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Biodiversity is us

January is summer in the veldt of KwaZulu-Natal. In the absence of trees, the gently rolling hills spread soft green from horizon to horizon. It seems that one can see forever, or at least as far as anyone would ever care to see. The veldt is a glorious, uncluttered landscape and the day is perfect, warm, not humid, with blue skies and rufous-naped larks whistling everywhere. Heading south along a dirt road, we cross a low ridge without much thought, until a couple of kilometers later, we reach our destination. Looking back at the ridge, we realize that's where they had been hiding – the twenty-five thousand Zulu warriors, the British troops were hoping to find. Advanced scouts did find them and, once discovered, the Zulus swarmed over the ridge and ran towards the thousand well-organized, redcoats. Something quite extraordinary happened that summer's day, the 22 January 1879. The British lost. Almost none of their troops survived.

They didn't make a habit of doing this, you understand. Later that year, the British would defeat the Zulus decisively and finally at Ulundi. A little over two years earlier, in a North American prairie looking remarkably like this veldt, also in summer, and also as a consequence of the same blunder, General Custer's forces had met the same fate. The US army didn't make a habit of such losses either and redeemed themselves by slaughtering several hundred Sioux at Wounded Knee a few years later.

The lesson from these battles is how exceptional they were. Not for the odds encountered and certainly not as examples of strategic incompetence. Rather, that when technologically-rich cultures confront technologically-poor ones, history offers no large-scale surprises, exemplified on the small scale by Isandlwana and Little Big Horn. The technologically-poor lose and lose badly.

In case you're wondering, this essay, like my previous one, is about biological diversity – our own.

I'm not sure of the best way to measure this. Languages, however, are counted, mapped, and the number of speakers recorded. The results show that very many languages are losing and losing badly. Their loss will be one of the salient features of this new century. Species may be disappearing quickly, but languages are going even faster.

What is a language? How different is what people write or say before we recognize it as a separate language, rather than just a separate dialect? I grew up greeting people with "ey up," using "sumat" and "nowt" for "something" and "nothing" respectively. I watch the movie "The Full Monty" without subtitles. It was generally accepted that I spoke English, though my undergraduate contemporaries at Oxford had their doubts.

Linguists have the same ones. Some use "language" to mean the major forms of speech in the world and "dialect" for everything else. Others use "language" to mean speech forms that share some specified percentage of words and "dialect" to share some higher percentage. Those percentages will be hard to estimate for the thousands of different languages and completely arbitrary even when they can be.

Edited by Barbara Grimes, *Ethnologue*, *Languages of the World*, is a hefty compilation of the world's languages. In her introduction, she writes: "to those of us interested in cross-cultural communication … it seems clear that one of the main factors … is how well two linguistically close communities understand each other". "Marginal intelligibility", she continues, "does not allow their speakers to engage in meaningful communication".

With this implied definition, her book lists about 6500 languages, plus 103 deaf sign languages, and seventy-nine creoles and pidgins. Dialects, such as Yorkshire, literally my mother tongue, are listed within

each language, the linguistic equivalent of subspecies. *Ethnologue* lists the number of people who speak a language – its population size – and, crucially, its birth rate – the fraction of the children who speak it.

All the top ten first-spoken languages are European and Asian. Nearly three quarters of a billion people speak Mandarin Chinese as a first language, English nearly half a billion, and Spanish over a quarter of a billion. Hindi, Arabic, Portuguese, Bengali, Russian, Japanese, and German follow with between 180 million and 120 million speakers each. Nearly a billion people speak English as one of their languages.

In head-to-head competition, European languages have won big over their non-European rivals. Even within European cultures, the losers lose big. Nine hundred years of armed or cultural conflict between the British and the French have ensured that the latter doesn't make it into the top ten. As a first language or as either a first or a second language, English beats French seven to one. Of course, every Englishman will tell you that his language had to be win out over French in North America, because of the former's superior good looks, better seamanship, intelligence, strength, capacity to eat boiled beef, and toleration of cold, damp weather. The reasons don't matter to my story, but the outcome does. Success breeds success, the winner takes all, and there is a law of increasing returns.

There are only about two hundred and fifty languages spoken by more than a million people. The rest of the world's languages – ninety-seven percent of them – are spoken by fewer than one million. Many of them are spoken by only tens to a few thousands of individuals. ''One million'' has special significance. It's a rough estimate of the minimum viable population size for a language in contact with the rest of the world.

Just like species, languages are not distributed randomly across the plane. Just like species, the tropics, and particularly the wet tropics, hold the most. (And the rarest and most endangered.) The broad patterns are these.

The Old World tropics hold the richest areas for languages. The island of New Guinea alone has over a thousand, the Greater Sundas, the lesser Sundas, Wallacea and the Philippines add nearly another seven hundred. Combined these islands comprise another quarter of the world's languages. In the Americas south of the US border, there are another seven hundred native languages. Yet, just six are spoken by more than a million people: Central Aymaran primarily in Bolivia, three forms of Quechuan in Peru and Bolivia, and Guaraní in Paraguay. Most are in the Amazon and Orinoco basins. Australia follows the North American pattern. Of more than two hundred and fifty native languages, none but imported English is spoken by more than few thousand speakers. Africa has about two thousand native languages, with many in the Congo basin and West Africa. The Indian subcontinent has over four hundred languages, about forty of them spoken by at least one million people.

How many languages are dying each year? My guess is that at least three thousand and perhaps six thousand languages will go within the next human generation or two. That would mean that languages will die out at more than one hundred per year. My guess comes from looking at how common must a language be if it is to survive. A language will only survive if it's taught to its speakers' children. And a language has the best chance if it is the language of choice of those children.

There are continents, like North America and Australia, where native languages come into full contact with English – the global big winner. And there are those continents where they have not. Not yet, that is.

In North America thirty-five of the listed languages are extinct. Another 139 will surely be extinct within a couple of decades. They are spoken by fewer than a thousand people. For only three of them are there attempts to teach them in local schools. The rest are spoken by the middle aged, or in many cases, only the elderly. (Such is the rate of extinction that Dr. Grime's language surveys are likely to be quickly out of date. Many of these 139 will surely be already extinct.) Almost nobody is monolingual for these languages. Indeed, typically only one in seven people within the language's ethnic group even speaks the language at all.

The number ''one thousand speakers'' seems to be a magic one, for above this threshold, some languages can remain vital. Another forty-eight languages are spoken by between one thousand and ten thousand people. These speakers represent over two thirds of the language's ethnic group. And at least fourteen of these forty-eight are in widespread use by young people. Nonetheless, for the majority of these, the native language is not the one of choice for the young. Nor are there but a scattering of elderly individuals who are monolingual.

Another nine languages are spoken by between ten thousand and one hundred thousand speakers. For all of these, the language is used vigorously by adults, children use it too, but there are still only a few elderly, monolingual individuals. Just one native language, Navaho, is spoken by more than one hundred thousand individuals. At this threshold, five percent of the population speak only that language; they too are the elderly.

Out of a total of 232 native languages, 174 are extinct or will be soon, and only 24 can be thought to have any future. And even that future will be as one of two languages, the other usually being English. Australia is exactly like the North American pattern, with all of its native languages in danger of extinction within a generation. Only seven of its languages are spoken by more than one thousand individuals.

Europe provides a different range of numbers. Certainly, there are a few languages with a few thousand speakers or fewer, such as Inari Saami and Northern Frisian. As in North America, these languages are those of the elderly and typically one of two languages – Finnish in the first case. But Europe has a score of languages spoken by a hundred thousand to a million in addition to its major languages. Basque and Scots Gaelic are spoken by just under one hundred thousand speakers each, Icelandic and Ingush by a quarter of a million, Breton and Welsh by half a million, Estonian and Cechen by a million.

What I find remarkable in these numbers is their vitality. All but Icelandic – the language of a remote island – have been suppressed in various ways within memory.

In their teens, my Welsh friends had to learn that language in their churches. Their parents were punished in their schools when they didn't speak English. Whatever sins of cultural domination can be laid at English feet, they are minor ones compared to the former Soviets. Tens of millions died under Stalin. He and his successors brutally suppressed the Estonians at one end of Europe to Chechens and Ingush at the other. Chechens and Ingush were deported to Siberia and Kazakstan in the decade following the Second World War, both losing between a quarter and a half of their population. For Armenians, Azerbaijanis, Belorussians, Estonians, Georgians, Latvians, Lithuanians, and Ukrainians – all with a million or more speakers each – the first consequence of the Soviet Empire's demise was an independent, national home for the language. The Armenians suffered a slaughter of more a million people at the hands of the Turks in 1915, yet nonetheless kept their language.

These statistics touch so much politics and religion, history and continuing conflict. Put passion aside to notice one simple empirical rule.

Across Europe and North America, the numbers who speak different languages span eight orders of magnitude – from one (in the case of several native North American languages) to hundreds of millions (English). With fewer than one hundred thousand speakers, languages struggle to survive; with more than a million speakers, languages survive the most brutal attempts at eradication. The languages spoken by more than a million people are all robust.

If this rule were to work worldwide, then all but the two hundred and fifty languages spoken by more than a million people would go extinct on cultural exposure to the big winners. "Cultural exposure" may be the mechanism of the present – with television and movies as its carrier – and it may be the mechanism of the future, via the Internet. But it certainly wasn't the mechanism of the past.

If the winners are obvious, which languages did not survive? As with understanding patterns of species diversity, look at where the languages are to be found. Better, look at where they are not. Europe and North America are examples of language-poor continents; there are regional impoverishments too. Explaining why requires no more than a recap of ecological history. Consider three time markers: 1780, 1880, and 1980.

In 1780, American settlers had broken through the Appalachian mountains and were now clearing the temperate forests in the Ohio and Tennessee valleys. Within a decade, English settlers would be clearing forests in eastern Australia. Those forests would be cleared within decades; so, too would be the peoples who had once lived there and the languages that they spoke. In few remote places, the mopping up would take a century.

By 1880, knowledge and technology had improved enough that settlers realized they could make a living from farming or grazing prairies. In North America, the US cavalry was continuing Custer's mission. In South America, Argentineans elected General Julio Roca president, grateful for his savage extermination of the Araucanian Indians of the pampas. The British were intruding into the veldt of South Africa. Colonial Australians had crossed the Great Dividing Range and were grazing the grasslands of their continent's exterior. There are now large gaps in linguistic diversity from all these grasslands.

By 1980, linguistic diversity has retreated to the humid forests of the world. (I concede that even originally these places could have been richer in languages than anywhere else.) There is huge diversity of languages on the islands in Southeast Asia. In Africa, the Congo basin is home to about six hundred languages, the West African forests nearly a thousand.

In the South America, the cooler uplands of Venezuela, Colombia, Ecuador, Peru, and Bolivia are mostly Spanish-speaking. Once numerous languages, such as Chibca in southern Colombia are extinct. As elsewhere, the diversity of languages is in the humid, tropical forests. In Brazil, the long-settled, highly-fragmented, moist forests along the Atlantic have almost no remaining native languages, nor does the drier interior. But the forests of the Amazon basin have nearly one hundred and seventy.

In sum, the loss of languages mirrors our clearing of deciduous forests two hundred years ago, grasslands a century ago, and tropical forests today.

Sitting in the lobby of my hotel in Rio de Janeiro one afternoon, a group of students from the university joined me for a beer. Brazil, among few countries in the world, spans modern cities indistinguishable in their amenities from those in Europe or North America, and yet has perhaps a hundred or so linguistic groups living with little more than Stone-age technology. "Had any ever met fellow countrymen who spoke no Portuguese? And how did they all find the contrast?" Only one had

been to the more remote parts of the Amazon. She was bewildered by the experience, incapable of communicating, of course, and amazed by the contrast in living.

What would I have to say if Ancient Britons were still roaming the Welsh mountains painting themselves with woad, or Amerindians were still hunting buffalo on foot in Texas? Then the thought crossed my mind that the flying time to the Amazon from Rio de Janeiro is almost exactly the same as from Miami. The linguistic and cultural diversity of the Amazon is as near to Americans as it is to most Brazilians. And it's so far away that we never give it a moment's thought.

Yet, two centuries of human expansion have cleared temperate forests, ploughed prairies, and have diminished biodiversity and our own cultural diversity as a consequence. Within the next few decades we will clear most, perhaps all of the tropical moist forests. We will eliminate a large fraction of the planet's plant and animal species. And we will eliminate an overwhelming fraction of our own cultural and linguistic diversity. Tropical moist forests are no more devoid of people than were the grasslands of a century ago, or the temperate forests of two centuries ago. The loss of languages – all too often by the deaths of the people who speak them – is the human face of the current ecological changes to our planet.

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