

Is There a Link Between Autism and the Capacity for Invention?

It is clear that our hominid ancestors could use simple stone tools. For example, *Homo habilis* and *Homo erectus*, who both lived 2 million years ago, used stone axes and hammers. And so could the Neanderthals who lived as recently as 40,000 years ago. But despite small changes in the design of their tools, for millions of years, there was little evidence for generative invention: the ability to invent in multiple ways, not just as a one-off. If we look at non-human species alive today, a lot of animals can use simple stone tools. Chimpanzees, for example, can use a rock as a hammer to crack a nut, and crows can drop a stone to raise the water level to be able to reach a worm. Both the behavior of other animals and our hominid ancestors can be parsimoniously explained as the result of associative learning, that is, forming an association between two items, A and B, with little sign of generative invention.



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But then, 70,000 to 100,000 years ago, when *Homo sapiens* was on the scene, the rate of inventions suddenly took off, and it's been unstoppable ever since. Suddenly, we see the capacity for generative invention, not just inventing once, but inventing non-stop. A cognitive revolution had occurred in the human brain.

What was this cognitive revolution? There were two new circuits in the human brain, the Empathy Circuit and the Systemizing Mechanism. The Systemizing Mechanism allowed humans to look for special patterns in the world, which I call "if-and-then" patterns. These are the basis of any system. If I take something, and I do something to it, then I get an outcome. The Systemizing Mechanism allowed us to analyze the world to find such patterns and confirm that they hold true. To do this, we repeat our observations over and over again. Once confirmed, we then can vary the mechanism by experimenting with the "if" or the "and". If we produce a new pattern, that is an invention. I borrow this terminology from the 19th century logician George Boole, who analyzed the structure of thought.

We can infer the existence of the Systemizing Mechanism in the modern human brain because 75,000 years ago, we see the first jewelry. If I make a hole in each shell, and thread a string through each hole, then the shells will form a necklace. And 71,000 years ago, we see the first bow and arrow. Again, the same "if-and-then" algorithm: If I attach an arrow to a stretch fiber, and release the tension in the fiber, then the arrow will fly.

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The earliest musical instrument, 40,000 years old.

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And 40,000 years ago, we see the earliest musical instrument that has ever been found: a flute made from a hollow bone. If I blow down the hollow bone and cover one hole, then I make a specific sound.

Mousterian point. Place of discovery: Le Placard cave, Vilhonneur Charente, France.

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But is the link between autism and pattern-seeking genetic? We had the opportunity to work with the personal genomics company 23andMe, and found that the genetic variants associated with high systemizing overlap with the genetic variants associated with autism. So some of the genes that cause autism also cause talent in pattern recognition. This leads to a prediction: that autism might be more common in places like Silicon Valley. We went to the Dutch city of Eindhoven, where one-third of jobs are in IT and which is home to the Eindhoven University of Technology, much like MIT, and where the Philips Factory has been for over 100 years. We found autism rates were twice as high in Eindhoven compared to two other Dutch cities, Utrecht and Haarlem, matched for demographics. This is again consistent with a genetic link between autism in the child, and a talent in pattern-seeking among their parents.

So, we have evidence that the genes for autism have driven human invention. And yet, how are we as a society treating autistic people? The majority of autistic adults are unemployed and have high levels of poor mental health, likely the result of a lack of support or from being excluded from [education](#) and work. We owe autistic people a huge debt of [gratitude](#) for the role their genes have played in human progress, and we have a moral responsibility to ensure no group of individuals is deprived of their human rights to education, employment, and participation in society. It's time for a change. We can learn from the Israeli army, which has a special unit that only recruits autistic adults because of their aptitude to look at thousands of aerial photographs to look for unexpected patterns that might be a sign of terrorist activity. They are making sure autistic people are included and are playing their part in society.

It's time to embrace the concept of [neurodiversity](#)—the idea that brains come in many varieties—and none is better or worse than another; they are just different.

This post also appears in the Trinity College Cambridge magazine The Fountain.