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# TOWARDS A NEW BIOLOGICAL SCIENCE OF LANGUAGE

Jaume Bertranpetit

Science is the human activity aimed at acquiring knowledge by means of a very specific method, the scientific method, in which logical reasoning is put at the service of empirical and observable evidence. We perfectly understand what it means to be able to focus our scientific perspective on a problem: we want to understand it reasonably, according to the observation, and different observers will obtain an equivalent result. More and more fields of knowledge are diving into scientific analysis. Experimental sciences are based on it, but other fields of knowledge have also found themselves needing it in order to gain social acceptance and recognised explanatory possibilities.

When biology appeared, science expanded tremendously, especially due to how many aspects it could comprehend, from physiology to medicine. We are talking about biology understood as an expression of mechanical philosophy, under the laws of physics and chemistry, with the ability to explain many of the functions of living beings, including humans. In this sense, explaining the human singularity is becoming a scientific activity. Many human characteristics benefit from being analysed by science. Language is one of them.

What does it mean, for instance, to have a scientific explanation of language? It is understanding language based on the causes behind it, on the physical bases from which it emerges, on the machine that produces it. That is, essentially, on the functioning of the brain. This way we can delve on the understanding of language from a purely naturalistic and material point of view, using our finest experimental tools for dissecting it.

Our current understanding of how the brain works is very limited; we have tools to understand the molecular basis for the transmission of neural impulses, a list of genetic mutations that produce malfunctions, good

imaging of the parts of the brain that work when we carry out specific tasks, and a good map of the brain's neural connections. We have advanced a lot, but we still ignore the series of causal connections that could help us to understand the phenomena from the molecules to the organs. That will take a long time.

Our brain can explain many things related to speech. It explains nothing, though, about the specific language we speak, but it does confirm that language is an innate function in humans, as predicted a long time ago by Noam Chomsky. And neuroscientific tools help to define this function, functionally showing everything we detect and how the circuits of the brain are activated by specific functions related to language.

The exhibition «Talking Brains», held in CosmoCaixa (Barcelona) not long ago, brings us smoothly and with clarity to the world of the natural history of human language, using the tools of current biology, especially regarding imaging and dysfunction. It shows us the natural history of a distinctive feature of our species that plays a major role in making us what we are, humans; and how we are starting to understand the brain as a linguistic connectome (of circuits, of neurons). From biology, it is difficult to imagine where a fine understanding of the basis of language could lead us. The biology of recent decades has made us think about the small: if we understand basic – molecular – mechanisms, we understand biology. But, regarding our understanding of the basis of language, we are still far from knowing how coherent a description we can reach. At the moment we are following two paths: on the one hand, a rather social attempt to make us realise that science's participation in the study of language thanks to neuroscience can be very powerful. On the other, a path that allows researchers to keep tracing the basic mechanisms of operation of the most complex organ in the universe, our brain. 🌱

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**«OUR BRAIN CAN EXPLAIN  
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