

Book Review

The Human Advantage: A New Understanding of How Our Brain Became Remarkable

S. Herculano-Houzel

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If you are like me and enjoy neuropsychology or myth-busting then you will love *The Human Advantage*, as it has plenty of both.

The human brain comprises 100 billion neurons: this statement Suzana Herculano-Houzel often saw written by researchers, but no one ever referenced it or, when challenged by her, knew from where this 'fact' came. In her book, she describes how she invented a way of checking the number for herself, by 'turning brains into soup', and found it to be 86 billion. If you protest that 86 is close to 100, Professor Herculano-Houzel is ahead of you. The 'missing' 14 billion neurons could build an entire baboon brain, with 3 billion neurons' change.

Another 'fact' often repeated by neuro-researchers is that glial cells outnumber neurons 10 to 1 (or even 50 to 1), which can be pressed, in the public imagination, into the egregious nonsense that we use less than ten per cent of our brains. Glial cells are now known to have far more than a humble supporting role in the brain's architecture: Herculano-Houzel cites research which demonstrated that mice whose developing brains received human progenitor glial cells turned into faster learners. Her original contribution here was to count neuronal and non-neuronal (glial) cells in the human brain and find not a 1 to 50 preponderance but — equality.

The 'triune brain' — the notion that the human brain is a composite of reptile, mammal and uniquely human brains — dates back to 1964, and is best regarded as metaphor rather than biological truth. However Herculano-Houzel goes too far when she protests the triune brain is false because 'mammals did not descend from reptile-like beings' (page 7) and thus could not have such a palaeological relic inside their skulls. However, mammals evolved from therapsids, rulers of the early Triassic, who were mammal-like reptiles — they laid eggs on land, possessed reptilian lower jaws and so on.

The Human Advantage's pre-history is more compelling when it speculates on its own title — what is it that has put us *Homo sapiens sapiens* ahead? It seems that yet another 'fact' (that is, myth) is that human brains are anomalously large for our bodies. Rather, our brain is made in the image of other primate brains. Nor does our connectome — the 'wiring diagram' of neural connections — differ radically from cats or even pigeons, for instance. Our advantage may not be qualitative as quantitative: we just have more neurons in our pre-frontal cortex, a whopping 1.3 billion of them to crunch data. And, talking of crunching, the author believes neuron numbers alone were not enough, and we had to lose the crudivore diet too in order to evolve.

Raw foods held *Homo* back, it seems. Brain mass in the *Homo* lineage increased rapidly after the invention of cooking, one and a half million years ago, and Herculano-Houzel sees a connection in the two events. Cooked food needs less chunky skulls to chew it than raw — thus freeing up brain cavity space — and, synergistically, it yields around three times the nutrition, chemical energy that can be invested in brain development and use.

Chimpanzees, not renowned for their Executive Function skills, will wait for food to be cooked for them, in preference to eating it immediately, raw. Perhaps it was the same for our ancestors — and once the tastiness of cooked food was learned, the secrets of its preparation became forever ours, as much a part of us, in a way, as our mitochondria. Successive waves of cultural evolution ramped up this first gain. The human invention of fire did not merely prefigure cooking, but our digital cookbooks too. Suzana Herculano-Houzel does not convincingly explain why our cousins *Homo sapiens neanderthalensis*, who also cooked and were bigger-brained too, did not out-evolve us, but that is another work, and the one she has provided is already very rich and filling.

I would recommend this book to any psychologist. In Essex EPS, we have termly meetings of EDEN (EP Development of Educational Neuroscience), and the book generated a lot of interest here.

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