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Does Your Language Shape How You Think?

By GUY DEUTSCHER

Seventy years ago, in 1940, a popular science magazine published a short article that set in motion one of the trendiest intellectual fads of the 20th century. At first glance, there seemed little about the article to augur its subsequent celebrity. Neither the title, "Science and Linguistics," nor the magazine, M.I.T.'s Technology Review, was most people's idea of glamour. And the author, a chemical engineer who worked for an insurance company and moonlighted as an anthropology lecturer at Yale University, was an unlikely candidate for international superstardom. And yet Benjamin Lee Whorf let loose an alluring idea about language's power over the mind, and his stirring prose seduced a whole generation into believing that our mother tongue restricts what we are able to think.

In particular, Whorf announced, Native American languages impose on their speakers a picture of reality that is totally different from ours, so their speakers would simply not be able to understand some of our most basic concepts, like the flow of time or the distinction between objects (like "stone") and actions (like "fall"). For decades, Whorf's theory dazzled both academics and the general public alike. In his shadow, others made a whole range of imaginative claims about the supposed power of language, from the assertion that Native American languages instill in their speakers an intuitive understanding of Einstein's concept of time as a fourth dimension to the theory that the nature of the Jewish religion was determined by the tense system of ancient Hebrew.

Eventually, Whorf's theory crash-landed on hard facts and solid common sense, when it transpired that there had never actually been any evidence to support his fantastic claims. The reaction was so severe that for decades, any attempts to explore the influence of the mother tongue on our thoughts were relegated to the loony fringes of disrepute. But 70 years on, it is surely time to put the trauma of Whorf behind us. And in the last few years, new research has revealed that when we learn our mother tongue, we do after all acquire certain habits of thought that shape our experience in significant and often surprising ways.

Whorf, we now know, made many mistakes. The most serious one was to assume that our mother tongue constrains our minds and prevents us from being able to think certain thoughts. The

general structure of his arguments was to claim that if a language has no word for a certain concept, then its speakers would not be able to understand this concept. If a language has no future tense, for instance, its speakers would simply not be able to grasp our notion of future time. It seems barely comprehensible that this line of argument could ever have achieved such success, given that so much contrary evidence confronts you wherever you look. When you ask, in perfectly normal English, and in the present tense, "Are you coming tomorrow?" do you feel your grip on the notion of futurity slipping away? Do English speakers who have never heard the German word *Schadenfreude* find it difficult to understand the concept of relishing someone else's misfortune? Or think about it this way: If the inventory of ready-made words in your language determined which concepts you were able to understand, how would you ever learn anything new?

SINCE THERE IS NO EVIDENCE that any language forbids its speakers to think anything, we must look in an entirely different direction to discover how our mother tongue really does shape our experience of the world. Some 50 years ago, the renowned linguist Roman Jakobson pointed out a crucial fact about differences between languages in a pithy maxim: "Languages differ essentially in what they *must* convey and not in what they *may* convey." This maxim offers us the key to unlocking the real force of the mother tongue: if different languages influence our minds in different ways, this is not because of what our language *allows* us to think but rather because of what it habitually *obliges* us to think *about*.

Consider this example. Suppose I say to you in English that "I spent yesterday evening with a neighbor." You may well wonder whether my companion was male or female, but I have the right to tell you politely that it's none of your business. But if we were speaking French or German, I wouldn't have the privilege to equivocate in this way, because I would be obliged by the grammar of language to choose between *voisin* or *voisine*; *Nachbar* or *Nachbarin*. These languages compel me to inform you about the sex of my companion whether or not I feel it is remotely your concern. This does not mean, of course, that English speakers are unable to understand the differences between evenings spent with male or female neighbors, but it does mean that they do not have to consider the sexes of neighbors, friends, teachers and a host of other persons each time they come up in a conversation, whereas speakers of some languages are obliged to do so.

On the other hand, English does oblige you to specify certain types of information that can be left to the context in other languages. If I want to tell you in English about a dinner with my neighbor, I may not have to mention the neighbor's sex, but I do have to tell you something about the timing of the event: I have to decide whether we *dined*, *have been dining*, *are dining*, *will be dining* and so on. Chinese, on the other hand, does not oblige its speakers to specify the exact time of the action in this way, because the same verb form can be used for past, present or future actions. Again, this does not mean that the Chinese are unable to understand the concept of time.

But it does mean they are not obliged to think about timing whenever they describe an action.

When your language routinely obliges you to specify certain types of information, it forces you to be attentive to certain details in the world and to certain aspects of experience that speakers of other languages may not be required to think about all the time. And since such habits of speech are cultivated from the earliest age, it is only natural that they can settle into habits of *mind* that go beyond language itself, affecting your experiences, perceptions, associations, feelings, memories and orientation in the world.

BUT IS THERE any evidence for this happening in practice?

Let's take genders again. Languages like Spanish, French, German and Russian not only oblige you to think about the sex of friends and neighbors, but they also assign a male or female gender to a whole range of inanimate objects quite at whim. What, for instance, is particularly feminine about a Frenchman's beard (*la barbe*)? Why is Russian water a she, and why does she become a he once you have dipped a tea bag into her? Mark Twain famously lamented such erratic genders as female turnips and neuter maidens in his rant "The Awful German Language." But whereas he claimed that there was something particularly perverse about the German gender system, it is in fact English that is unusual, at least among European languages, in not treating turnips and tea cups as masculine or feminine. Languages that treat an inanimate object as a he or a she force their speakers to talk about such an object as if it were a man or a woman. And as anyone whose mother tongue has a gender system will tell you, once the habit has taken hold, it is all but impossible to shake off. When I speak English, I may say about a bed that "it" is too soft, but as a native Hebrew speaker, I actually feel "she" is too soft. "She" stays feminine all the way from the lungs up to the glottis and is neutered only when she reaches the tip of the tongue.

In recent years, various experiments have shown that grammatical genders can shape the feelings and associations of speakers toward objects around them. In the 1990s, for example, psychologists compared associations between speakers of German and Spanish. There are many inanimate nouns whose genders in the two languages are reversed. A German bridge is feminine (*die Brücke*), for instance, but *el puente* is masculine in Spanish; and the same goes for clocks, apartments, forks, newspapers, pockets, shoulders, stamps, tickets, violins, the sun, the world and love. On the other hand, an apple is masculine for Germans but feminine in Spanish, and so are chairs, brooms, butterflies, keys, mountains, stars, tables, wars, rain and garbage. When speakers were asked to grade various objects on a range of characteristics, Spanish speakers deemed bridges, clocks and violins to have more "manly properties" like strength, but Germans tended to think of them as more slender or elegant. With objects like mountains or chairs, which are "he" in German but "she" in Spanish, the effect was reversed.

In a different experiment, French and Spanish speakers were asked to assign human voices to

various objects in a cartoon. When French speakers saw a picture of a fork (*la fourchette*), most of them wanted it to speak in a woman's voice, but Spanish speakers, for whom *el tenedor* is masculine, preferred a gravelly male voice for it. More recently, psychologists have even shown that "gendered languages" imprint gender traits for objects so strongly in the mind that these associations obstruct speakers' ability to commit information to memory.

Of course, all this does not mean that speakers of Spanish or French or German fail to understand that inanimate objects do not really have biological sex — a German woman rarely mistakes her husband for a hat, and Spanish men are not known to confuse a bed with what might be lying in it. Nonetheless, once gender connotations have been imposed on impressionable young minds, they lead those with a gendered mother tongue to see the inanimate world through lenses tinted with associations and emotional responses that English speakers — stuck in their monochrome desert of "its" — are entirely oblivious to. Did the opposite genders of "bridge" in German and Spanish, for example, have an effect on the design of bridges in Spain and Germany? Do the emotional maps imposed by a gender system have higher-level behavioral consequences for our everyday life? Do they shape tastes, fashions, habits and preferences in the societies concerned? At the current state of our knowledge about the brain, this is not something that can be easily measured in a psychology lab. But it would be surprising if they didn't.

The area where the most striking evidence for the influence of language on thought has come to light is the language of space — how we describe the orientation of the world around us. Suppose you want to give someone directions for getting to your house. You might say: "After the traffic lights, take the first left, then the second right, and then you'll see a white house in front of you. Our door is on the right." But in theory, you could also say: "After the traffic lights, drive north, and then on the second crossing drive east, and you'll see a white house directly to the east. Ours is the southern door." These two sets of directions may describe the same route, but they rely on different systems of coordinates. The first uses *egocentric* coordinates, which depend on our own bodies: a left-right axis and a front-back axis orthogonal to it. The second system uses fixed *geographic* directions, which do not rotate with us wherever we turn.

We find it useful to use geographic directions when hiking in the open countryside, for example, but the egocentric coordinates completely dominate our speech when we describe small-scale spaces. We don't say: "When you get out of the elevator, walk south, and then take the second door to the east." The reason the egocentric system is so dominant in our language is that it feels so much easier and more natural. After all, we always know where "behind" or "in front of" us is. We don't need a map or a compass to work it out, we just feel it, because the egocentric coordinates are based directly on our own bodies and our immediate visual fields.

But then a remote Australian aboriginal tongue, Guugu Yimithirr, from north Queensland,

turned up, and with it came the astounding realization that not all languages conform to what we have always taken as simply "natural." In fact, Guugu Yimithirr doesn't make any use of egocentric coordinates at all. The anthropologist John Haviland and later the linguist Stephen evinson have shown that Guugu Yimithirr does not use words like "left" or "right," "in front of" or "behind," to describe the position of objects. Whenever we would use the egocentric system, the Guugu Yimithirr rely on cardinal directions. If they want you to move over on the car seat to make room, they'll say "move a bit to the east." To tell you where exactly they left something in your house, they'll say, "I left it on the southern edge of the western table." Or they would warn you to "look out for that big ant just north of your foot." Even when shown a film on television, they gave descriptions of it based on the orientation of the screen. If the television was facing north, and a man on the screen was approaching, they said that he was "coming northward."

When these peculiarities of Guugu Yimithirr were uncovered, they inspired a large-scale research project into the language of space. And as it happens, Guugu Yimithirr is not a freak occurrence; languages that rely primarily on geographical coordinates are scattered around the world, from Polynesia to Mexico, from Namibia to Bali. For us, it might seem the height of absurdity for a dance teacher to say, "Now raise your north hand and move your south leg eastward." But the joke would be lost on some: the Canadian-American musicologist Colin McPhee, who spent several years on Bali in the 1930s, recalls a young boy who showed great talent for dancing. As there was no instructor in the child's village, McPhee arranged for him to stay with a teacher in a different village. But when he came to check on the boy's progress after a few days, he found the boy dejected and the teacher exasperated. It was impossible to teach the boy anything, because he simply did not understand any of the instructions. When told to take "three steps east" or "bend southwest," he didn't know what to do. The boy would not have had the least trouble with these directions in his own village, but because the landscape in the new village was entirely unfamiliar, he became disoriented and confused. Why didn't the teacher use different instructions? He would probably have replied that saying "take three steps forward" or "bend backward" would be the height of absurdity.

So different languages certainly make us *speak* about space in very different ways. But does this necessarily mean that we have to *think* about space differently? By now red lights should be flashing, because even if a language doesn't have a word for "behind," this doesn't necessarily mean that its speakers wouldn't be able to understand this concept. Instead, we should look for the possible consequences of what geographic languages *oblige* their speakers to convey. In particular, we should be on the lookout for what habits of mind might develop because of the necessity of specifying geographic directions all the time.

In order to speak a language like Guugu Yimithirr, you need to know where the cardinal directions are at each and every moment of your waking life. You need to have a compass in your

mind that operates all the time, day and night, without lunch breaks or weekends off, since otherwise you would not be able to impart the most basic information or understand what people around you are saying. Indeed, speakers of geographic languages seem to have an almost-ıperhuman sense of orientation. Regardless of visibility conditions, regardless of whether they are in thick forest or on an open plain, whether outside or indoors or even in caves, whether stationary or moving, they have a spot-on sense of direction. They don't look at the sun and pause for a moment of calculation before they say, "There's an ant just north of your foot." They simply feel where north, south, west and east are, just as people with perfect pitch feel what each note is without having to calculate intervals. There is a wealth of stories about what to us may seem like incredible feats of orientation but for speakers of geographic languages are just a matter of course. One report relates how a speaker of Tzeltal from southern Mexico was blindfolded and spun around more than 20 times in a darkened house. Still blindfolded and dizzy, he pointed without hesitation at the geographic directions.

How does this work? The convention of communicating with geographic coordinates compels speakers from the youngest age to pay attention to the clues from the physical environment (the position of the sun, wind and so on) every second of their lives, and to develop an accurate memory of their own changing orientations at any given moment. So everyday communication in a geographic language provides the most intense imaginable drilling in geographic orientation (it has been estimated that as much as 1 word in 10 in a normal Guugu Yimithirr conversation is "north," "south," "west" or "east," often accompanied by precise hand gestures). This habit of constant awareness to the geographic direction is inculcated almost from infancy: studies have shown that children in such societies start using geographic directions as early as age 2 and fully master the system by 7 or 8. With such an early and intense drilling, the habit soon becomes second nature, effortless and unconscious. When Guugu Yimithirr speakers were asked how they knew where north is, they couldn't explain it any more than you can explain how you know where "behind" is.

But there is more to the effects of a geographic language, for the sense of orientation has to extend further in time than the immediate present. If you speak a Guugu Yimithirr-style language, your memories of anything that you might ever want to report will have to be stored with cardinal directions as part of the picture. One Guugu Yimithirr speaker was filmed telling his friends the story of how in his youth, he capsized in shark-infested waters. He and an older person were caught in a storm, and their boat tipped over. They both jumped into the water and managed to swim nearly three miles to the shore, only to discover that the missionary for whom they worked was far more concerned at the loss of the boat than relieved at their miraculous escape. Apart from the dramatic content, the remarkable thing about the story was that it was remembered throughout in cardinal directions: the speaker jumped into the water on the western side of the boat, his companion to the east of the boat, they saw a giant shark swimming north

and so on. Perhaps the cardinal directions were just made up for the occasion? Well, quite by chance, the same person was filmed some years later telling the same story. The cardinal directions matched exactly in the two tellings. Even more remarkable were the spontaneous hand gestures that accompanied the story. For instance, the direction in which the boat rolled over was gestured in the correct geographic orientation, regardless of the direction the speaker was facing in the two films.

Psychological experiments have also shown that under certain circumstances, speakers of Guugu Yimithirr-style languages even remember "the same reality" differently from us. There has been heated debate about the interpretation of some of these experiments, but one conclusion that seems compelling is that while we are trained to ignore directional rotations when we commit information to memory, speakers of geographic languages are trained not to do so. One way of understanding this is to imagine that you are traveling with a speaker of such a language and staying in a large chain-style hotel, with corridor upon corridor of identical-looking doors. Your friend is staying in the room opposite yours, and when you go into his room, you'll see an exact replica of yours: the same bathroom door on the left, the same mirrored wardrobe on the right, the same main room with the same bed on the left, the same curtains drawn behind it, the same desk next to the wall on the right, the same television set on the left corner of the desk and the same telephone on the right. In short, you have seen the same room twice. But when your friend comes into your room, he will see something quite different from this, because everything is reversed north-side-south. In his room the bed was in the north, while in yours it is in the south; the telephone that in his room was in the west is now in the east, and so on. So while you will see and remember the same room twice, a speaker of a geographic language will see and remember two different rooms.

It is not easy for us to conceive how Guugu Yimithirr speakers experience the world, with a crisscrossing of cardinal directions imposed on any mental picture and any piece of graphic memory. Nor is it easy to speculate about how geographic languages affect areas of experience other than spatial orientation — whether they influence the speaker's sense of identity, for instance, or bring about a less-egocentric outlook on life. But one piece of evidence is telling: if you saw a Guugu Yimithirr speaker pointing at himself, you would naturally assume he meant to draw attention to himself. In fact, he is pointing at a cardinal direction that happens to be behind his back. While we are always at the center of the world, and it would never occur to us that pointing in the direction of our chest could mean anything other than to draw attention to ourselves, a Guugu Yimithirr speaker points through himself, as if he were thin air and his own existence were irrelevant.

IN WHAT OTHER WAYS might the language we speak influence our experience of the world? Recently, it has been demonstrated in a series of ingenious experiments that we even perceive

colors through the lens of our mother tongue. There are radical variations in the way languages carve up the spectrum of visible light; for example, green and blue are distinct colors in English but are considered shades of the same color in many languages. And it turns out that the colors that our language routinely obliges us to treat as distinct can refine our purely visual sensitivity to certain color differences in reality, so that our brains are trained to exaggerate the distance between shades of color if these have different names in our language. As strange as it may sound, our experience of a Chagall painting actually depends to some extent on whether our language has a word for blue.

In coming years, researchers may also be able to shed light on the impact of language on more subtle areas of perception. For instance, some languages, like Matses in Peru, oblige their speakers, like the finickiest of lawyers, to specify exactly how they came to know about the facts they are reporting. You cannot simply say, as in English, "An animal passed here." You have to specify, using a different verbal form, whether this was directly experienced (you saw the animal passing), inferred (you saw footprints), conjectured (animals generally pass there that time of day), hearsay or such. If a statement is reported with the incorrect "evidentiality," it is considered a lie. So if, for instance, you ask a Matses man how many wives he has, unless he can actually see his wives at that very moment, he would have to answer in the past tense and would say something like "There were two last time I checked." After all, given that the wives are not present, he cannot be absolutely certain that one of them hasn't died or run off with another man since he last saw them, even if this was only five minutes ago. So he cannot report it as a certain fact in the present tense. Does the need to think constantly about epistemology in such a careful and sophisticated manner inform the speakers' outlook on life or their sense of truth and causation? When our experimental tools are less blunt, such questions will be amenable to empirical study.

For many years, our mother tongue was claimed to be a "prison house" that constrained our capacity to reason. Once it turned out that there was no evidence for such claims, this was taken as proof that people of all cultures think in fundamentally the same way. But surely it is a mistake to overestimate the importance of abstract reasoning in our lives. After all, how many daily decisions do we make on the basis of deductive logic compared with those guided by gut feeling, intuition, emotions, impulse or practical skills? The habits of mind that our culture has instilled in us from infancy shape our orientation to the world and our emotional responses to the objects we encounter, and their consequences probably go far beyond what has been experimentally demonstrated so far; they may also have a marked impact on our beliefs, values and ideologies. We may not know as yet how to measure these consequences directly or how to assess their contribution to cultural or political misunderstandings. But as a first step toward understanding one another, we can do better than pretending we all think the same.

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Tacit knowledge (as opposed to formal or explicit knowledge) is knowledge that is difficult to transfer to another person by means of writing it down or verbalising it. For example, stating to someone that *Tooting is in London* is a piece of explicit knowledge that can be written down, transmitted, and understood by a recipient. However, the ability to speak a language, use algebra[1], or design and use complex equipment requires all sorts of knowledge that is not always known explicitly, even by expert practitioners, and which is difficult to explicitly transfer to users.

While tacit knowledge appears to be simple, it has far reaching consequences and is not widely understood.

Definition

With tacit knowledge, people are not often aware of the knowledge they possess or how it can be valuable to others. Effective transfer of tacit knowledge generally requires extensive personal contact and trust. Another example of tacit knowledge is the ability to ride a bicycle, where the formal knowledge is, that to balance, if the bike falls to the left, one steers to the left; and to turn right, the rider first steers to the left, and then when the bike falls, steer to the right; but knowing this formally is no help in riding a bicycle, and few riders are in fact aware of this.

Tacit knowledge is not easily shared. Tacit knowledge consists often of habits and culture that we do not recognize in ourselves. In the field of knowledge management, the concept of tacit knowledge refers to a knowledge which is only known by an individual and that is difficult to communicate to the rest of an organization. Knowledge that is easy to communicate is called explicit knowledge. The process of transforming tacit knowledge into explicit knowledge is known as codification or articulation.

The tacit aspects of knowledge are those that cannot be codified, but can only be transmitted via training or gained through personal experience. Tacit knowledge has been described as “know-how” -- as opposed to “know-what” (facts), “know-why” (science), or “know-who” (networking). It involves learning and skill but not in a way that can be written down.

The conflicts demonstrated in the previous two paragraphs are a result of Nonaka's model of organizational knowledge creation, in which he proposed that tacit knowledge could be converted to explicit knowledge. Tacit knowledge is presented variously as uncodifiable ("tacit aspects of knowledge are those that cannot be codified") and codifiable ("transforming tacit knowledge into explicit knowledge is known as codification"). This is common in the knowledge management literature. Nonaka diverted from Polanyi's original view of 'tacit knowing' without empirical or conceptual foundation. This is discussed in detail in a later article by Ikujiro Nonaka and Georg von Krogh[2].

[edit]

Examples

One example of tacit knowledge is the notion of language itself—it is not possible to learn a language by being taught the rules of grammar—a native speaker picks it up at a young age almost entirely unaware of the formal grammar which s/he may be taught later. Another example is how to ride a bike; this can only be learned through personal experimentation.

Collins showed [3] that a particular laser (The ppTEA laser) was designed in America and the idea, with specific assistance from the designers, was gradually propagated to various other universities world-wide. However, in the early days, even when specific instructions were sent, other labs failed to replicate the laser, it only being made to work in each case following a visit to or from the originating lab or very close contact and dialogue. It became clear that the originators while they clearly could make the laser work did not know exactly what it was they were doing to make it work and so could not articulate or specify it by means of monologue articles and specifications. But a cooperative process of dialogue enabled the tacit knowledge to be transferred.

Another example is the Bessemer steel process — Bessemer sold a patent for his advanced steel making process and was sued by the purchasers who couldn't get it to work. In the end Bessemer set up his own steel company because he knew how to do it, even though he could not

convey it to his patent users, which became one of the largest in the world and changed the face of steel making.[4]

As apprentices learn the craft of their masters through observation, imitation, and practice, so do employees of a firm learn new skills through on-the-job training. When Matsushita started developing its automatic home bread-making machine in 1985, an early problem was how to mechanize the dough-kneading process, a process that takes a master baker years of practice to perfect. To learn this tacit knowledge, a member of the software development team, Ikuko Tanaka, decided to volunteer herself as an apprentice to the head baker of the Osaka International Hotel, who was reputed to produce the area's best bread. After a period of imitation and practice, one day she observed that the baker was not only stretching but also twisting the dough in a particular fashion ("twisting stretch"), which turned out to be the secret for making tasty bread. The Matsushita home bakery team drew together eleven members from completely different specializations and cultures: product planning, mechanical engineering, control systems, and software development. The "twisting stretch" motion was finally materialized in a prototype after a year of iterative experimentation by the engineers and team members working closely together, combining their explicit knowledge. For example, the engineers added ribs to the inside of the dough case in order to hold the dough better as it is being churned. Another team member suggested a method (later patented) to add yeast at a later stage in the process, thereby preventing the yeast from over-fermenting in high temperatures .[5]