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**Ask A Genius 93 – Life and Death (8)**  
**Scott Douglas Jacobsen and Rick Rosner**  
**February 18, 2017**

*\*Footnotes in the interview & references after the interview.\**  
*\*This session edited for clarity and readability.\**

**Scott: Two things come to mind there – well, three actually. One, all of evolution builds on previous structures and functions. So any prior structure with an implied function will develop its future possible paths, or imply a narrow set of future possible paths, in future organisms that will be its future successful descendants.**

Rick: Okay, in other words, you're working from a library of available apps.

**S: Absolutely! I love it when you make things more concrete. Thank you for that. Another one is the rapid increase follows that, I think. Where there must be a specific set of paths, that brain volume increase, interconnectivity, complexity, and just raw brain cell number increase follow a certain path along that (Robson, 2011; Tuttle, 2015; Garrett, 2014; Cairó, 2011; Gilbert et al, 2005; The University of Chicago News Office, 2006; Hawks, n.d.; Smithsonian Institution, 2016; University of Colorado Denver, 2012; McAuliffe, 2011;**

**Hofman, 2014).**<sup>1,2,3</sup> **Once you get that going, it just starts going. Another one that goes along that might be language, and you've talked about this before. You start with grunting, then**

<sup>1</sup> *Complexity of Our Brain* (2014) states:

*In the past we took a different attitude to studying the brain. Most of the scientific writing on the brain was focused on establishing the superiority of human intelligence. But there is not one single factor that we can apply to distinguish our brains from those of other animals. We cannot just use size, because some mammals (eg whales) have bigger brains. Perhaps it is the size of the brain in proportion to the body.*

*When we try that by measuring the Encephalization Quotient (EQ) ratio, small birds beat us. Perhaps it is size, EQ and something else. The correct question is to ask what aspects of the world are we, as humans, trying to represent in our brain? And how complex is the brain really?*

*In 2009, the Brazilian scientist Suzana Herculano-Houzel performed a review of what we know about the physical structure of the brain. The adult human male brain has 86 billion neurons--more than any other primate. Each neuron has between 1,000 to 10,000 synapses that result in 125 trillion synapses in the cerebral cortex alone. That is at least 1,000 times the number of stars in our galaxy. Stephen Smith from Stanford University reported that one synapse might contain some 1,000 molecular-scale switches. That is over 125,000 trillion switches in a single human brain.*

Garrett, M.D. (2014, February 25). *Complexity of Our Brain*. Retrieved from <https://www.psychologytoday.com/blog/iage/201402/complexity-our-brain>.

<sup>2</sup> We can consider the encephalization quotient as well. *Genetic links between brain development and brain evolution* (2005) states:

*EQ is calculated by one of two allometric scaling equations:  $EQ = E/P^{0.28}$  and  $EQ = E/P^{0.59}$ , where  $E$  is brain weight and  $P$  is body weight. Although exponents of 0.67 (Ref. 1) and 0.75 (Refs. 102,103) have been postulated for mammals, these high values are only suitable for comparisons at broad taxonomic levels and are not appropriate for closely related species 36, 104, 105, 106, 107, 108. For related species, much lower exponents have been proposed, ranging from 0.28 (Refs. 36,104) to 0.59 (Ref. 105). Given the uncertainty in the exponent and the debate over the relevance of EQ in gauging an animal's brain capacity (see Ref. 109 and accompanying commentaries), two sets of EQ values are presented, one calculated from the lower-bound exponent of 0.28, the other from the upper-bound value of 0.59. a | EQ values for species residing along the primate lineage leading to *Homo sapiens*.*

Gilbert, S.L., Dobyns, W.B., & Lahn, B.T. (2005, July). *Genetic links between brain development and brain evolution*. Retrieved from [http://www.nature.com/nrg/journal/v6/n7/fig\\_tab/nrg1634\\_F1.html](http://www.nature.com/nrg/journal/v6/n7/fig_tab/nrg1634_F1.html).

<sup>3</sup> *Bigger Brains: Complex Brains for a Complex World* (2016) states:

***Brain size increases slowly***

*From 6–2 million years ago*

*During this time period, early humans began to walk upright and make simple tools. Brain size increased, but only slightly.*

***Brain and body size increase***

*From 2 million–800,000 years ago*

*During this time period early humans spread around the globe, encountering many new environments on different continents. These challenges, along with an increase in body size, led to an increase in brain size.*

***Brain size increases rapidly***

*From 800,000–200,000 years ago*

**start developing language, and then that starts developing with cultural aspects like writing (Bryant, 2017).<sup>4</sup>**

R: If you could think about things via tags, which are words, that stand for things and manipulate them in your consciousness and hold them in your consciousness are more compact than having to think about the thing itself. It is probably super-efficient in holding things in consciousness. So that language – I hate slippery slope stuff – offers advantages that are so powerful that it pushes the development to a fairly sophisticated full language. It is like the colonists landing on the East coast of America (Hoffman et al, 2016; Pringle, 2012). Europe is already fairly highly developed. There are a quarter of a billion or a half of a billion people in Europe at the time of the colonists, but the US is fairly sparsely populated (U.S. Department of State, n.d.). It's got all of these resources. Ka-boom! Within a couple hundred years, the colonists have spread across 4.5 or 5 million square miles of undeveloped country and just sloppily cut down forests, throw down railroad tracks, throw up a zillion towns, because it is easy to develop here. I guess brain and language development are similarly a treasure trove of benefits versus costs. When you have all of the pieces in place for this brain explosion to happen, it will happen super-fast evolutionarily to the point where it looks hard to explain.

**S: You talked about religion at the outset of this.**

R: Yea, yea, I got diverted.

**S: I think there's something important there, though, that can tie back in. If someone takes the Mysterian view, and if they're applying it within a traditional religious view such as the Abrahamic ones, and what they deem, conveniently, essential mysteries are proof of a divine hand, are they right or are they wrong?**

R: Back to this book I am reading, I knew Nietzsche said, "God is dead" (Amazon, 2017; Magnus, 2015; Philosophy Index, 2017; Blount, 2016; Wicks, 2016).<sup>5</sup> I didn't know he said it at

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*Human brain size evolved most rapidly during a time of dramatic climate change. Larger, more complex brains enabled early humans of this time period to interact with each other and with their surroundings in new and different ways. As the environment became more unpredictable, bigger brains helped our ancestors survive.*

Smithsonian Institution. (2016, February 6). Bigger Brains: Complex Brains for a Complex World. Retrieved from <http://humanorigins.si.edu/human-characteristics/brains>.

<sup>4</sup> *How did language evolve?* (2017) states:

*Primates have an advanced system of communication that includes vocalization, hand gestures and body language. But even primates stop short of what man has been able to achieve -- spoken language. Our ability to form a limitless number of thoughts into spoken word is one of the things that separates us from our less evolved cousins. While we know that language first appeared among Homo sapiens somewhere between 30,000 and 100,000 years ago, the secret to how language evolved is still unknown...*

Bryant, C.W. (2017). *How did language evolve?*. Retrieved from <http://science.howstuffworks.com/life/evolution/language-evolve.htm>.

<sup>5</sup> *Friedrich Nietzsche* (2015) states:

the same time evolutionary theory hit and was prompted by that. That once you buy the theory of evolution then it is much harder to buy the idea of divine creation, and the theory of evolution was a major part of what some other major author calls disenchantment that happened in the mid-19<sup>th</sup> century because the magic was taken away from everything because there were scientific explanations available. So it is only 150 years later and there are still plenty of people, perhaps most of the people in the world, who still buy religious explanations for certain aspects of existence above technical and scientific explanations. Those beliefs will, for the next couple centuries, continue to tangle with technical changes in how we live and how we fight off death. Divine conceptions of people will generally be conservative. The same way conservatives are marriage is between a man and a woman (Conservapedia, 2016; Blackburn, 2011; Bible Study Tools, 2017).<sup>6</sup> They will argue a human is deserving of the most respect legally and culturally among all creatures, natural or artificial. That's somebody with one brain and one bod.

### **S: What about humanists claiming the same?**

R: Okay. There will be religious arguments. There will non-religious, but traditionalist or conservative, arguments. I can imagine “one brain in one body” in the same way people say, “Marriage is between a man and a woman.” That'll have to be fought over in courts and legislatures and by people who are willing to show they are as deserving and dignity as traditional humans, even though they're living in weird social and information-processing relationships.

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*Friedrich Nietzsche, (born October 15, 1844, Röcken, Saxony, Prussia [Germany]—died August 25, 1900, Weimar, Thuringian States), German classical scholar, philosopher, and critic of culture, who became one of the most-influential of all modern thinkers. His attempts to unmask the motives that underlie traditional Western religion, morality, and philosophy deeply affected generations of theologians, philosophers, psychologists, poets, novelists, and playwrights. He thought through the consequences of the triumph of the Enlightenment's secularism, expressed in his observation that “God is dead,” in a way that determined the agenda for many of Europe's most-celebrated intellectuals after his death. Although he was an ardent foe of nationalism, anti-Semitism, and power politics, his name was later invoked by fascists to advance the very things he loathed.*

Magnus, B. (2015, August 19). Friedrich Nietzsche. Retrieved from <https://www.britannica.com/biography/Friedrich-Nietzsche>.

<sup>6</sup> *Marriage* (2016) states:

*Marriage is the divinely ordained covenant between one man and one woman, and is intended to be for life. (Genesis 2:24) This is recognized by the majority of churches. The unity between a man and a woman in marriage is an expression of the spiritual relationship that God desires His creation to realize with Him. The first marriage occurred nearly 6,000 years ago in the Garden of Eden, in the area of the world that we now know as the Middle East. The first couple was Adam and Eve, and the Lord Jesus specified that it was male and female that God joined together in marriage for life. (Matthew 19:4-6)*

Conservapedia. (2016, July 21). Marriage. Retrieved from <http://www.conservapedia.com/Marriage>.

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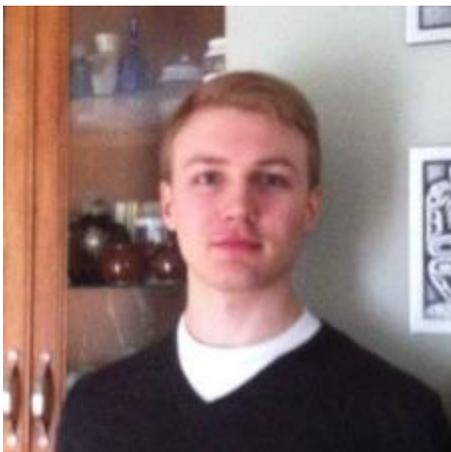
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