

## A Fragile Archipelago: What Linguistic Diversity Tells Us

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One of my favourite short stories is by the great Argentinian writer, Jose Luis Borges (1962, 1941), *La Biblioteca de Babel* (*The Library of Babel*). It features an infinite library, made of hexagons joined to each other, spreading out in every direction with books in every possible language about every possible topic, including languages that have never been written down before. We can think of this as a bit like what we do as linguists. Among the interesting things in that story, he mentions the idea that there will be problems that we haven't solved in philosophy, in science, in religion, and so on, in the traditions of well-known languages like Japanese, English, or Greek. But maybe somewhere in that library, there's a book that holds the answer, in a language that perhaps no philosopher in a well-known culture has developed or used. But alongside these nuggets of profound truth are millions of falsehoods and other mistakes, which we all know about when we record untrue or unreliable stories for their linguistic interest or do bad transcriptions. So this, in a way, is what we deal with as linguists interested in the diversity of the world's languages.

So we can reconceive Borges' Library of Babel as a library of all that can and has been expressed in all the world's thousands of tongues—recorded, transcribed and translated in an endless series of wings that does full justice to the real extent of the world's linguistic and epistemic diversity. But this library is gradually being destroyed. Almost every week, some of its rooms or whole wings are burning down. Many Ryukyuan varieties are presently confined to people in their 80s, getting down sometimes to just half a dozen old speakers. Even though people here in the Ryukyus live longer than just about anywhere else, at one point, they won't be with us anymore. So this library is very fragile, and the challenge we face is to preserve and record it.

To crystallise this fragility, I direct you to a recording made in 1962 in the Marrku language of Northern Australia.

When I discovered this recording in the AIATSIS archive in Canberra—an Australian archive containing many materials on Australian languages—I had not been able to find anyone who could help me transcribe or interpret it (two old men who had known the

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language to a certain degree had grown too impatient and deaf to help). Luckily though, Joy Williams, with whom I was working on another language, Iwaidja, recognised the voice when I played the recording to her in 2004: “That’s my mother!” she cried out, mingling laughter and tears. She understood every word her mother was saying, even though she could not speak the language herself. Working together, we were able to prepare the transcription and translation given below.<sup>1)</sup> However, Joy herself is now dead, and not even that would be possible today. Such is the fragility of language.

(1)

*Ngarta wawularr, larra warrabunyi, makathinyi thak.*

/ŋaʃa wawular, lara warabuni, makaʃini ʃak/

My grandfathers, and my (classificatory) fathers, they’re all gone.

*Ngawulayi ngarta, larra kamu, larra bunyi, larra murnduj.*

/ŋawulaji ŋaʃa lara kamu lara buni lara muŋɟuc/

It’s just me now. Me and my mother, and my father, and my brother.

*Mukunhi ngarta thawuthi inkawart, manathuni thak.*

/mukuɲi ŋaʃa ʃawuʃi inkawaʃ manatuɲi ʃak/

I can still talk Marrku, even though the old people have died.

*Makathinyi thak, ngaldayi ngarta wajuk ngalawuthi irrya marrku.*

/makaʃini ʃak ŋalaji ŋaʃa wacuk ŋalawuʃi irja marku/

They’ve all gone, I’m sitting here alone talking.

*Marrji ngarta larlkalawuyi.*

/marci ŋaʃa laʃkalawuji/

Those other Aboriginal people came across.<sup>2)</sup>

*Marrkuwa kirriyawuthi kirriyuan, warrhi kildayi kirriyawuthi nyirrilaku thak.*

/markuwa kirijawuʃi kirijuwan waruʃi kilaji kirijawuʃi jirilaku ʃak/

I’ll talk Marrku, and after I’m gone I’ll still be on the tape talking and you can all listen to it.

If you work in the Ryukyus, where the languages are not so different from Japanese, it might not be so obvious, but to transcribe an old recording is impossible without someone who knows the language and who can help you. Therefore, the recordings we make now are going to be of limited value unless we can also transcribe them and translate them. That is part of the challenge, not just the recording but also the transcription and translation.

Now let us take a look around the world. We find that language diversity is distributed in surprising ways. If we measure countries by their number of autochthonous languages (which we can think of a *gross linguistic product*’) instead of their population or eco-

conomic output, our view of where the superpowers are changes dramatically. Some countries, such as Papua New Guinea, Indonesia, India, Nigeria, and Cameroon are huge in terms of their number of languages. Others like Korea or Poland, for example, are very small because they don't have many languages there. Japan only escapes being near the bottom because of Ainu and the many languages of the Ryukyus.

Moving on to another unique country, Vanuatu is the world champion in terms of the number of languages per capita: It has a population of about a quarter of a million, and it has 135 autochthonous languages (and we are talking about distinct languages, not dialects, which would add further complexity), as well as English and French, the two colonial languages, plus Bislama, the national lingua franca. That's about 2,000 speakers per language. Vanuatu has probably always been very diverse, but what is rather remarkable in this contemporary era of globalisation and epidemic language loss is that it is still maintaining almost all of that diversity. Fewer than a dozen languages are not being transmitted to children. The first reason for this is that there is very high tolerance of multilingualism. People learn their mother tongue, either French, English, or Bislama, that is the basic starter pack of three, and then often go on to learn more. The second reason is that there is a national pride in custom and tradition, which includes great pride in local languages.

The word *Babel* in the *Library of Babel* has lots of negative connotations in Western tradition. The Tower of Babel was destroyed by the Judaic God. It was destroyed to punish human beings for their arrogance. The many languages that resulted and caused confusion on Earth were seen as a punishment for humans for their arrogance. But there are many other traditions in other parts of the world where the multitude of languages is seen as a boon, a benefit. Here is one example. In the founding myths of western Arnhem Land in northern Australia, the ancestors gave each tribal group their own distinct language to signal their unique identity. As the founding ancestress Warramurrungunji travelled down through the country between Croker Island and the escarpment rock country inland, she put foods into the country, lotus roots in one area, wild yams in another, water lily bulbs in another, and so on. In each place, she told people what language they should speak: *Ruka kundangani, riki angbaldaharrama! Ruka nuyi nuwung inyman!* "I am putting you here, this is the language you should talk! This is your language!" (Evans, 2009, p. 5) as it is recounted in the version of the story told by the late Tim Mamidba. So languages are seen as a sort of passport, a title deed showing who you are and where you belong. You respect other languages because other people are there, in their own countries, and their ownership of those countries, and the spiritual connections and special knowledge of that place, is all bound up with them. This is a case of *egalitarian multilingualism* (François, 2012: Haudricourt, 1961), where each language is equal in status but is associated with a different group who form part of an overarching mosaic of interacting groups.

But this great linguistic diversity is a fragile treasure—a language can disappear in the course of a human lifetime. I have been the sad witness of this in the case of Kayardild, the Australian language that I researched for my PhD (Evans 1985, 1995). In 1940 this

language was the mother tongue of all 140 people of the Kayardild tribe. Soon after they were forced by Christian missionaries to leave their ancestral lands, and since this arrogant intervention and the reduction of Kayardild people to the status of a despised minority, the transmission of their language was broken forever. Today there only remain two old people who can speak it, and even that is an optimistic estimate because they live apart from one another. In fact, one no longer hears it spoken, and young people, and even the middle-aged, no longer know it. There are people who know some, but they are not fluent speakers, so one of the world's most unusual and revealing languages has all but disappeared in the course of one human lifetime. It can happen that quickly.

Each time a loss like this happens, we lose a piece of the world's linguistic diversity, but also diversity of knowledge, of aesthetics, and of values. As Joshua Fishman put it regarding the value of cultural diversity to our conception of human nature: "Only if each collectivity contributes its own thread to the tapestry of world history, and only if each is accepted and respected for making its own contribution, can nationalities finally also be ruled by a sense of reciprocity, learning and benefiting from each other's contributions as well" (Fishman, 1982, p. 7). Not only the languages of great powers, not just the well-known languages of large civilizations, but every language, sometimes with as few as 70 speakers back through their history, have something to teach us, and in each case we do not know what it is until we start the process of recording and analysis, a process that takes many decades to carry through properly. The loss of each language brings a sharp dwindling in the richness of the whole world's intellectual heritage. For each language that we lose, our conception of human nature and of human history becomes more narrow and limited. For each language carries, inside itself, sometimes in a unique way, the answers to many fundamental questions for humankind: the enigma of our origins, the mutual influence of language and thought, the possibilities and limits of the architecture of human language.

What do these languages teach us? The variability of language itself, which is, of course, a prime question for linguists, traditional biological and ecological knowledge that language transmits, the evolution of human concepts, the interweaving of language, culture, and thought, the classic questions of how language influences the way we think, what people create with and in language.

Let us begin with history. The similarities between words in languages as distant as Malagasy in the Indian Ocean and Tahitian in the Pacific, from the indigenous languages of Taiwan in the north to Maori in the south, have led linguists since the eighteenth century to postulate the existence of the great language family that we call Austronesian, *islands of the south*. This family, with its 1,200 languages, is the second largest language family in the world in terms of number of languages, and the remarkably detailed history that we have of these 1,200 peoples is based almost entirely on evidence carried forward by their languages.

Unlike Indo-European, Afro-Asiatic, Dravidian, Sino-Tibetan languages, or Japanese, with their written records going back thousands of years, the Austronesian languages do

not in general have written versions going back in time. (The oldest written forms of an Austronesian language that we have are Old Chamic from Vietnam in the mid sixth century AD, followed by Srivijayan documents from Sumatra three centuries later, but for most of the Austronesian languages, we have no written forms until the last century or two.)

We have to rely, in understanding history, on the comparative method applied to detailed modern documentations of the languages of the Austronesian family, often supplemented by perceptive ethnographic records. By the 18<sup>th</sup> century it was already realised that words from Tahiti in the Pacific across to Madagascar in the Indian Ocean, and including languages through the Indonesian Archipelago and the Philippines, were cognate. We can see this just by looking through the words in Table 1, which gives ten basic vocabulary items in seven Austronesian languages, including the most northerly (Taiwan) and southerly (Maori), the most westerly (Malagasy), as well as one close to the east (Tahitian). The similarity across vocabulary items can be seen from the words for *louse*, whose form barely varies across this vast family except for the weakening of k at the beginnings of words to h or to the glottal stop ʔ.

We have to take into account some small, but regular, sound changes, such as from l to r in Maori (where *ara* ‘path’, *toru* ‘three’, *rima* ‘five’ and *ṅahuru* ‘ten’ all involve the replacement of an original \*l with an r in Maori), or the replacement of inherited words (such as *rima* ‘five,’ derived from ancestral *lima*) by new words (here, *pae* in Tahitian).

**Table 1.** *Samples of cognate terms across six Austronesian languages and their reconstructed forms.*

Gloss	Tao (Taiwan)	Tagalog (Phili.)	Malay	Chamorro (Guam)	Tahitian	Maori (NZ)	Malagasy (Madag.)	Proto Austron.
child/ offspring	anak	anak	anak	<i>patgon</i>	tama	tamaiti	anaka	*anak
louse	kutuʔ	kutuʔ	kutu	hutu	ʔutu	kutu	<i>hao</i>	*kutu
breast	ʃuʃuʔ	susuʔ	susu	susu	ʔōuma (ū ‘milk’)	ū	<i>nono</i>	*susuʔ
new	vajuʔ	bagu	baru	<i>nuebu</i>	<i>ʔāpī</i> (but faʔahou ‘again’)	hōu	(vao)	*baʔu
path	raraʔan	daʔan	jalan	calan	ara.ti’a	ara	lalana	*dalan
eye	mata	mata	mata	mata	mata	mata	<i>maso</i>	*mata
sick/pain	miṅən	sakit	sakit	sageʔ	maʔi (< ma-saki)	<i>māuiui</i> (sahiran)		*sakit
three	tiluʔ,	tatlo	tiga	tulu	toru	toru	telo	*telu
five/hand	atlo	lima	lima	lima	<i>pae</i> (older rima)	rima	dimy	*lima
ten	sapuluʔ	sampuʔ	səpuluh	<i>manot</i>	ʔahuru	ṅahuru	folo	*sapuluʔ

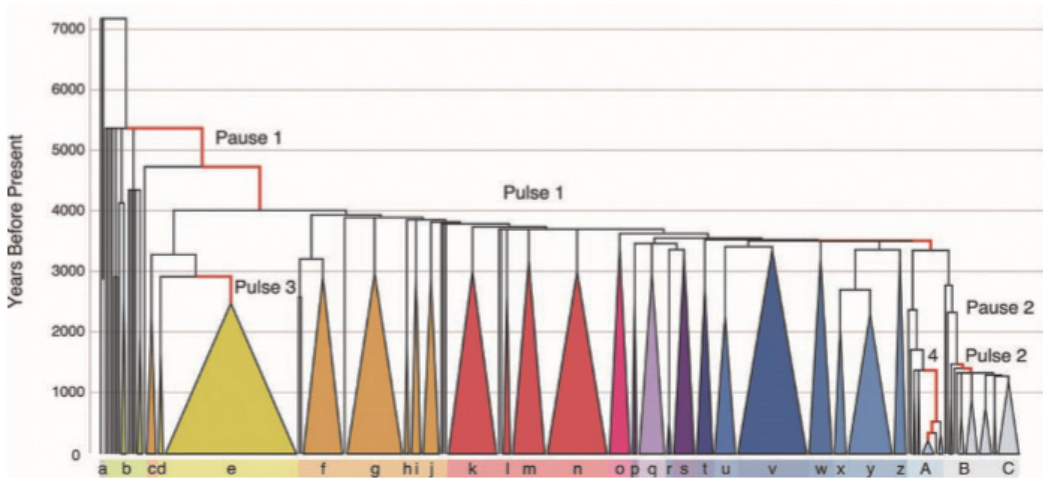
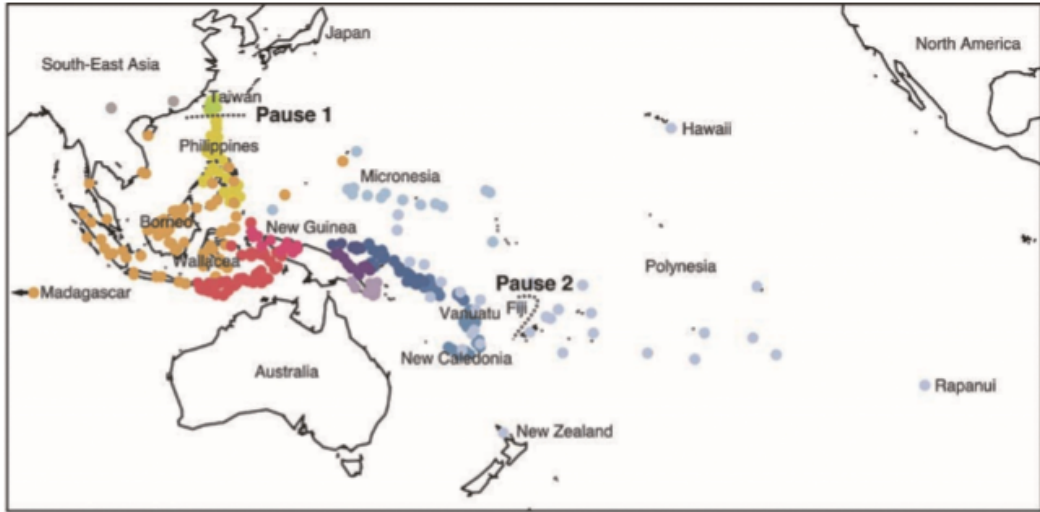
*Note.* Innovated non-cognate terms are in italics. The asterisk (\*) marks forms reconstructed to the ancestral proto-Austronesian language using the comparative method

Taken together, the Austronesian languages have undergone lots and lots of sound changes, studied by scholars for a century and a half to the point where we understand the *sound correspondences* pretty well, line words up as cognates or weed out borrowings that do not match the pattern of inherited sound changes, and then carry out a phylogenetic analysis to put together the branching structure of the Austronesian family tree. In fact, the main elements in this branching structure, vital to understanding the peopling of the Austronesian world, had already been worked out just from applying the comparative method to the linguistic evidence by Otto Dempwolff (1934, 1937, 1938) with many subsequent refinements by scholars like Blust (2013), Tsuchida (1976) and Ross & Pawley (1993).

The analysis of the Austronesian languages, through the use of the comparative method, has allowed us to deduce the trajectory of the great ancient migrations that led the ancestors of the Pacific peoples to leave Taiwan around 4,000 years ago, to pass through the Philippines, and then to spread out across the Indonesian archipelago, venture into the Indian Ocean as far as Madagascar, pass around the coasts of New Guinea, and then out into the Pacific via the Solomon Islands, Vanuatu, and Fiji, from where they set off to explore and colonise all habitable archipelagos and islands of the Pacific.

This sequence of migrations, which was first reconstructed on the basis of linguistic methods, has now been confirmed by the sciences of genetics and archaeology. Genetics gives us an idea of who married whom along the way, such as the substantial levels of intermarriage between the Austronesians and Melanesian populations along the coasts of New Guinea, while archaeology allows us to fix the dates of arrival of Austronesian speakers at various points in the Pacific—Vanuatu, New Caledonia, Fiji, Polynesia—through a range of physical markers ranging from the distinctive Lapita pottery style to the simple fact of human presence for the first time, the latter allowing us to attribute precise dates to the various waves of Austronesian colonisation (Spriggs, 2011). We can then plug these dates back into our linguistic family tree to *fix* some of the branching points and pin dates on some of the pulses of population expansion. *Figure 1* (from Gray et al., 2009) shows the picture we get from this.

But the linguistic evidence, carried forward in the more specialised parts of vocabularies, allows us to do much more than this: We can reach back in time to reconstruct a great deal of the physical, conceptual, and spiritual world of Austronesian speakers as well as intermediate steps like speakers of Proto-Oceanic, spoken around the eastern coasts of New Guinea some 3,500 years ago. This is because the comparison of words allows us to reconstruct ancestral worlds through the words that designate them. We can know, for example, what spirits people believed in and how the kinship system works, but here I will focus on the material world. The multi-volume Proto-Oceanic Lexicon, compiled by Andrew Pawley, Malcolm Ross, and Meredith Osmond, is a treasure house I recommend to all readers interested in exploring this world in great detail. For example, we know that the speakers of Proto-Oceanic who occupied the eastern coasts of New Guinea three thousand years ago made use of such tools as the *pupu* (woven fish trap), the

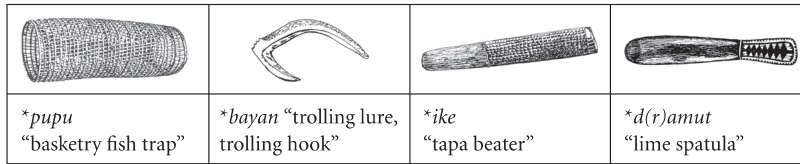


**Figure 1.** The Austronesian expansion from Taiwan, through space and time (source: Gray et al., 2009, p. 480).

*bayan* (trolling hook), and the *ike* (tapa beater) (see Figure 2). We also know that the Proto-Polynesians who lived in Fiji, where they invented the double-hulled canoe, produced what they called the *taba* (whose original meaning was skin or bark), the ancestral word that gives us the word *tapa* in Tahitian and in the languages of Tonga, Samoa, Mangareva, and Rarotonga.

For each of these items, we can find both linguistic reflexes and recorded material items in the cultures that have retained their use, though sometimes changes in meaning result in different objects being denoted, so the method of *lexical reconstruction* (Ross et al., 1998) must be used to infer what the original referent was. For *\*bayan*, we have, among others, Teop (Bougainville Island) *beana* ‘lure’, Samoan *pā* ‘mother-of-pearl’,

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**Figure 2. Four reconstructed Proto-Oceanic lexical items, and the objects they denote (Ross et al., 2008, Evans, 2013).**

and Tongan *pā* ‘hook, especially for catching bonito.’ For \**ike* ‘tapa-beater’ (*tapa* is a kind of bark-cloth, originally made from mulberry bark) we have, among others, Tongan *ike* ‘tapa-beating mallet,’ Samoan *i’e* ‘tapa beater,’ and Hawaiian *i’e* ‘tapa beater.’

The vocabulary of each modern language thus carries the traces of ancient worlds, and by doing this sort of research we learn, with growing precision, how the ancestors of each group lived. The monumental work by Ross, Pawley, and Osmond (1998, 2003, 2008, 2011, 2016) could also draw on the observations and collections of ethnographers, missionaries, and people who were collecting these objects—a reminder that as documentary linguists it is essential that we do not just record the words but also record the objects that they denote, the materials they are made from (since object names often evolve from the names of the materials they are made from, as in the case of English *glass* for a drinking vessel, *iron* for the object that presses clothes, and *rubber* for a condom), and the processes that produce them.

Each language also contains an encyclopaedia of environmental knowledge relating to the identification of species but also their use and their behaviour. *Figure 3* shows a group of Nen men (from Southern New Guinea) who are dealing with a poisonous Papuan black snake, which had taken up residence in a hollow log next to a forest track. Note the warning knot tied to one of the trees to alert passers-by (just above the head of the man on the right). To persuade the snake to move on, these men are spitting in the log after having chewed an herb still unknown to Western science but known in Nen under the name *kiembkiemb mnz*. Centuries of experimentation have taught them that the smell of this herb, mixed with human saliva, is unbearable for the snake, and it will find another home. It is a less confrontational way of dealing with a very aggressive and dangerous snake. That sort of observation is painstakingly accumulated over many centuries by people. Sometimes, it is sort of recorded in the language itself.

Here is another example from western Arnhem Land in northern Australia. The spangled grunter fish bears the same name as the bush white apple, *Syzygium eucalyptoides*, because this species of fish eats the fruits of this tree that fall in the creeks and pools below it. In the Kunwinjku language, both are called *bokorn* (see *Figure 4*).

It is clearly extremely useful for anyone wanting to catch a spangled grunter to know this link: Look for the tree, and you will probably find its partner just below. The languages of Arnhem Land abound in associations like this, which make them a veritable local fisherman’s manual.





Figure 3. Nen-speaking men from Papua New Guinea dealing with a poisonous snake.

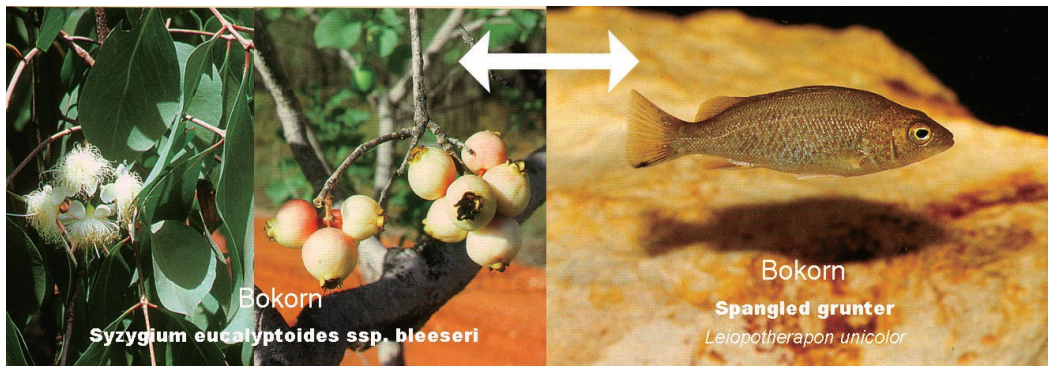


Figure 4. A sign metonymy: The word bokorn in the Kuninjku dialect of Bininj Kunwok denotes both the spangled grunter fish and the native white apple.

For hunter-gatherers, their most important technology is their detailed knowledge of the environment, rather than any particular material objects. Indigenous cultures in Australia often have just a small number of artifacts, portable and replaceable, but their knowledge of the environment, and how to steward it, is intimate and fine-grained. This is now impacting on a very contemporary concern: how to reduce CO<sub>2</sub> emissions, which are the biggest cause of global warming. Recent research on bush fires in Arnhem Land by Russell-Smith et al. (2009) has shown that if traditional indigenous burning practices are followed, there is a significant reduction in CO<sub>2</sub> emission. For example, there is a practice that is known, again in Bininj Kunwok, as *ka-rung ka-wohdalknjihme* (Garde, 2009), which literally means it burns the grass a little bit but which we can translate that into English as patchwork burning (*Figure 5*). This ensures that areas are burned off in small patches, preventing bushfires from becoming so big that they burn out of control.

Starting from the earliest moment in the season after the monsoon, when some plants dry out, you start to burn small patches in a patchwork way. What that means is that there is never a big burnable load, and fire can never spread as a large fire because there are safe bits that you burned off already. There are now a number of fire ranger groups where young Aboriginal men and women work on burning off foliage and on other land management issues in areas that would have otherwise offered no employment—see, for example, the site for the Mimal Land Management Group at <http://www.mimal.org.au/our-work>. This allows young people to stay on their own land, get to know it intimately, and reinstate traditional practices of burning and in the process bring down carbon emissions at least in that area. Significant funding for this comes from large companies wanting to offset their carbon footprint. Like any skill, doing this properly is partly a matter of observation and practice, but it is also a matter of transmitting information through vocabulary, so there is very detailed vocabulary about burning (*Figure 6*).

Now, let us turn to another area that the world's banquet of languages can teach us about—the architecture of language itself, and what, if any, are the limits on how different languages can be. There has been a very influential approach in linguistics going back to the thirteenth-century philosopher Roger Bacon and more recently associated with Noam Chomsky and his intellectual heirs (Chomsky, 1988, 2007; Chomsky & Berwick, 2016) that postulates a fundamental *universal grammar* that places strong constraints on what is a possible human language. One of the key reasons Chomsky invokes is that given the supposed *poverty of the stimulus*—the supposedly degenerate and inadequate input children receive from their parents and other caregivers—children would be unable to learn languages in the way they do if there were not some closely restricted set of possibilities that allows them to make quick guesses about the chaotic input we receive as a child. (In fact, many researchers on child language have argued that Chomsky's claims about the poverty of the stimulus do not bear up empirically, and that children do in fact receive sufficient input to allow them to employ statistical learning to extract patterns from the data—see, e.g., Tomasello, 2009).

One of the predictions of universal grammar that was proposed by Pinker and Bloom



Figure 5. Patchwork burning, called *ka-rung ka-wohdalknjihme* in Bininj Kunwok (Garde, 2009).

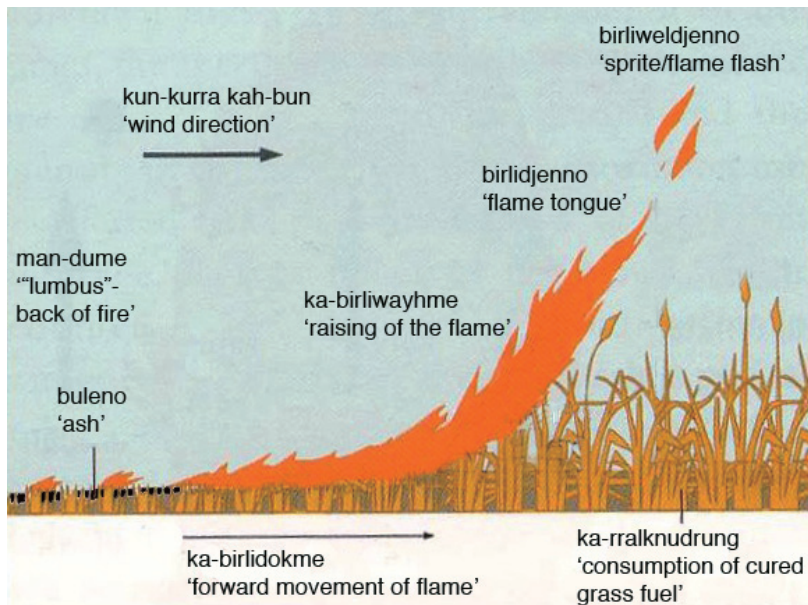


Figure 6. Some Bininj Kunwok terms relating to the dynamics of *manwurrk* 'landscape fire' (Garde, 2009).

(1990) was that no language uses noun affixes to express tense. Now, if we go to Kayardild, the language that I introduced to you earlier, we have a situation that is a bit like Japanese, but the word order is more fluid since verbs can go anywhere in Kayardild, like in Latin. You have endings on every word that show who does what to whom but also the tense. If I say “I saw (the) turtle,” I could say (1) *ngada kurrijarra bangana*, (2) *ngada bangana kurrijarra*, (3) *bangana ngada kurrijarra*, (4) *bangana kurrijarra ngada*, (5) *kurrijarra ngada bangana* or (6) *kurrijarra bangana ngada*. When people were teaching me the language, and I did not understand something, which happens when you are an ignorant newcomer, they would just permute the orders, hoping that one would work for me. After six, I sort of got it, usually. That is Kayardild lesson one.

Kayardild lesson two, which is more interesting and more unusual, is that as you change the tense, you go from *ngada kurri-jarra* ‘I saw,’ to *ngada kurri-ju* ‘I will see.’ So far this just shows tense changing on the verb, which is not unusual cross-linguistically, just like in Japanese 見ました ‘I saw’ vs. 見ます ‘I see’ (with the slight difference that 見ます includes present habitual as well as future readings). But what is unusual about Kayardild is that you also change the suffix on the object: compare *ngada kurrijarra bangana* ‘I saw the turtle’ vs. *ngada kurriju bangawu* ‘I will see the turtle.’ Instead of *bangana*, where maybe you thought *-na* was simply equivalent to the object marker を in Japanese or like an accusative case marker in Latin, here we see that you replace it with a different object marker that says “I’m the object, and I’m in the future tense.” The *na* says “I’m the object, and I’m in a past tense clause.”

It would take us too far astray to discuss it here, but in fact there is a set of six of these *modal case* suffixes (see Evans, 1995; Round, 2012 for details). I could show you there is a set of six of these, a lot of different distinctions in there. Kayardild is a language that uses noun suffixes to show tense, contrary to what Pinker and Bloom (1992) predicted (for a comprehensive survey of languages that mark tense on nouns, see Nordlinger & Sadler, 2004).

Now if you are a child learning Kayardild, you have to be able to learn a language that marks tense on nouns. You do not know that your language violates universal grammar. As one of my other Kayardild teachers, Pluto Bentinck, once said to an intruder in his country who made the mistake of addressing him in English: *Nyingka birdiya kangki kabath*. *Ngada junkuya kangki kabath, yuujband* “You’ve found the wrong language. I found the right words, from right at the beginning” (see Evans, 2009, p. 9; Evans, 2013 for the full story). This same reproach could be made to the people formulating proposals about universal grammar on the basis of just a small set of languages. It is vital that we proceed from a really comprehensive sample so as not to reach premature conclusions about what is possible for a human language (cf. Evans & Levinson, 2009).

Let’s turn now to another topic, the deep history of ideas going back before our first philosophers and scientists. After all, the earliest thinkers we know about through written records were able to build on concepts in their language that had been built by many anonymous conceptual breakthroughs long before. I will use the example of number sys-

tems, which form the foundations of most mathematics and technology.

We now take it for granted that number systems would be based on ten (fingers on the two hands, as in English or Japanese), or maybe five (many Austronesian languages, based on the fingers of one hand), twenty (Mayan—the digits of both hands and feet), or sixty (Sumerian)<sup>3</sup>. But if we look at a wider range of languages, actually, any number can serve as a base (see Hammarström, 2010; Lean, 1992)—mathematically, the choice of base is arbitrary.

Consider the Nen language of Southern New Guinea, the only region of the world where languages have a base-six (senary) number system. A *pus* is a unit of six, a *prta* is a unit of thirty-six (six squared), a *taromba* is a unit of two hundred and sixteen (six cubed), a *damno* is a unit of one thousand two hundred and ninety six (six to the power four), and a *weremaka* means seven thousand seven hundred seventy six, that is six to the fifth power.

Stop for a moment about to think about what such a system as this implies for our idea of the *design space* (Dennett, 1995)—the imaginary logical space, stretched in many directions, that can accommodate all languages in all their variety. People are used to thinking of English and Japanese as very different languages—as occupying quite different regions of the design space. But an example like this—constructing the argument here using numbers, though it could be with many other linguistic features—shows us that English and Japanese are not so far apart in the grand galaxy of this design space. As Table 2 shows, the logical structure of numbers in English and Japanese is pretty similar when compared to Nen.<sup>4</sup>

If we take having few or many words, or characters, as a reasonable measure of conceptual simplicity or complexity in a given system, then we can see that the simple con-

**Table 2. Numerals in English, Japanese, and Nen**

One	一	Ämbs
Two	二	Sombes
Three	三	Nambis
Six	六	(ämbs) pus (6)
Seven	七	Ämbs pus ämbs (1×6+1)
Nine	九	Ämbs pus nambis (1×6+3)
Ten	十	Ämbs pus sombes a sombes (1×6+[2+2])
Thirty-six	三十六	Prta (6 <sup>2</sup> )
One hundred	一百	Sombes prta sombes a sombes pus sombes a sombes (2×6 <sup>2</sup> + [2+2]×6+ [2+2])
Two hundred sixteen	二百十六	Taromba (6 <sup>3</sup> )
One thousand	一千	Sombes a sombes taromba sombes a sombes prta sombes a sombes
Seven thousand seven hundred seventy-six	七千七百七十六	(4×6 <sup>3</sup> +4×6 <sup>2</sup> +4) Weremaka (6 <sup>5</sup> )

cepts—like the one-word/one-character units *hundred* in English or *hyaku*/百 in Japanese—correspond to complicated concepts in Nen (nine words to compose a hundred, namely *sombes prta sombes a sombes pus sombes a sombes* ( $2 \times 6^2 + [2+2] \times 6 + [2+2]$ )). Going in the other direction, a simple one-word concept in Nen (*weremaka*) requires seven words in English or seven characters in Japanese to translate it: *seven thousand seven hundred seventy-six* or 七千七百七十六. In other words, English/Japanese on the one hand and Nen on the other each have simple concepts, or *sweet spots*, expressed straightforwardly, and more complex concepts requiring a larger number of words for their expression, but these *expressive sweet spots* are different depending on the language. What we have exemplified here using numerals could be extended to any part of a language’s expressive system—time/tense, talking about kinship, or how to talk about the location and placement of objects in space, for example. But it is easier to see with numerals because we have a precise metalanguage—a language for talking about language—in the form of mathematical notation.

This simple numerical example is a good metaphor for how languages differ and for how this impacts on our thought. Speaking English or Japanese or Nen does not make it impossible to think about numerals in the way done by the other languages presented in the table—mathematicians do it regularly, and at school children are regularly given the exercise of working out arithmetic in other bases. But each system gives you a pattern for thinking about the world in a well-oiled, well-practiced way, making some calculations easier and some harder. This is how I see the Sapir-Whorf hypothesis regarding the influence of language upon thought. It is not about what you *cannot* think—with effort, we can always think in another way. Rather, it is what is easy to think, and we should not underestimate the effects of habit and laziness in human life.

I’ll come back to the whole Sapir-Whorf question shortly, but before doing so it is worth asking how such a seemingly strange system as that found in Nen could have evolved. After all, it is not like people in southern New Guinea have six fingers like the Simpsons. Here is what seems like the most likely reason.

If we were basing this just on Nen, we would not have good information since Nen speakers no longer engage in ritualised yam counting, but we do have some ethnographic reports from anthropologist F. E. Williams regarding the practices of the neighbouring Keraki people in the 1920s and 1930s. More recently, Christian Döhler, as part of our VolkswagenStiftung-sponsored DoBeS project *Nen and Tonda: Two languages of Southern Papua New Guinea*, worked on a nearby and related language, Komnzo, where the traditional yam-counting ritual is still practiced, and he was able to produce a fine video record of the practice, which you can watch at <https://vimeo.com/54887315>. Here is F. E. Williams’ (1936) description of the process:

. . . two men begin to tell them over. Each picks up three at a time, and they move off a few paces, and deposit them together. Meanwhile one of them, who acts throughout as teller, is shouting *Nyambi, nyambi, nyambi, . . .* (i.e. ‘One, one, one. . .’). This means that they have put down the first unit of six. Without pausing they again take three each and as soon as these

are deposited the teller changes his should to *Yenta, yenta, yenta, . . .* (i.e. ‘Two, two, two, . . .’). So they proceed until six units of six have been deposited, when the teller throws one of his last handful to a third man sitting by, who places it before him as a counter to show that thirty-six taitu, or one *peta*, have been set down. The two men, however, do not pause, but count another six sixes, depositing them on top of the first *peta*; and, as they complete this second *peta*, the man who sits by silently places the second counter. So they go on until they have finished six *peta*, when they pause and the counters are carefully told over to verify. Five of these are thrown on to the heap, while one is kept as a major counter. By now there is a heap of  $6 \times 36 = 216$  (less the one kept as a major counter) and this heap constitutes one storage heap called *tarumba*. (p. 226)

The ethnographic documentation by Williams for the Keraki, and the more recent video documentation by Döhler for Komnzo, helps us to understand how this counting system arose: essentially, as a kind of human abacus or *soroban* 算盤, but its unusual organisation around the number six comes from the physical affordances of how many yams a man can conveniently carry with his two hands, plus the convention that two men carry out the task together and the procedure of removing a *counter* yam every time a pile of thirty-six is reached. In other words, a number of cultural factors unique to the Southern New Guinea setting form a particular type of *cultural selector* that has nudged the evolution of numerals in Southern New Guinea in a particular way. There is no evidence that it is difficult for a human mind to learn such a system if you grow up in a culture that uses it, but it may be more difficult to evolve because we do not have six fingers, so compared to five or ten, the *physical affordances* that favour the emergence of decimal or quinary systems are not available for senary ones.

Now, I want to return to the question of how language influences thought. There is a perceptive Czech proverb, *Kolik jazyků znáš, tolikrát jsi člověkem*, which we can translate briefly as ‘new language, new person’ or more completely as ‘for each language you know, you are a new person.’ As formulated by Edward Sapir, this insight was expressed in the following famous line: “No two languages are ever sufficiently similar to be considered as representing the same social reality.” (1929, p. 162). Note that Sapir’s wording does not say the same reality but rather is careful to emphasise the same social reality—in other words, the same assumptions about what is real in the world that you share with other members of your society.

Perhaps the most important consequence of this view—typically called the Sapir-Whorf Hypothesis—is that we have our attention drawn to different things as we learn to speak different languages. When I learned Kayardild, I immediately had to learn the importance of the compass points. When people say hello to you, they say *Jinaa nyingka warraju?* ‘Where are you going?’ You have to answer with an appropriate directional expression, which means you need to be aware of your trajectory in terms of the compass points; for example, you might reply *Ngada jirrkurungku* ‘I am (going) northwards.’ Or if I’m sitting in a car, and I ask an old man to move over just a couple of inches on the back seat, in English I might just say, “Can you move over a little bit?” but in Kayardild, I should say something like *Jirrkariwath!*, meaning ‘Move a bit to the north.’

If there were some people sitting around the fire, and I wanted to say the equivalent of English “Ask your uncle,” I would say something like *Daamija ngumbanda riya kakuju!* (Ask your east uncle) if the uncle were at the eastern edge of the group. Inside the vocabulary of Kayardild, there is a huge number of derivatives of each compass point (see Table 3, which illustrates some of those built on the root *ri* ‘east’). I will just mention a couple of examples here to indicate the fine topological distinctions involved. If we look at *rinyinda*, which means ‘at the eastern extremity of (but still a part of),’ for example, talking about the easternmost part of the keyboard I am typing these words on. *Ringurrnga* means ‘(place) that is east across a geographical/topological boundary.’ In some contexts, it might refer to an island that you see that is east across the sea—for example, someone in Oita in Kyushu, or in Yamaguchi Prefecture in Honshu, might use *Ringurrnga* for the island of Shikoku; traditionally Kayardild people referred to Sweers Island in this way since it is east across the sea from Bentinck Island, their main home. But it could also be used on a much smaller scale, such as moving from inside a house, through the front door, into a small garden just to its east. *Riinkirida* refers to the boundary that is reached moving from the east towards the point of speech—for example, if someone is coming in from the garden to the east and stands at the doorstep just east of the house door. This is only part of the rich vocabulary of Kayardild directionals, but it gives a flavour of how

**Table 3.** *Some Kayardild compass-point derivatives based on the root ri ‘east’*

<i>riya</i>	‘east’
<i>rilungka</i>	‘to the east, eastward’
<i>riyananganda</i>	‘to the east of’
<i>rilumbanda</i>	‘easterner’
<i>riinda</i>	‘moving from the east’
<i>riliida</i>	‘heading ever eastward’
<i>riliji</i>	‘far to the east’
<i>rinyinda</i>	‘at the eastern extremity of’
<i>ringurrnga</i>	‘east across a geographical discontinuity’
<i>riinkirida</i>	‘at the boundary one meets moving from the east towards the point of speech’
<i>rimali</i>	‘Hey you in the east!’
<i>riinmali</i>	‘Hey you coming from the east!’
<i>rilumali</i>	‘Hey you going eastward!’
<i>rilumirdamirda</i>	‘in the dugong grounds to the east’
<i>rilunganda</i>	‘easterly wind’
<i>rilurayaanda</i>	‘previous night’s camp in the east’
<i>rilijatha</i>	‘turn (self) round to the east’
<i>rilijulutha</i>	‘move something to the east; sleep with one’s head to the east’
<i>rimarutha</i>	‘look to the east’
<i>riinmarutha</i>	‘look from the east’



precisely they lead you to think about the mapping of space onto the compass points.

But, does this really mean that people think differently? It certainly seemed that way to me as I learned the language, and getting those personal insights from fieldwork, from participant observation, are a vital first step in the science of language. But they risk being subjective and unfalsifiable: We need to follow up on these insights with other kinds of evidence that are more objective, and where possible, experimentally based. I learned Kayardild from old people, so I could not do experiments with them, but fortunately, similar phenomena are found in other languages with healthier speech communities, and in the last two and a half decades, a whole lot of ingenious work has been done with them, supporting the view that a language's frame of reference (to adopt an expression for different ways of referring to space) has a significant impact on how people think about space.

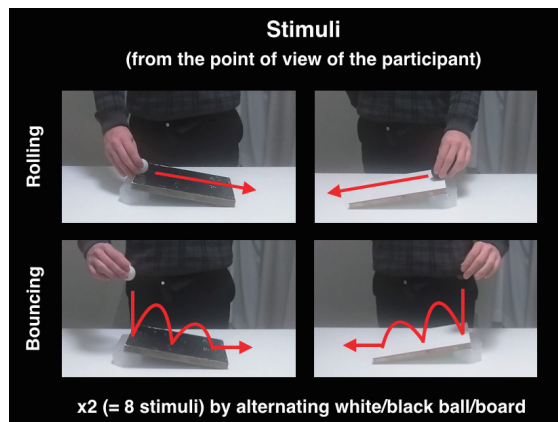
A first hint of this came from Steve Levinson and John Haviland (Levinson, 2003, p. 5), who recorded stories in Guugu Yimithirr, another Australian Aboriginal language, from Cooktown in Cape York.<sup>5)</sup> At a time when most linguists did not generally make film or video recordings, they had the foresight to do this during their fieldwork, and by good luck, they recorded the same man, Jack Bambi, telling the same story on two different occasions one year apart. In the story, he tells about being out at sea in a boat when a shark comes and capsizes the boat. It just so happened that he was sitting facing a different direction. The first time around, he was facing west, and to describe the boat turning westwards, he made a forward-turning gesture. The second time, he was facing north, so to show the boat turning westward, he had to make a slightly awkward sideways gesture. The speaker would do this as a matter of course because in these speech communities, to make a gesture that does not exactly reproduce the spatial layout is tantamount to lying: it is giving inaccurate information. Dan Slobin, the psycholinguist, uses the expression *thinking for speaking* to capture the fact that in order to say something in a given language, we first have to lay it out in our minds in order to say it. But we can extend that to say *attending for remembering* because we do not just have to plan out what we are saying now but also to attend to what aspects of the lived moment we will need to store away for later reporting, so that in a week, in a year, in ten years, we can talk about it at any point in our lives. We can also add *remembering through speaking* because, to continue with the Jack Bambi example, each time we retell a story giving particular information (e.g., gesturing in a way that cements our memory of the orientation to the compass) it reinforces our memory for later use. That is how deep the priorities given by our language run in shaping our attention and the way we think and remember.

To make this more experimental, Steve Levinson and his group in Nijmegen designed some interesting experiments (see Levinson, 2003 for the classic synthesis). Here is one very simple one. You get someone who speaks a language to look at objects on a table, maybe three sheep, one white, one black, one spotty, left to right, and ask them to remember the layout. Then you lead the person to another table without telling them what you are doing, rotate them through 180 degrees (stand them on the other side of the table), and

give them the same set of three plastic sheep to lay out in the same way as before. Now, if you speak a language like English, you would typically think something like, “The white sheep is on my left,” so you put the white sheep on your left, and so on. On the other hand, if you speak a language like Kayardild, or Guugu Yimithirr, you will think “The white sheep is on the south”; to keep it on the south, you have to swap the order, so it has now gone from being on your left to being on your right. This would be called an absolute response because it is reflecting the absolute compass points. When their team carried this out with speakers of different languages, not just Australian languages but also languages like Hai//om from Namibia (see Majid et al., 2004 for discussion), they found that this is what people speaking languages with *absolute frames of reference* typically do: just as, when they speak, they habitually locate objects by using the absolute compass points, so when they carry out tasks like this, they maintain their absolute positions. In contrast, speakers of languages like English, who usually locate objects using relative strategies, like the white sheep is on my right, reproduce scenes using such relative strategies even when no speech is involved.

Turning to the Ryukyus, recent work by Kenan Celik, Rafael Nuñez, and their colleagues (Celik et al., 2019; Nuñez et al., 2019) have shown that such differential effects can be found even between such closely related languages as Japanese and Miyako, and even within the same individual as they switch between languages. The team worked with speakers who are bilingual in Japanese and in one of two different Ryukyuan varieties, Miyako and Shiraho (I just focus on the Miyako results here). Their method was slightly different to the one described above. They would get something to happen, like a ball bouncing along (*Figure 7*).

Then they would lead people to another place and covertly turn them through 180 degrees, in exactly the same way as in the experiments of the Levinson group (see *Figure 8*), and ask speakers to say what happened. The person asking them, who had not seen the

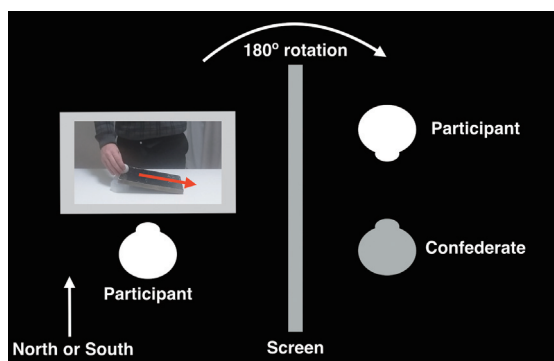


**Figure 7.** Initial stimuli in the Japanese/Ryukyuan experiment by Nuñez et al. (2019).

event, would pose the question either in standard Japanese or in the relevant Ryukyuan language, tacitly prompting them to respond in the same language as the question.

Just as in the table-layout experiments, these events can be interpreted, and then reproduced, either in a relative way e.g., (happening from left to right) or in an absolute way (e.g., happening from west to east). Now, previous studies of Miyako speakers (Suzuki, 1978; Celik, Takubo & Nuñez, 2010) have found that when speaking Miyako, they prefer to use absolute frames of reference, just like speakers of Kayardild, Guugu Yimidhirr, or Hai//om (according to how you store it). Impressionistically, from observations before carrying out the experiment, it seemed that bilingual speakers tend to employ an absolute frame of reference when speaking the Ryukyuan language and a relative one when speaking Japanese. Interestingly, this pattern was confirmed experimentally.

In a traditional spatial description task, Miyako speakers were found to use an absolute system of description when instructed to complete the task in their traditional language but a relative one when completing the same task in Japanese. They were also found to use absolute gestures in a gesture elicitation experiment. *Figure 9* illustrates an absolute response given by a subject speaking Miyako, describing the trajectory of a bouncing ball which, in her original observation, had been moving to her right, and to the west. She is now facing north, and describes the ball with a swiping gesture of her (right)



**Figure 8.** Response setup for the test phase of the bilingual Japanese/Ryukyuan experiment by Nuñez et al. (2019)



**Figure 9.** Sample absolute response of a Miyako-speaking woman describing the movement of a bouncing ball (Nuñez et al., 2019, p. 893).

hand, still towards the west, but now moving left., while saying:<sup>6)</sup>

(2) aei-ba=du ffu+tama=nu nagari pin-ta:=ti:

CNJ-because=FOC black+ball=NOM flow.CVB go.away-PST=QUOT

“As I am saying, the black ball rolled away”

In other words she maintains the absolute information (ball moving westwards) but sacrifices the relative information (since she switches from watching it move to her right, to depicting it moving to her left).

This is not an all-or-nothing effect but rather a statistical preference, i.e., for Miyako-Japanese bilinguals, they gave around 80% absolute responses if the instructions were in Miyako but only 40% if the instructions were in Japanese. Three lessons can be drawn from their work. First, two languages that seem rather similar, like Japanese and Miyako, can host quite different ways of thinking.

Second, these two modes of thinking can coexist in the minds of a bilingual speaker, and bear in mind that in order to be able to reproduce the actions either absolutely or relatively, these bilinguals must have scanned in both sets of information. Returning to the Czech proverb, they are really two people in one: We can have different persons inhabiting our mind, and we can switch between them or be pushed between them according to the language that we are speaking.

Third, to discover such deep and interesting facts about how endangered languages (like those of the Ryukyus) shape the human mind, we need to probe much deeper than just collecting vocabulary or audio texts and get vivid and realistic records of people interacting within their own cultural setting, including video data capable of capturing gestures and other visible signaling.

In closing I would like to make a couple of observations about how all this informs what we should be doing, now, to fulfill our responsibilities toward future generations (see Seifart et al. 2018 for a fuller statement).

Four facts are of overwhelming significance today. The first is the accelerated loss of languages: Languages are being lost faster now than at any time in human history.

Second, for the first time in history we are beginning to gain wide acceptance about the true worth of the world's thousands of languages, which wasn't always obvious. People used to despise unwritten languages, thinking of them just as savage crude tongues, but more and more people are becoming aware of the *intellectual wealth* (Hale, 1998) that they contain, and at least in some countries, we now have more political and educational recognition of the value of traditional languages, including the cognitive benefits of learning to read and write first in your mother tongue, and the psychological health benefits for Indigenous people in knowing their own language, in starting with their mother tongue as well as a national language.

Third, the rapid improvements in our technological capacity make it possible to record more and better data faster, including the use of video to capture gestures, facial expressions, and cultural context, and to transcribe and archive the material. When I was doing my PhD between 1982 and 1985, for example, I could not record film, which meant

that there were lots of things with Kayardild, such as gestures while speaking, that I never captured—now it is a matter of standard practice to do this, and affordable and practicable for a PhD student. Jennifer Green’s superb book *Drawn from the Ground* (2014) is an example of the sort of enriched account of human communication that can come from this sort of work. All this means we can gather hugely more data than used to be possible even a decade ago.

Fourth, more and more there is support from different funding agencies and an ethical commitment to involve native speakers in research. In Brazil, for example, there have been some superb documentation programs led by speakers of the languages under study, including magnificent video footage on the Kuikuro language and for the first PhD that was written bilingually in an indigenous language and a world language, namely Portuguese (Kaxinawá, 2014). The special insights, the relationships, and the commitment of members of the speakers in the community is becoming more and more important and significant, leading to the prospect of a linguistics where we can examine each language both from the inside looking out and from the outside looking in (Ameka, 2006).

Having taken the time to record all of this material in the field, we have to make sure it just does not get lost, which can so easily happen (Woodbury, 2014). That means having good, permanent, searchable archives, which remains a huge challenge since we need to maintain the migration of data, the updating of metadata, the updating of access conditions, and so forth. In many countries, including my own, it has not been too hard to get funding to set archives up (in our case, PARADISEC (<http://paradisec.org.au>), master-minded by Linda Barwick and Nick Thieberger in 2003 and now holding 5,900 hours of archived audio and video materials representing more than 1060 languages from around 67 countries in some 13.5 terabytes. (Other archives, in some cases larger, are the TLA (The Language Archive) based at the MPI for Psycholinguistics, which includes the DoBeS archive and now holds about 80 terabytes of well-described resources, amounting to around 20,000 hours of digitized audio/video recordings with 5 million annotations in over 200 languages, AILLA (El Archivio de los Idiomas Indígenas de Latinoamérica) in Austin, Texas, which holds 7,500 hours of archived audio materials representing more than 300 languages from at least 28 countries, and ELAR at SOAS in London, which holds 4,161 hours of audio and 12,240 hours of video representing more than 580 languages (with more substantial data on about 300) from at least 91 countries, comprising over 21 terabytes). For all of these archives, the problem is not just to keep them growing (often at an accelerated rate as demand increases) but to ensure that they become permanent repositories, accessible indefinitely far into the future like we expect of any national library or archive, and this requires us to make public funding bodies aware that they are as valuable as any collection of papyrus, manuscripts, or ancient inscriptions.

After a couple of decades of very substantial support from some big research bodies, both national and international, running to scores of millions of dollars or euros and the input of many thousands of people who have devoted years, often decades, of their lives to language documentation and description, where we stand now is that we still only have

good scientific recordings and documentation for about a tenth of the world's languages. This figure is based on a bare minimum threshold, namely a reasonably comprehensive and professionally-analysed grammar (of at least a couple of hundred pages), a dictionary of two thousand words, and a basic text collection (let us say 5,000 words of transcribed naturalistic text). This criterion is way short of what any language deserves if its riches are to be captured in full, and if we start to set our ambitions higher, for example, a sixty million word corpus for every language of the world, like we have for classical Greek or Sanskrit, and a dictionary of at least five thousand words and a comprehensive grammar comparable to the Panini- or Gabelentz-prize winning grammars honoured by the Association for Linguistic Typology, the figure is much, much lower, perhaps around 1%. That gives you some idea of the enormity of the task we face and the responsibility that we as linguists have to arouse interest in this sort of work among the best and brightest of our students, to place it at the centre of what our field values, and to persuade others of its centrality to the human quest for knowledge, about the history of all human cultures, and the full range of ways that these languages illustrate for us of what it means to be human. We need to persuade the general public, funding agencies, and sometimes also members of speech communities whose pride in their own language has been diminished by the hegemony of larger cultural groups, particularly homogenising nation-states. We need more initiatives to support the preservation of this fragile knowledge from as many quarters as possible if we are truly to hear the messages that the world's archipelago of languages can impart to us.

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#### Notes

- 1) I give only two parts of the passage. Fuller details can be found in Evans, Malwagag and Marrala (2006).
- 2) After WWII, people came to Minjilang from other areas, such as Goulburn, Oenpelli, and Cape Don to work for the mission.
- 3) Generated by using the fingers of one hand to count iterations to twelve on the other hand, by which the thumb points in turn to each bone of the other four fingers.
- 4) They are not identical, though. The fact that Japanese groups higher numbers around powers of 10,000 or  $10^4$ , namely *man*/万, creates problems of inter-translatibility with larger numbers, and many Japanese speakers whose English is fluent, or English speakers whose Japanese is fluent, begin to stumble when expressing a number like 45,000 / 4万5000 in the other language (and note that the two ways I have grouped these numbers reflects the way they are written in the two languages, which in turn reflects the way they are expressed in words).
- 5) This happens to be the first Australian language recorded, when Captain Cook and his crew spent time repairing their boats at what is now Cooktown. It was at this time that the first word from an Australian

language, kangaroo, entered the English language (from *gangurru*, the Guugu Yimidjirr word for a particular species of large black or grey kangaroo).

- 6) In fact, she initially responded in Japanese, then, after a second prompt, responded with the Miyako words given here. In both cases she accompanied her speech with an absolute gesture.

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