Darwin and language diversity
A Darwinian approach to language

We'll be turning our attention from the variety of species in the natural world to another flowering of diversity – language. It's probably the trait that distinguishes us from all other species on earth; it allows us to plan, to communicate, formulate rules, give directions and to share knowledge or experience. And through it, we've evolved a rich array of ways in which to express ourselves.

Quentin Atkinson:
In the world today there are about six thousand recognised languages. A lot of those we know are related into large families like the Indo-European language family spread across Europe and the near east, the Bantu language family in Africa is a huge family of some five or six hundred languages. The largest language family in the world is the Austronesian language family which comprises about fifteen hundred languages and stretches from Hawaii and Easter Island in the east to Madagascar in the west so it covers about a third of the globe.

Rissa:
Quentin Atkinson, an evolutionary biologist now working at the University of Oxford has for some years been collaborating with colleagues at the University of Reading, in the Evolutionary Biology Group headed by Professor Mark Pagel. What's the attraction of language diversity for evolutionary biologists? Mark Pagel.

Mark Pagel:
I think what got me interested in language evolution was that people like myself, evolutionary biologists, were interested in things that evolve not surprisingly, and when you look around the world you see that a single species, human beings, speak about seven to eight thousand mutually unintelligible languages, and so it's evident that we have this system that has evolved a lot of diversity, and so someone like me he wants to understand that diversity in the same way I might try to understand the diversity of species, of biological species.

Quentin Atkinson:
I got interested in the evolution of language when I realised that the processes that generate language diversity are very similar to the processes that generate biological diversity and so that means that the methods that we use to study species evolution can be applied to study the evolution of languages.

Mark Pagel:
There are many parallels between biological evolution and linguistic evolution. When we study biological evolution, we're blessed by the fact that we know there are genetic systems composed of these discrete elements we call genes, and those genes are inherited from parents to their offspring, and we know those genes can change over time by processes of mutation, and we know that some genes are favoured over others because of what they do for the bodies that they reside in and we call that favouring natural selection. And when you look at languages we also see that they're comprised of discrete elements, we call them words, and there are other aspects of language that are discrete, like the grammar or the syntax. Those discrete elements, those little chunks, are handed by and large from parents to their offspring, so there's a process of replication. We also know that mistakes can be made to those processes of mutation and we also know that in some circumstances we can say the right thing and we can say the wrong thing and so there's a process as much like natural selection as a right way to express oneself or a better way to express oneself and a worse way.

Rissa:
When we communicate through language, what filtering processes might operate to favour certain words or expressions over others? In other words, what's the cultural analogue to natural selection?

Mark Pagel:
One might be that if we want to be understood we have to follow a very, very simple rule which is that we should speak like everybody else, and so there isn't selection so much on the particular word we use, but on the fact that we should use the same words that everybody else is using, and so in that sense there's what we call frequency dependent selection – do what everyone else is doing. In some other senses there may actually selection on words, that is to get them right. If I say to you that there are two guys coming over the hill and they're going to attack us, and in fact I should have said two hundred, consequences could follow, and so in that sense there may be selection to get our language correct.

We think that linguistic selection is acting on the words we use and the sentences that we speak, and the reason it acts is that those sentences have to make sense, they have to be understood by the people we're speaking to, and they have to be clear and replicable, that is they have to be something we can learn and teach to our offspring.

Rissa:
Given that language isn't a physical chemical entity in the way that genes are, it's remarkable how closely its transmission mimics a genetic system in one crucial respect.

Mark Pagel:
Genes are replicated when they're transferred from parents to their offspring. We make a copy of that gene and we pass it on to our offspring. Now in language evolution there is no analogous physical chemical unit that gets passed on from parents to their offspring, and so it's remarkable that language can be transmitted with such accuracy, given that it's not a physical replication process. It's a process of me imitating what you're saying to me.There's a fundamental way that language evolution differs from genetical evolution, and yet language evolution mimics genetical evolution in a remarkably high fidelity way.

It's so high fidelity that not only is it extremely easy for children to learn from their parents and they might be separated by twenty years but children can speak to their grandparents and they may be separated by maybe fifty years of language evolution, but we know that we can read texts in our language that are hundreds of years old, sometimes even thousands of years old. And so we know this process of what Darwin would have called descent with modification, that is the language being passed on from parent to offspring over and over and over, is of such fidelity that the language is recognisable over maybe hundreds of thousands of years.

Rissa:
If languages do evolve by a process of descent with modification, we might expect them to form family trees of related languages. Indeed such linguistic family trees were an inspiration for Darwin as he pondered on biological evolution. Now, 150 years later, can biologists return that favour by offering some of their theoretical tools to the study of language diversity?

Mark Pagel:
We can borrow or sometimes adapt mathematical and statistical methods that we can use to characterize the evolution of species and apply them to languages and one of the things we have done is just that. So we have dreamt up the sort of mathematical models that make predictions about how language might evolve, and we apply those to languages, and they then allow us to draw these very precise phylogenetic trees we call them, and that's just a technical term for a for a family tree, and what's remarkable about is that we've had great success adapting these methods from biology to use on this linguistic data.