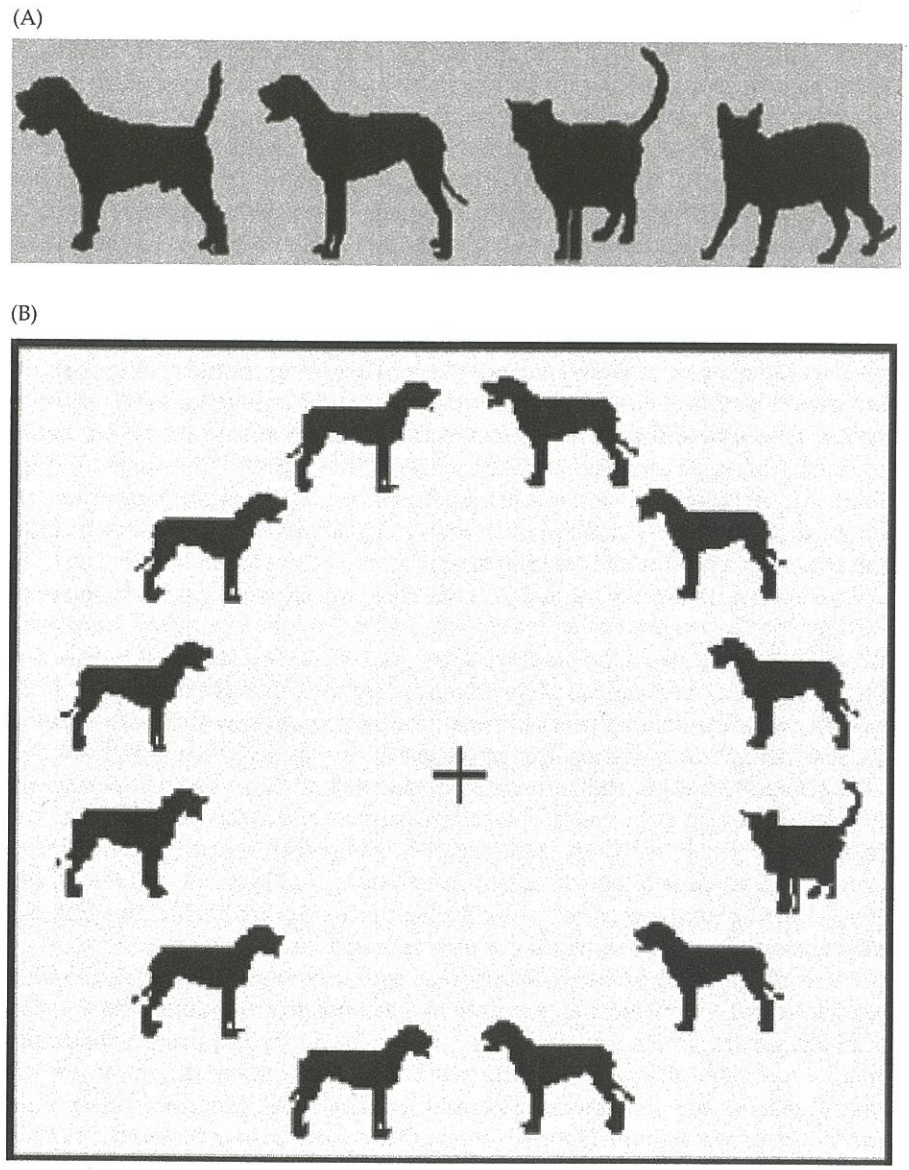


Figure 12.14 (A) The stimuli used in Gilbert's experiment (2008), including two different images in each of the cat and dog categories. (B) An example trial, illustrating an oddball that is from a different category than the surrounding images. (From Gilbert et al., 2008.)

showed an even more dramatic difference between the left-field and right-field results. In her case, the cross-category advantage disappeared entirely when the oddball images were presented in the left visual field. This suggests that when the two hemispheres weren't able to communicate with each other (that is, when language was prevented from exerting an influence on the task in the left-field condition), it was no easier to spot the difference between cat and dog images than it was to distinguish one cat image from another. So, much like the experiments with color terms, this study shows that conceptual categories can operate independently of linguistic categories, but that in some circumstances, the two become yoked to each other.

What about even more complex concepts—for instance, concepts that involve *events* rather than just objects? Not surprisingly, it's easy to find examples of languages that differ sharply in how they encode a complex event. For example, there are interesting crosslinguistic differences in the information that gets packed into verbs of motion. In English, we have a copious assortment of verbs to describe how a person might move his body from one location to another—

walk, amble, stride, trot, run, jog, saunter, and so on, all of which encode the *manner* of the motion. Now, in describing an event, it will sometimes be important to describe the *path* of the movement as well, but this dimension is usually captured not by the verb, but by a prepositional phrase that gets tagged onto the verb. For example: *Nigel jogged* ***up the hill****; Kim ran* ***into the house****; Blake ambled* ***down the street***. In languages like Spanish or Greek, the situation is reversed: normally the verb encodes the path, and a tagged-on adverbial phrase encodes the manner. So, in Spanish, you would typically say: *Juan entró en la casa* (literally "Juan entered the house"). If you thought it was really important to specify *how* Juan entered, you could say: *Juan entró en la casa caminando* (literally "Juan entered the house walking"). Note that there *are* Spanish verbs that do focus on manner (*caminar*—"to walk"; *correr*—"to run"), just as there are English verbs that denote path (*enter, ascend*). But the languages differ in what seems the most natural way to describe an event—for example, it's not outright ungrammatical for an English speaker to say something like "John entered the house walking," but it would strike the listener as a bit odd in most contexts. Apparently, by the age of three, English- and Spanish-speaking children already use whichever pattern is most natural for their language.

This means that English speakers normally *have* to pay attention to the manner in which a motion is executed, because this is the dimension that is usually encoded linguistically; specifying the path is more optional. On the other hand, speakers of Spanish or Greek normally pay attention to the path of the motion and, for the purpose of linguistic encoding, only occasionally focus on the manner. What happens after many years? In perceiving an event, do English speakers eventually become more automatically attuned to the manner of a motion, while Spanish or Greek speakers orient more to its path? Consider the event shown in **Figure 12.15**, which depicts a boy skateboarding into a hockey net. If you pay more attention to manner than to path, you might focus on the boy's skateboard (the manner of motion), whereas if you focus on the path, you might spend more time looking at the net (the path's end point).

To find out whether people's native language influences how they visually parse events, Anna Papafragou and her colleagues (2008) tracked the eye gaze of English and Greek speakers as they watched videos of simple events like the one in Figure 12.15. They found that the two groups did indeed show very different patterns of eye movements while watching the videos, with the Greek speakers immediately focusing on the path's endpoint, and the English speakers zeroing in on details that were relevant for identifying the manner—but

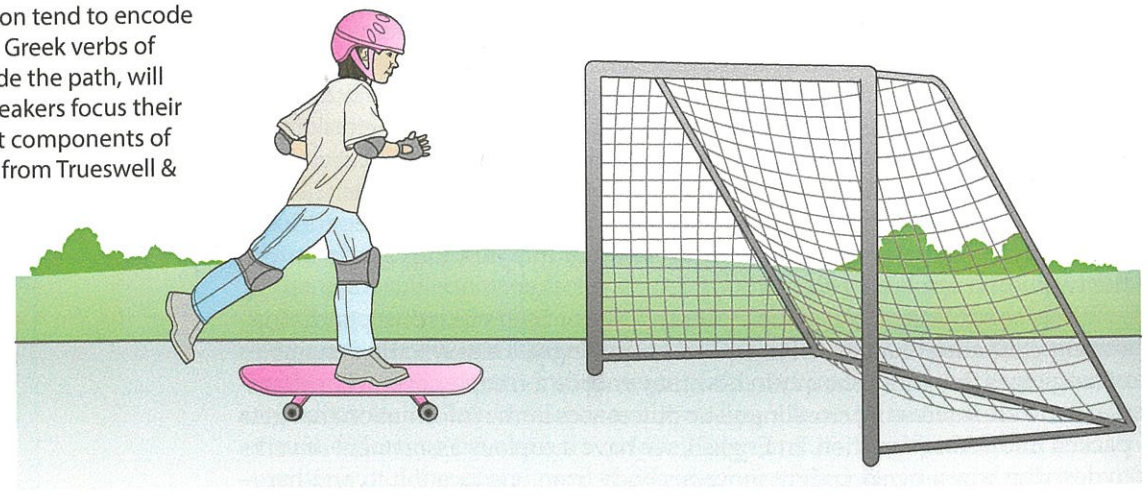


Figure 12.15 This complex event includes both a manner of locomotion (skateboarding) and an end point to the path of motion (the net). Given that English verbs of motion tend to encode the manner, whereas Greek verbs of motion tend to encode the path, will English and Greek speakers focus their attention on different components of this event? (Adapted from Trueswell & Papafragou, 2010.)

this difference only showed up when the subjects were asked to verbally describe the event right after watching the video. If their task was to remember the events in preparation for a later memory test, the eye movements of the two groups as they watched the videos were indistinguishable. Hence, thinking for speaking revealed different strategies than thinking for remembering, and it was only in the former that language strongly shaped how people were watching the unfolding events. A similar study of verbs of motion with Spanish and English speakers (Gennari et al., 2002) also found that the language spoken by the subjects had an effect on their judgments of how similar events were—but only if they had been instructed to describe the events they were seeing.

Nevertheless, the eye movement data did reveal some more subtle effects of language even in the memory task condition. It's true that in this task, the English and Greek speakers showed no differences in eye movements during the actual videos of the events—but they did show some interesting differences in the few seconds *after* the event, while watching a frozen video frame upon the event's completion: English speakers spent *more* time than the Greek speakers looking at the path's end point. Why would this be, since English linguistically encodes manner while Greek encodes the path? Exactly. The researchers suggested that in order to help them remember the details of the events, the subjects were spending extra effort committing to memory the information that wasn't already packed into the verbal content that would most naturally be tagged to the event. This interpretation assumes that, even though subjects weren't actively planning a description of the event in their minds, they were still activating verbal content in some way, and choosing a memory strategy that would complement the linguistic code. This assumption was vindicated in a later study (Trueswell & Papafragou, 2010): when subjects were asked to count aloud while watching the videos, making it harder for them to activate linguistic content related to the events, all effects of the speakers' language on eye gaze, whether during or after the videos, were eliminated.

Perceiving events of motion is quite a different mental activity than perceiving color swatches, but experiments across these domains appear to generate broadly consistent results: the language you speak can indeed influence the way you think about or interact with the world, but it doesn't permanently mold your thoughts or perception. Its influence is greatest when you're most likely to be activating the linguistic system. You can recruit linguistic knowledge—whether deliberately or unconsciously—to help you accomplish tasks that aren't overtly linguistic, and when you do so, language is likely to have some effect in organizing your thoughts.

The *selective* nature of Whorfian effects can create a methodological minefield for researchers (see **Method 12.1**). It also helps to put in some perspective some of the strong claims that people sometimes make about the relationship between language and thought—to say that we're conceptually *imprisoned* by the language we speak would be a gross overstatement. That's not to say, though, that even the subtle and selective effects of language on thought can't lead to significant consequences.

One such demonstration comes from Caitlin Fausey and Lera Boroditsky (2011). Their study focused on differences between English and Spanish speakers in how they typically describe accidental events that are caused by humans—for instance, an event in which a woman unintentionally breaks a vase. In English, it's possible to describe the event without mentioning its causal agent: *The vase broke*, or *The vase was broken*. But it's far more common to produce a sentence in which the agent appears in subject position: *The woman broke the vase.* Not so for Spanish speakers, who are more likely to describe the event by saying something like: *Se rompió el florero* (literally "The vase broke

METHOD 12.1

Language intrusion and the variable Whorf effect

As you saw in the studies of color and verbs of motion, Whorfian effects are found in some experimental situations but not in others. Variable effects that come and go demand an explanation, and in this case, the common thread underlying the variability seems to be the degree to which language itself intrudes into the task. It's true that the language that people speak can affect their performance on a cognitive or perceptual task, but this is less likely to happen when language isn't being recruited to help solve the task, or is actively prevented from participating.

Knowing that Whorfian effects depend on the degree to which linguistic representations are activated provides a useful framework for making sense of their variable nature. But it doesn't necessarily allow researchers to come up with a clear way to *predict* whether language will affect thought in any particular situation. This is simply because it's hard to know, in any given case, whether linguistic representations *will* be activated for a specific task. Obviously, at the extreme ends of the spectrum, you can either force or prevent the activation of linguistic forms—for instance, by requiring people to describe the stimuli, or by blocking access to the corresponding linguistic representations through verbal interference. But suppose you do neither of these things, and simply ask subjects to remember certain stimuli for later testing on a memory test. Or ask them to make judgments about the similarity of various stimuli. Will your subjects spontaneously enlist language to help them with the task? Surely, in order to evaluate whether people's behavior in real-world situations is likely to be affected by the language they speak, it would be good to have some solid answers to these questions.

Coming up with the answers, though, is not a simple matter. For example, in some of the studies we've reviewed, we've seen that a person's language can affect judgments of similarity when it comes to color (as found by the study by Kay and Kempton, 1984), whereas a similarity judgment task investigating verbs of motion *didn't* show any language-specific effects unless the subjects were explicitly asked to describe the events (Gennari et al., 2002). So which is it? Does a basic similarity test rely on linguistic representations or not?

A variety of factors likely determine the extent to which language is activated in a cognitive task. The linguistic representations themselves may be more accessible in some cases than in others. For example, in many of the color studies, it was easy to find language-specific effects even in tasks that didn't overtly require the use of language; these effects were then muted when linguistic access was blocked through verbal interference. This suggests that color words were activated fairly automatically. But keep in mind that in some of these tests, the researchers looked at a very small number of targeted colors—for example, just blues, or blues and greens in a very simple, repetitive task. In this case, the color words may have been highly predictable and easy to activate. Does this mean that color words would automatically be activated in, say, a more complex task that requires an interior decorator to choose from among hundreds of samples of color, involving many different objects? It's not entirely clear.

It's also more likely that language will be involved in solving a task that's hard to undertake without linguistic assistance. Non-linguistic memory for a simple event is fairly easy, but remembering the exact shade of red of your girlfriend's favorite sweater is more challenging. Applying a specific label ("cardinal red") might help. Or try remembering the exact number of geese you saw flying overhead yesterday. Being able to attach a word to this number ("nine") will increase your chances of success. In cases like these, even a nonverbal memory task may turn out to lean quite heavily on language.

All of this makes it quite complicated to compare two different populations. Tasks that might be easy and familiar for one group to solve without the benefit of language could be much more challenging for another, causing them to rely more on linguistic representation. Similarly, if the familiarity of certain concepts—or their corresponding linguistic representations—is shakier for one group than another, this could affect the degree to which language comes into the mix for a particular cognitive task.

Clearly, understanding the complex interplay between language and the rest of cognition is proving to be anything but straightforward. It would be premature to assert that Russian speakers show exceptional sensitivity in their art to different nuances of blue, based on the results we've seen so far from laboratory studies. But the ongoing accumulation of experimental work in this area promises to reveal a great deal about the range and limits of language's influence on thought and behavior.

itself"). On the other hand, when describing events that are *intentionally* caused by humans, Spanish and English speakers both encode the agent of the action.

Fausey and Boroditsky found that when English and Spanish speakers looked at videos of accidental events, they performed differently on a memory task, even if they were never asked to describe the events at any point between witnessing them and taking the test. Spanish speakers were less likely than English speakers to remember the agents of accidental events. However, when it came to remembering the agents of intentional events, both groups of speakers performed equally well. Hence, subjects' memory for the cause of the event ran in parallel with the likelihood that it would be mentioned in a sentence. Results like these raise the provocative possibility that eyewitness memory might be affected by linguistic codes that people activate at the time that they witness the event.

12.5 One Mind, Two Languages

Learn another language, expand your mind?

On page 474, I quoted from several attempts to persuade English speakers to learn a new language through the promise of an added cognitive bonus ("Learning a new language is the first step towards 'thinking outside the box'"; and "French … develops critical thinking"). Are such claims valid? Does learning another language really broaden your conceptual horizons or enhance your thinking skills?

The intuitive response would be yes, naturally. How could it not? But having now learned a great deal about psycholinguistics, you're in a position to approach the claim with some precision. First of all, it makes sense to distinguish between the benefits that might come from bilingualism itself—regardless of which languages are mastered—and the benefits that might come from knowing the particular words or grammatical devices a specific language uses.

How could the simple fact of knowing more than one language enhance cognition? As you saw in previous chapters, bilingual people don't have a firewall between their languages, and they regularly experience interference or competition between their linguistic systems. Becoming bilingual forces people to learn to manage this added competition, and this, it turns out, has some very positive side effects. There's a rapidly growing body of evidence showing that bilinguals generally achieve superior skills in cognitive control, whether it's in the form of reducing interference from irrelevant information, or switching between tasks more efficiently. These effects reach beyond the borders of language, and can have measurable effects on quality of life—for example, bilingualism slows down some of the cognitive declines that comes with age, and delays the symptoms associated with dementia (see Box 8.4). The benefits of managing two language systems can show up at the younger end of the age spectrum as well. In one study, 8-year-old bilingual kids displayed strong performance on a spatial perspective-taking task, whereas monolingual children of the same age had a harder time overcoming their own visual perspective (Greenberg et al., 2012). In another study, bilingual children in kindergarten displayed greater cognitive flexibility in their drawings than their monolingual peers (Adi-Japha et al., 2010). When asked to draw a picture of a flower that does not exist, monolingual children were fairly unadventurous, perhaps drawing a flower that was missing its leaves, or a flower with only one petal. Bilingual children, on the other hand, incorporated elements from completely different objects—producing, for instance, a flower with a tail, or a flower with teeth.

If knowing more than one language can make you more creative, better at ignoring irrelevant information, or less egocentric in your thinking, this really

does seem like quite the cognitive bonanza. But there are still many open questions. In order to reap the benefits of bilingualism, how proficient do you have to become in your second language? Does the age of acquisition matter? Do you have to exercise both linguistic systems on a daily basis? Is it still beneficial if you have only a reading knowledge of a second language, and don't have the skills to chat about the weather with a stranger at the bus stop? Language research is still in the early stages of gathering the evidence to address these questions. Based on the evidence so far, however—by all means, go learn a second language!

Whorfian effects in bilinguals

Let's now turn to the question of whether there are benefits to learning a *particular* language, aside from the broader cognitive gains of becoming bilingual. Any such payoff is highly unlikely to come from the fact that a certain language is especially "logical" or "analytical"—careful comparisons of languages provide not even the slightest glimmer that some languages enjoy these general properties more than others.

But since we know that languages can tilt thinking or perception in a particular direction depending on which concepts are regularly clothed in language, a more plausible approach would be to look *specifically* at how the second language encodes information in ways that differ from the first. It's on this terrain that we might see some concrete evidence that a second language sharpens the thinking of its learners in very targeted ways. For example: In Turkish, as in many languages, if you state an assertion, you also have to linguistically mark how you came to know that information. You would have to use one linguistic tag (*di*) to mark whether you learned the information firsthand through direct observation, and another (*miş*) to mark whether you know it secondhand through hearsay or indirect evidence. So, if you had witnessed the event yourself, you'd say:

Ahmet gel-di.

Ahmet came. (direct evidence)

But if you heard it from a friend, you'd say:

Ahmet gel-miş.

Ahmet came. (indirect evidence)

In English, there are options for making the same distinction:

I saw that Ahmet came.

I heard that Ahmet came.

Apparently, Ahmet came.

Ahmet came, I gather.

Ahmet must have come.

But English speakers aren't *forced* to make the distinction between firsthand and secondhand evidence. It's possible that being required to make the distinction between firsthand and secondhand knowledge makes Turkish speakers more attentive to the source of evidence, and maybe even allows them to remember it better. This could be very useful. Many psychology studies have shown that people are lousy at remembering the source of "known" information—for example, you may know that your childhood friend is getting married, but how do you know? Did she tell you? Did you hear it from her best friend? See it on Facebook? Perhaps speaking a language like Turkish, in which you're constantly having to categorize where your knowledge came from, would help you fix such information more firmly in your mind. And if that's true, would you get the benefit even if you started learning Turkish fairly late in life after having spent many years using English?

There's surprisingly little hard evidence for such targeted mind-expanding effects of learning a second language. But interest in the topic has heated up in recent years, so by the time you read this chapter, there will likely be many studies that shed light on it (check the book website for significant new developments). And, several studies do suggest that certain thinking patterns or mental categories can change as the result of acquiring another language (for a detailed review, see Bassetti and Cook, 2011).

It's worth noting that the data don't always point to effects in which mental categories or memory for events are *sharpened*—acquiring a second language can also lead to the blurring of information. For an illustration, let's step back into the great coliseum of color perception. In Box 12.4, I presented ERP data that showed that Greek speakers enjoyed an added sensitivity to certain shades of blue as compared with English speakers, reflecting the fact that Greek divides the color blue into a light (*ghalazio*) and a dark (*ble*) category. In that particular study, Greek speakers were found to be more sensitive than English speakers to slight differences that spanned the *ghalazio/ble* boundary. But in a later paper (Athanasopoulos et al., 2010), the researchers looked more closely at the same group of Greek speakers, dividing them into two groups depending on how long they had been living in the United Kingdom. They found that the group who had lived longer in the U.K. (an average of 42.6 months versus 7.2 months) showed signs of losing the sensitivity to the *ghalazio* and *ble* distinction.

But what does it mean to "lose" the *ghalazio/ble* distinction? We can split this notion apart into two distinct possibilities. Let's first consider the scenario in **Figure 12.16A**, which shows one way in which the linguistic labels for those bilingual in Greek and English might map onto conceptual space. In this case, the original distinctions of the Greek labels remain the same, while English labels have been added to the bilingual speakers' repertoire. So how can we explain the smearing of the *ghalazio/ble* boundary among the Greek speakers who'd spent a long time in the United Kingdom? Perhaps what's changed over time is that the Greek *labels* have become less accessible relative to the English ones. In the study by Athanasopoulos and his colleagues, the subjects were performing a task that didn't require the use of either one of their languages—they simply pressed a button if they detected an unusual shape. Since the task didn't *block* the activation of either linguistic code, it's possible that the long-stay Greek subjects were simply more likely to activate the English labels than their short-stay counterparts. Under this scenario, we might expect that if the situation turned up the dial for one set of labels over the other (for instance, by requiring subjects to name colors in a particular language), then they'd perform more like Greek monolinguals when using Greek, and like English monolinguals when using English.

On the other hand, it's possible that bilingualism changes the way in which labels map onto conceptual space, as shown in **Figure 12.16B**. In this scenario, the Greek labels *ghalazio* and *ble* still exist in the mind of the bilingual, but the distinction between them has become less crisp over time as a result of leakage from the English-

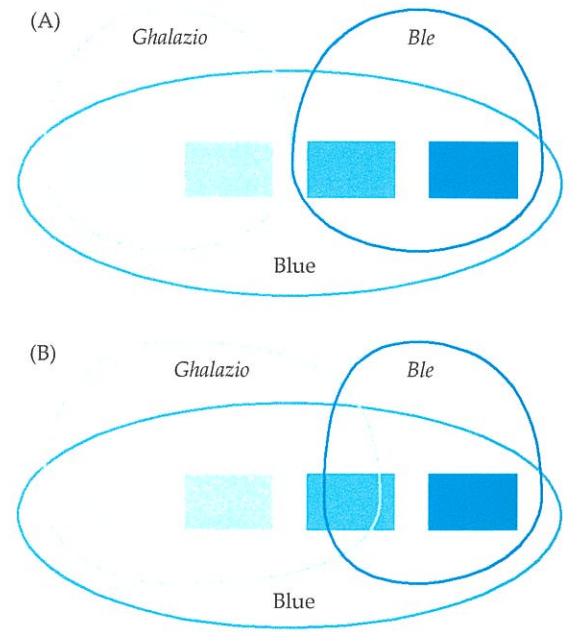


Figure 12.16 Two hypothetical ways in which color perception might change as a result of bilingualism. (A) The original Greek mapping of words to the color space remains the same for Greek speakers who have acquired English, but the relative accessibility of the Greek linguistic representations may be decreased compared with Greek monolinguals. (B) The mapping of Greek color labels to the color space has changed as a result of familiarity with the English mapping.

defined color system. By absorbing English into their cognitive system, Greek-English bilinguals would no longer think about color as their monolingual Greek compatriots did, even when speaking in Greek.

Supercharged linguistic skills

Aside from Whorfian effects, there are other ways in which a second language might reshape a person's cognitive landscape. As you've seen throughout this book, learning and using language relies on an assortment of very diverse skills. It may be that different languages demand somewhat different mixes of cognitive skills from their speakers. A language that makes use of 140 phonemes might demand finer control over the auditory and articulatory systems than one that limits itself to a dozen. A language that uses complex layers of syntactic embedding might call for a robust working-memory capacity. A language that permits free word order might require speakers to rapidly navigate a vast array of options when it comes to constructing a sentence. A language that is very sparse and resists adorning its words with morphemes that specify tense, number, person agreement, and so on might leave more work for intelligent inferring, while a language that compulsively stacks morphemes onto its words requires its learners to store all these grammatical markers in memory. It may turn out that different languages build strengths in different areas—which raises the question of whether you can become more efficient at a new language-related skill if you pick up a second language that strenuously exercises that skill. And if so, might certain buffed-up language skills spill over into other cognitive domains for which those skills are relevant?

To date, there's very little systematic research that addresses these questions—but there's just enough data to provide some assurance that the questions are worth exploring. For example, languages that use tone to distinguish word meanings have been linked to better skills at perceiving pitch. Many people can perceive *relative* pitch in order to distinguish how far apart two tones are in pitch, but people who are able to perceive *absolute* pitch, which allows them to peg the pitch of a single note produced in isolation, are in a much smaller minority. Absolute pitch is more common among speakers of tone languages, which use pitch to distinguish otherwise identical words (Deutsch et al., 2006). Moreover, it seems to be related to the level of proficiency with a tone language, providing a hint that the learning of a tone language might drive the enhanced perception of pitch (Deutsch et al., 2009). What's not yet clear is whether learning a tone language as a *second* language (especially later in life) can sharpen the perception of musical pitch.

In the domain of syntactic structure, there are entire continents of unexplored questions about the relationship between language structure and sentence-processing skills. For example, some languages have very limited recursion, so instead of nesting phrases inside each other, speakers pull them apart and form separate self-contained phrases or sentences. As you saw in Box 6.3, Pirahã appears to be such a language. Instead of saying "John's brother's house," Pirahã speakers would say something like:

> Brother's house. John has a brother. It is the same one.

Or instead of saying "The man who shot the jaguar is eating pig meat," they'd express the same idea like this:

> The man shot the jaguar. He is eating pig meat.

In Chapter 8, I discussed some ideas about how sentences may become very hard to interpret if they contain embedded structures that require hearers to hold in memory a number of syntactic dependencies over long stretches of time. These specific memory-taxing effects are likely to be much less of an issue for a language that doesn't have much embedding at all.

Even across languages that do enthusiastically stack phrases inside each other, there can be some striking differences in the resulting syntactic dependencies. In **Box 12.5**, humorist Mark Twain makes light of certain complex structures in German. But underneath the humor, a psycholinguist might find some serious open questions about whether different languages require the cultivation of different parsing skills.

BOX 12.5
Mark Twain on the awful memory-taxing syntax of German

If you've ever tried to learn German as a non-native language, you may have been challenged by the fact that verbs in embedded clauses are placed at the very end, like this:

Ich glaube daß die Kinder nicht nach Berlin gefahren sind.
I believe that the children not to Berlin travelled are.

"I believe that the children did not go to Berlin."

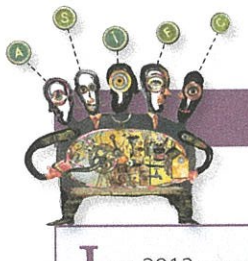
This fact, along with other features of German grammar, incited the following humorous commentary by Mark Twain in his 1880 essay "The Awful German Language":

> *An average sentence, in a German newspaper, is a sublime and impressive curiosity; it occupies a quarter of a column; it contains all the ten parts of speech—not in regular order, but mixed; it is built mainly of compound words constructed by the writer on the spot, and not to be found in any dictionary—six or seven words compacted into one, without joint or seam—that is, without hyphens; it treats of fourteen or fifteen different subjects, each inclosed in a parenthesis of its own, with here and there extra parentheses which reinclose three or four of the minor parentheses, making pens within pens: finally, all the parentheses and reparentheses are massed together between a couple of king-parentheses, one of which is placed in the first line of the majestic sentence and the other in the middle of the last line of it—***after which comes the VERB****, and you find out for the first time what the man has been talking about; and after the verb—merely by way of ornament, as far as I can make out—the writer shovels in "****haben sind gewesen gehabt haben geworden sein****," or words to that effect, and the monument is finished. I suppose that this closing hurrah is in the nature of the flourish to a man's signature—not necessary, but pretty. German books are easy enough to read when you hold them before the looking-glass or stand on your head—so as to reverse the construction—but I think that to learn to read and understand a German newspaper is a thing which must always remain an impossibility to a foreigner.*
>
> *Yet even the German books are not entirely free from attacks of the Parenthesis distemper—though they are usually so mild as to cover only a few lines, and therefore when you at last get down to the verb it carries some meaning to your mind because you are able to remember a good deal of what has gone before. Now here is a sentence from a popular and excellent German novel—which [sic] a slight parenthesis in it. I will make a perfectly literal translation, and throw in the parenthesis-marks and some hyphens for the assistance of the reader—though in the original there are no parenthesis-marks or hyphens, and the reader is left to flounder through to the remote verb the best way he can:*
>
> > *"But when he, upon the street, the (in-satin-and-silk-covered-now-very-unconstrained-after-the-newest-fashioned-dressed) government counselor's wife met," etc., etc.*
> >
> > *Wenn er aber auf der Strasse der in Sammt und Seide gehüllten jetzt sehr ungenirt nach der neusten Mode gekleideten Regierungsräthin begegnet.*
>
> *That is from The Old Mamselle's Secret, by Mrs. Marlitt. And that sentence is constructed upon the most approved German model. You observe how far that verb is from the reader's base of operations; well, in a German newspaper they put their verb away over on the next page; and I have heard that sometimes after stringing along the exciting preliminaries and parentheses for a column or two, they get in a hurry and have to go to press without getting to the verb at all. Of course, then, the reader is left in a very exhausted and ignorant state.*

Activating cultural values

Finally, I want to return to a forceful intuition for which I still owe you a satisfying explanation: Many multilinguals (myself included) have the strong subjective feeling that different languages really *are* infused with different cultural characteristics. They may feel that they think differently in their different languages—perhaps they even feel that different languages bring out different aspects of their personalities. These impressions aren't illusory. Several experiments show that bilinguals *do* exhibit different attitudes or behaviors depending on which language they're using.

In one such study, led by Dirk Akkermans (2010), Dutch subjects who also spoke English played a variant of the "prisoner's dilemma" game, intended to test whether subjects would choose a cooperative or competitive strategy. The game was set up like this: imagine that you're a business owner faced with setting the price for one of your products, and your partner in the game also sells the same product. You will reap the highest profits if both you and your partner choose a cooperative strategy of keeping prices for your products high, and the lowest profits if you play cooperatively but your partner chooses to undersell you. Since you're not able to communicate with your partner, you have to make a decision based on how you predict he or she will act.



LANGUAGE AT LARGE 12.2

Can your language make you broke and fat?

In a 2013 paper, economist Keith Chen made the startling claim that people's fiscal responsibility and lifestyle choices depend in part on the grammar of their language.

Languages differ in the devices they offer to talk about the future. For some, like Spanish and Greek, you have to tack on a verb ending that explicitly marks future time—so, in Spanish, you would say *escribo* for the present tense ("I write" or "I'm writing") and *escribiré* for the future tense ("I will write"). But other languages, like Mandarin, don't require verbs to be escorted by grammatical markers that convey future time; time is usually obvious from something else in the context. In Mandarin, you would say the equivalent of *I write tomorrow*, using the same verb form for both present and future. Chen's premise is that if you divide up a large number of the world's languages into those that require a grammatical marker for future time and those that don't, you see an interesting correlation: speakers of languages that force grammatical marking of the future have amassed a smaller retirement nest egg, smoke more, exercise less, and are more likely to be obese.

The claim is that a sharp grammatical division between the present and future encourages people to conceive of the future as somehow dramatically different from the present, making it easier to put off behaviors that benefit your future self rather than your present self.

Chen's claim is undeniably interesting—it suggests that the language you speak might have important, real-world effects, and not just subtle effects that are invisible outside of the careful probing of a lab experiment. Not surprisingly, the paper immediately generated a lot of press of the sort that's festooned with flashing lights. For example, in his popular blog, Andrew Sullivan headlined the story about Chen's paper with *Why Greeks Haven't Saved for a Rainy Day*. A facetious headline, no doubt. But before someone suggests that economic bailouts of troubled countries should be contingent on their retiring their grammatical tense markers, it's worth asking: Is the correlation between tense marking and retirement savings one that leads to the *conclusion* that grammar causes prudent behavior—or is it simply the starting point for investigating this intriguing question?

In response to Chen's paper, some researchers have emphasized that correlations between linguistic variables and cultural traits can arise quite easily even in situations where one doesn't cause the other. This often happens because speakers inherit or borrow a *number* of unrelated linguistic and cultural traits from their ancestors or from geographic neighbors—to revisit an earlier example, one language group might adopt both linguistic tone and chopstick use from another, but no one's suggesting that

Half of the subjects played the game in English, and half played the game in Dutch. The subjects who played the game in English chose a more competitive strategy (setting their prices low) than those who played it in Dutch. And the effects of language on strategy choice were especially prominent for those who'd lived in an Anglophone country for at least 3 months; among this group, those who played the game in Dutch played cooperatively 51% of the time, while those who played it in English did so only 37% of the time. In contrast, among those who *hadn't* spent more than 3 months in an Anglophone country, the rates for cooperative behavior were 48% for Dutch and 45% for English.

Does this mean English is a more "competitive" language than Dutch? I've thrown cold water on the idea that languages might *intrinsically* embody broad cultural values like rationalism or romanticism. If they don't, then what accounts for the language effect in the experiment I've just summarized? Why would speaking English cause people to behave more competitively?

A plausible account is that it's not the English language itself that is competitive. Rather, it's that the English language reminds people of the cultural practices of the people who happen to speak English. Using the English language simply serves as the trigger for priming the associated cultural norms. It's now known that cultural norms and stereotypes can be activated in any number of ways—this is not specifically a *language* effect. For example, one study showed that subjects could be induced to act more competitively if they

LANGUAGE AT LARGE 12.2 (*continued*)

linguistic tone leads to dexterity with chopsticks, or vice versa. We saw that this possible scenario is important in considering the significance of correlated linguistic traits, such as the word orders of two kinds of phrases. It's just as important in considering the meaningfulness of correlations between linguistic and cultural traits. And it's especially important when considering any issues that might have real-world implications for how policies are determined. [A detailed discussion of these concerns can be found in a paper by Seán Roberts and James Winters (2013).]

When carefully conducted, statistical correlations between linguistic variables and cultural traits can bring to light some interesting hypotheses. But these hypotheses need to be tested further. Experiments are especially useful in helping to determine whether one variable has a causal effect on another, and it should be possible to design one that fits the bill. The idea behind Chen's proposal is that every encounter with a distinct grammatical marker for future time creates a little mental nudge that leads to a conceptual partition between present and future time, and hence a devaluing of future benefits relative to present benefits. If that's so, then we should be able to see the effects of these little mental nudges on specific behaviors that we target experimentally.

So, we could easily set up a study that looked like this: To control for variables other than language, we might target a group of bilingual speakers of one language that obligatorily marks future tense (for example, French) and one that does not (for example, German). This group could then be randomly split, with half of the subjects being made to describe or read about some future event in German, and the other half in French. Both groups could then be given a mock investment task that involves making decisions about how much to save versus how much to spend now. In theory, those randomly assigned to the German experimental group should be eager to save more than the French group. Just to be sure to control for any spurious differences between our random groups, we could make each group come back the following week and do the same tasks in their other language, predicting the theoretically appropriate increase or decrease in their inclination to save for the future.

Of course, there's one more thing we'd need to control for. Remember the study by Akkerman and colleagues in which the Dutch-English bilinguals played a business game more competitively when speaking English than when speaking Dutch? The lesson from that study was that language can sometimes affect behavior not by virtue of its grammar, but because of the cultural traits that have come to be associated with speakers of that language. This factor too will need to be disentangled before we can conclude that certain grammatical properties can cause your present self to be more considerate of your future self.

implicit priming A psychological phenomenon in which exposing people to certain stimuli increases the likelihood that they'll exhibit behaviors that are associated with the stimuli. For example, exposing people to words associated with the elderly may trigger behaviors that are stereotypically associated with the elderly, such as walking slowly.

sat at a table holding objects such as a briefcase and an executive portfolio, as opposed to a backpack and a cardboard box (Kay et al., 2004). In another experiment, subjects showed more conformist behavior if they'd been shown a picture of a businessman rather than a punk rocker (Pendry & Carrick, 2001). Even the subliminal presentation of the Apple logo (as contrasted with the IBM logo) resulted in higher performance on a test of creativity (Fitzsimons et al., 2008). Over the last two decades, such demonstrations of **implicit priming** have proliferated, showing that a remarkable variety of stimuli can trigger behaviors and impressions that are associated with a particular social group.

All this adds a deep wrinkle to debates about how language affects thought. To create an imaginary experimental scenario, let's suppose you run an experiment with, say, Mandarin-English bilinguals and find that when your subjects interact with someone in English, they're more likely to show egocentric patterns of language use than when they use Mandarin—to test this, you might use the referential communication task described in Chapter 11 (see Method 11.1). Does this mean that something about the Mandarin language encourages sharper mind-reading inferences? (One might hypothesize, for example, that the morphological sparseness of Mandarin puts subjects in a mode where they have to pay more attention to recovering meanings from "between the lines," requiring them to focus on the speaker's communicative intentions.) This would be a tricky conclusion, because it's also possible that speaking in Mandarin simply activates cultural expectations that one should consider the thoughts and feelings of other people. You'd need to make sure that other *non*-linguistic triggers that are connected to Chinese culture—images of Chinese people, or eating Chinese food—wouldn't lead to the same result.

WEB ACTIVITY 12.5

Code-switching In this activity, you'll explore how the relationship between language and cultural associations plays out in the phenomenon of code-switching, in which bilinguals spontaneously shift between linguistic systems while speaking.

Clearly, language *is* entangled with culture. To a large extent, this is what makes language so endlessly fascinating. But as I hope you've gleaned from this chapter, truly understanding the nature of the entanglement needs to go far beyond uttering some intuitive "truisms." To explore the relationship intelligently, you need to equip yourself with a good set of tools: a precise understanding of the differences among languages; some solid ideas about the skills that are needed to learn and use the structures found in language; a sense of how concepts are formed; an awareness of the social and cultural contexts of particular languages; and a good set of methodologies to study the interaction of all of these elements.

But in the end, if you apply all this knowledge to the study of language and culture, you'll be in a position to go far beyond the usual clichés about how Italian is such a romantic language, or how French helps you to precisely order your thoughts.

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DIGGING DEEPER

Are all languages equally complex?

Here's a bold claim that's been around for a while in the language research community: All of the world's languages are about equal in complexity.

Now, it's pretty obvious that if you look at specific *subparts* of a language, some languages are more streamlined than others. For example, Hawaiian takes a just-the-basics approach to its phonemic inventory, with a grand total of five vowels and eight consonants, while the Khoisan language !Xóõ is a compulsive hoarder of sounds, possessing (if you count conservatively) 87 consonants, of which 43 are distinct "click" consonants. In Japanese, you have just one way of grammatically expressing the past tense:

yagio kata
I (have) bought a goat.

But Kikongo distinguishes four kinds of past tense:

nsuumbidingi nkoombo
I bought a goat (today).

yasuumbidi nkoombo
"I bought a goat (yesterday)."

yasaumba nkoombo
"I bought a goat (earlier)."

nsuumbidi nkoombo
"I have bought a goat."

Despite such examples, linguists have argued that if you were to compare the *overall* complexity of languages, you'd find that they come out about even; a miserly collection of grammatical morphemes might be balanced out by a more elaborate set of syntactic structures, as suggested by the famous linguist Charles Hockett (1958):

> Impressionistically, it would seem that the total grammatical complexity of any language, counting both morphology and syntax, is about the same as any other. This is not surprising, since all languages have about equally complex jobs to do, and what is not done morphologically has to be done syntactically. Fox, with a more complex morphology than English, thus ought to have a somewhat simpler syntax; and this is the case.

The idea of such trade-offs in complexity has been widely accepted since the second half of the twentieth century. But more recently, language researchers have become quite vocal in pointing out that there's actually very little evidence for this claim.

Why then, would the notion of equal complexity hold such sway over the field despite the lack of hard data? One answer is that the rise of nativist theories of language in the late twentieth century, with their emphasis on language universals that were genetically specified, made it seem highly implausible that languages would differ wildly in their degrees of complexity. A second factor is that linguists often found themselves in the position of trying to beat back the common misconception that "primitive" cultures have less highly developed languages than "civilized" societies. This idea—which can still be found floating around on the Internet—is clearly wrong. It's not hard to find examples of small, non-industrial societies whose languages display mind-boggling grammatical nuances and ornamentation. If you'd like one for your collection, try the case of the Siberian language Ket, which, to paraphrase linguist John McWhorter (2011), has the following complications: In Ket, pronoun prefixes are routinely attached to verbs. The trick is that there are two whole sets of prefixes, with one set attaching to one class of verbs, and the second set attaching to another class—you simply have to memorize which class of verbs takes which set of pronoun prefixes. To make matters more complicated, many verbs take *two* pronoun prefixes that mean the same thing. (But many don't). For example, *digdabatsaq* means "I go to the river," with both *d* and *ba* meaning "I," much as if we'd said in English "I go to I the river."

To make matters even more complicated, the verb's meaning can change depending on whether you double the pronoun. Specifically, ***d**igda**ba**tsaq* means that I go to the river and come back a bit later. But ***d**igda**d**daq* (which involves the double use of the *same* pronoun prefix *d*) means something different: I go to the river and stay for the season. But the same word with just one pronoun prefix—**d**igdaksak—means I go to the river and stay some days or weeks.

Linguists often find themselves pulling out such counterexamples in weary attempts to dispel the "primitive languages" myth. But this myth, like the villain from a horror movie, seems to be unkillable. Its sheer resilience has no doubt helped to turn the claim about uniform crosslinguistic complexity into something of

a mantra. Nevertheless, it's possible to avoid the trap of equating simple societies with simple languages, and yet still entertain the hypothesis that some languages might be more complex than others. John McWhorter (2001) has argued that some languages are simpler than others, not because they come from less complex societies, but because they are fairly young languages. Now, everyone agrees that newly hatched languages like Nicaraguan Sign Language, or Al-Sayyid Bedouin Sign Language (ABSL) are not as complex as more established languages like American Sign Language or English. In the spoken-language realm, we can also find simple pidgin languages, which arise when speakers of many different languages are thrown together and have to find a way to communicate. What emerges is a fairly rudimentary language that's often based on a mixture of the original languages, or on one of the more dominant languages within the group. Pidgins are less systematic or complex than more mature languages. But the general thinking has been that within the space of a few generations, as children learn the new language as their native tongue, they embellish the young language with the grammatical devices typical of a "real" language. Hence, young languages are usually thought to quickly settle into the "optimal" level of linguistic complexity. But McWhorter has argued against this prevailing view, suggesting that additional complexity grows slowly over a very long period in the life of a language.

According to McWhorter, there's a flawed assumption behind the claim of equal complexity: the notion that grammatical devices exist in a language because they serve an important communicative function. But perhaps not all grammatical devices *do* serve an urgent communicative need. Think of how some languages mark gender on all of their nouns, including forks, socks, and cabbages. Many languages survive quite nicely without having to divide the world of inanimate objects into two separate categories, so it's hard to see how this is important for communication.

McWhorter argues that in addition to acquiring genuinely useful grammatical markers over time, languages also collect ones that are less useful—or that perhaps were useful within the system at one point, but no longer are. Earlier in the chapter, in talking about a language's collection of words, I suggested that languages, like old houses, contain many not-so-useful objects that are there simply because, well, they've *always* been there, and no one has bothered to throw them out. This may apply to grammatical devices as well as words. And if it's true that some of the complexity within languages comes from the accumulation of linguistic junk, there's no reason to suppose that all languages would have hoarded exactly the same amount of it.

(If you have trouble imagining why the speakers of a language would bother to preserve bits of language that serve no pressing communicative need, I invite you to imagine what would happen if you, as a speaker of German, decided that gender marking serves no useful purpose, and that you would henceforth simply stop distinguishing the gender of socks versus cabbages.)

In arguing for the connection between the youth of a language and its simplicity, McWhorter points to creole languages. Creole languages are the descendants of pidgin languages, and the oldest ones date back only as far as the 1600s, when colonial powers first began dislocating large numbers of people from their homes and language communities. Because creole languages were built anew by their displaced speakers, rather than simply being handed down from one generation to another, they provide the opportunity to see what languages look like when they haven't had quite as long to accumulate less useful complexities. If McWhorter is right, they may allow us to see which grammatical elements are most closely tied to communicative pressures. In a sense, studying one of these languages would be a bit like dropping in on someone who's very recently set up a new household—the things they own tells you something about what's important for their daily life.

McWhorter doesn't suggest that all old languages are doomed to carry around an ever-growing heap of grammatical knickknacks. First, there's likely an upper limit to the grammatical stuff that a language can contain and still be manageable for its speakers. Second, there may be historical events that precipitate a dramatic purging of linguistic junk, much as moving from one house to another often forces people to get rid of unnecessary things. In Chapter 2, I discussed how English lost many of its grammatical markers shortly after the influx of a large Norman population into England. McWhorter (2002) has argued that this grammatical purging took place because of the large number of *adult* learners of English in the invading population; these adult learners simplified the language because, unlike children, they were unable to learn the language in its original form.

These are provocative ideas, and they illustrate some of the field's renewed interest in taking a closer look at the assumption of equal complexity. But as scholars begin to have serious discussions about comparing the overall complexity of different languages, some challenges quickly come up. For starters, how should complexity be defined? And if we want to seriously evaluate the claim that complexities in one area of a language are balanced out by simplicity in another, how do we compare complexity across different linguistic domains? We can all agree that a language like Archi (spoken in the northeast region of the Caucasus) has a *very* complex inflectional morphology—an Archi verb can allegedly end in any one of 1.5 million forms, putting English morphology to great shame. But just how much syntactic complexity would English have to have to compensate for the intricacies of Archi verbs? (Perversely, Archi is also endowed with one of the world's largest inventories of consonants.)

Another question is whether we want to talk about the *grammatical* complexity of a language, or its *cognitive* complexity. We might propose, for example, that all languages achieve roughly equal degrees of complexity because they want to allow for a lot of expressive potential without unduly taxing the processing system. In that case, we have to think about complexity in terms of structures that are easier or harder to produce and understand, not just in terms of the number of grammatical devices that speakers of a language have to control. But this just raises another issue: sometimes there's a clash between what makes a sentence easy to produce and what makes it easy to understand. Look back at the ways in which Japanese and Kikongo mark past tense, with Japanese using one form to cover all of the four meanings that Kikongo expresses with distinct forms. On the face if it, it looks like Japanese is obviously simpler. Certainly, it would be simpler to *produce* sentences marked with past tense in Japanese. But what about the hearer's perspective?

As you saw in Chapter 10, hearers do a lot of cognitive work in *elaborating* the linguistic code through a variety of inferences. In the Kikongo examples, there's plenty of detailed information right in the linguistic code, so the hearer doesn't have to link back to the context in order to figure out exactly when the past event occurred. But in Japanese, the hearer carries a larger inferential burden.

And another question: Do we want to talk in terms of the degrees of complexity that languages *allow*, or the degrees of complexity that are regularly *produced* by speakers of that language? For example, it's been claimed that the syntax of the Pirahã language lacks any rules of recursion. This is a controversial claim, but it does appear that Pirahã speakers rarely, if ever, utter clauses that are embedded within other clauses. Now, suppose we combed through 10 million sentences uttered by Pirahã speakers and found one lone embedded clause. Of course, the proportion of embedded clauses in a random sample of English sentences would be much higher. In this imagined scenario, it looks like Pirahã *allows* recursion, it's just that its speakers almost never exercise this option. Do we want to say that in terms of syntactic embedding, English and Pirahã are equally complex?

Once you start digging into discussions about cross-linguistic complexity, it becomes apparent that not all researchers want to measure complexity in the same way, and that there are good reasons for each of the various approaches. But naturally, this makes it hard to agree on how to go about testing the hypothesis of equal complexity.

One solution offers a dose of compromise: What if we measure complexity by appealing to crosslinguistic universals? The idea would be that the rarer a phenomenon is across languages, the more "complex" that phenomenon is. As you saw earlier in the chapter, it's likely that a number of different explanations jointly contribute to the common patterns across languages, ranging from learning biases, to ease of production/comprehension, and to communicative efficiency. In that case, the implicational universals themselves might serve as a reasonable stand-in for the combined effects of all of these factors. Would we see trade-offs, so if a language proved to be an outlier in some ways, it would stick to common linguistic norms in others? [In one such study, researcher Matti Miestamo (2009) concludes "yes" for some linguistic phenomena, "no" for others.]

In the end, we may or may not find out that all human languages hit a particular "sweet zone" when it comes to complexity. But along the way, we'll no doubt have learned a lot about what human languages can look like, and why they look the way they do.

PROJECT

Conduct a comparative study of English and the fictional language Klingon (see *The Klingon Dictionary* by Marc Okrand). In Chapter 6, you were introduced to the notion that the Klingon language was deliberately designed to incorporate many highly unusual elements. Using the resources available on the WALS website, identify a number of linguistic features for which English exhibits a more common or typical pattern than Klingon. Discuss the potential implications of the differences between the two languages. If you were to measure complexity in terms of the typicality of patterns across languages, would Klingon come out as "more complex" than English? Finally, can you find a language that appears "less complex" than English, with respect to the crosslinguistic data that are available from WALS?