

## **Intuition and Habits**

Lauri Järvillehto, Aalto University

It is a deeply ingrained belief in our culture that man is, as Aristotle once put it, a rational animal. That is to say, it is thought that the faculty of conscious rational reflection is what sets the human beings apart from the rest of the animals.

Owing to this belief, the non-conscious side of thinking, making decisions and drawing inference has often been ignored in Western philosophy and science.

Intuition – the non-conscious capacity to make decisions, generate ideas and draw inference – has indeed perplexed philosophers for centuries. Firstly, it is difficult to properly define what we mean by ‘intuition’. Secondly, intuition is, as a topic of study, an evasive one. Intuition is somehow so deeply rooted in the functions of the mind that many philosophers and psychologists such as W.V.O. Quine and B.F. Skinner decided to do without it altogether. And yet, there it is: those unconscious thoughts that weave into new ideas that pop into the head in the middle of the night; that strange “gut feeling” that enables you to make outstanding new decisions and leaps of reasoning; those snap judgments that turn out to be exactly the right thing to do.

While the nature of intuition has perplexed philosophers and scientists for centuries, recent advents in neuroimaging and cognitive psychology have given us tools to develop new understanding of what intuition is and how it works. Furthermore, when intuition is studied in terms of its function, a central notion typical to the American pragmatist tradition comes to be of tremendous value. The notion of habit, advocated forcibly by e.g. Charles S. Peirce and William James, is seen here as crucial for explaining the development and function of intuitive thought.

In this paper, it is my purpose to study the nature of intuition in terms of the pragmatic notion of habit, as applied in the theoretical framework of the dual processing theory of thought prominent in cognitive psychology. The paper

draws both from the tradition of pragmatic philosophy of the mind and from well-validated empirical studies in neuroscience and cognitive psychology. While the argument involves also recourse to empirical data the questions addressed are themselves fully philosophical: What is intuition? And how does it work?

### *The Two Minds*

The dual processing theory of thought, advocated most prominently by Jonathan Evans (2010), is one of the most prominent mainstream theories of the structure of the mind in cognitive psychology. The basis of the dual processing theory is in the argument that the mind consists not of one, but in fact two systems. According to Evans:

Dual-process theories of thinking and reasoning quite literally propose the presence of two minds in one brain. The stream of consciousness that broadly corresponds to System 2 thinking is massively supplemented by a whole set of autonomous subsystems in System 1 that post only their final products into consciousness and compete directly for control of our inferences, decisions and actions. (Evans, 2003, p. 458.)

System 1 is evolutionarily very old, and it is typical to practically all the higher animals. It involves functions ranging from directing the autonomic nervous system to emotional reactions such as the fight or flight response. System 1 is very fast and powerful in terms of processing capacity, and it can be involved in great number of processes at one time. System 1 is what moves our legs, keeps our heart pumping and makes us feel excited when facing a new challenge. In addition, System 1 is the seat of non-conscious thought: the associative patterns typical to the human mind are generated in System 1.

System 2 is evolutionarily new, and typical mainly to humans and possibly few other species such as the higher primates. It involves functions such as rational thought, computation and self-reflection. System 2 is relatively slow compared to System 1, and its processing capacity is quite low, as a substantial number of

experiments from the last six decades has demonstrated. In the famous experiment by George Miller (1956) it was shown that a person can consciously maintain only about seven items of information. Dijksterhuis and Nordgren (2006, p. 97) argue that the range of the processing power of the conscious mind is around 10–60 bits per second. Csikszentmihalyi (1990, pp. 28–29) presents slightly different numbers, but still in line with the other findings. While the exact number varies from study to study, the nature of the findings are the same: the processing power of System 2 is very low.

There does not exist an extensive literature on the cognitive processing power of the nonconscious human mind, owing to the obvious limitations of its study. It is relatively straightforward to test the bounds of the conscious mind by showing people series of numbers, letters or pictures and asking them to repeat them shortly after. But one cannot really ask what a person is thinking non-consciously. Even if somebody were to answer such a question, the thought would have immediately become tainted by its having become a conscious thought.

While measuring non-conscious thought is tricky, there have nonetheless been some compelling cases made to illustrate its processing power. In the 1980's, neuroscientist Manfred Zimmermann argued, on the grounds of an analysis of the afferent nervous system of the human body, that the processing power regarding the sensory input processed by the non-conscious mind is in the order of 11.2 million bits per second. (Zimmermann, 1989.)

While Zimmermann's finding is one of the rare arguments concerning the processing capacity of the non-conscious mind, it too only addresses the capacity of the afferent nervous system. What processes take place in the neocortex or the limbic system are difficult to measure with the technology that we have right now. Suffice to say, given that the brain alone has some 100 billion neurons and 100 000 billion synapses to connect them, the potential information processing taking place is enormous: theoretically, every single

synapse can process one bit of information. While the exact scope of System 1 remains unknown for the time being, it is quite clear from the research that we have that the processing power of System 1 is gargantuan when compared to System 2.

While the raw processing power of System 2 is limited, it is nonetheless a very useful and powerful resource in itself. Whereas System 1 is mostly determined by habituated and autonomous processes, in System 2 we have the capacity to start and stop processes, and to redirect our activity. System 2 is, in other terms, the seat of our will – the capacity to consciously direct action.

On the grounds of the present scientific research, it appears that we have two functionally different mental systems whose capacity differs highly from one another. One of these concerns the autonomous and habituated mental functions. The other concerns the conscious capacity to affect and adjust actions. The processing power of System 1 alone does not, however, suffice to explain how we have such a capacity as intuition. A further look at the structure of System 1 is required.

We can study System 1 in terms of nervous correlates. The autonomous functions of the body – motions of the heart and the lungs, for example – are driven by the brainstem. Emotional responses correlate with changes in the limbic system. Non-conscious higher thought, visual and language processing, and motor function correlate highly with the neocortex. Of course, it should be remembered, that no portion of the brain works in isolation; the brain and the rest of the body form an intricate network of connections where correlations between certain functions and certain active areas can be pointed out.

Structural correlation does not, however, give us deeper insight as to how intuition comes to be. Certain areas in the brain, such as the neocortex, seem certainly to be more important to it. But how the activity in such areas of the

brain translates into intuitive thought – or any thought for that matter – is still unknown.

A more fruitful avenue of inquiry can be found in looking at the origin and functions of System 1 processes. System 1 processes can be roughly divided into ontogenetically and phylogenetically acquired processes, according to their source. Phylogenetic processes, such as the functioning of the autonomous nervous system, or the fight or flight reflex, are functions that we have been bestowed with through the biological evolution of our species. They are highly similar not only to all humans, but to much of the animal kind, all the way down to the smallest of reptiles. These processes have proven to be powerful to ensure the survival of a species.

Ontogenetic processes, in turn, are processes that are acquired through practice and experience. It is these processes that are the seat of intuition. Intuitive thinking is not, in other words, a magical know-all facility, but it is in fact highly specific to the domain of expertise of a person. In a large meta-analysis of studies on intuition, Erik Dane and Michael G. Pratt (2007) found this to be the case: intuitive capacity is, indeed, limited to one's own domain of expertise.

But what is the grounds of this expertise? Here, the American pragmatist philosophy offers a compelling answer.

### *Intuition and Habits*

According to Charles S. Peirce, a habit

denotes such a specialization, original or acquired, of the nature of a man, or an animal, or a vine, or a crystallizable chemical substance, or anything else, that he or it will behave, or always tend to behave, in a way describable in general terms upon every occasion (or upon a considerable proportion of the occasions) that may present itself of a generally describable character (Peirce, 1934, 5.538).

Central to the recognition of a habit are the results it would produce, given the proper circumstances:

the identity of a habit depends on how it might lead us to act, not merely under such circumstances as are likely to arise, but under such as might possibly occur, no matter how improbable they may be. What the habit is depends on when and how it causes us to act. (Peirce, 1934, 5.400.)

Habits are not, however, just any dispositions to produce results. In fact, it is central to habits that they are acquired through multiple iterations. According to Peirce, habits

differ from dispositions in having been acquired as consequences of the principle [...] that multiple reiterated behavior of the same kind, under similar combinations of percepts and fancies, produces a tendency, – the habit, – actually to behave in a similar way under similar circumstances in the future (Peirce, 1998, p. 413).

In his seminal *Principles of Psychology*, William James argues that habits are at the very core of our being. He writes:

When we look at living creatures from an outward point of view, one of the first things that strike us is that they are bundles of habits. In wild animals, the usual round of daily behavior seems a necessity implanted at birth; in animals domesticated, and especially in man, it seems, to a great extent, to be the result of education. The habits to which there is an innate tendency are called instincts; some of those due to education would by most persons be called acts of reason. It thus appears that habit covers a very large part of life, and that one engaged in studying the objective manifestations of mind is bound at the very outset to define clearly just what its limits are. (James, 2007, p. 104.)

Habits are acquired or innate routines that produce a predictable result. They are often confused with less dynamic processes such as mechanisms or routines. Habits differ from mechanisms in that where the structure of a mechanism is fixed, a habit is malleable and plastic. A mechanism is identified by its structure; the habit is identified by the result it produces. A mechanism is highly susceptible to environmental changes: a clock may break down when a

stick is inserted into its cogs and wheels. Habits are, in turn, self-correcting: when some environmental obstacle arises, the habit adjusts to account for it. Mechanisms are relatively simple. Habits are typically very complex.

Habits possess “a structure weak enough to yield to an influence, but strong enough not to yield all at once.” (James, 2007, p. 105.) The ways to reach a given result vary from one situation to another – but given enough practice, we can acquire the habits of action that generate desirable results. James compares magnetism (a mechanism) to the desire of Romeo and Julia to embrace one another (a habit):

Romeo wants Juliet as the filings want the magnet; and if no obstacles intervene he moves towards her by as straight a line as they. But Romeo and Juliet, if a wall be built between them, do not remain idiotically pressing their faces against its opposite sides like the magnet and the filings with the card. Romeo soon finds a circuitous way, by scaling the wall or otherwise, of touching Juliet's lips directly. With the filings the path is fixed; whether it reaches the end depends on accidents. With the lover it is the end which is fixed, the path may be modified indefinitely. (James, 2007, p. 7.)

Where magnetism works always in a predictable manner, living beings vary their actions if an obstacle arises. Romeo has the habit of kissing Julia – and if a wall arises, he will find a way to effect this habit in another way.

Acquired habits are generated by experience and practice. While simple habits are generated relatively easily, complex habits such as those driving the intuitive capacity take years to develop. Indeed, in a famous meta-analysis, Anders Ericsson (1993) demonstrated, that to acquire world-class expertise in a given domain one must deliberately practice a minimum of 10 000 hours. That is three hours a day of focused practice, every day for the period of ten years.

This effect was presciently outlined already by James:

A path once traversed by a nerve-current might be expected to follow the law of most of the paths we know, and to be scooped out and made more

permeable than before; and this ought to be repeated with each new passage of the current. Whatever obstructions may have kept it at first from being a path should then, little by little, and more and more, be swept out of the way, until at last it might become a natural drainage-channel. (James, 2007, p. 108.)

The accuracy of James' view was later vindicated by Eric Kandel in his Nobel-winning studies. Kandel demonstrated that repeated stimulation of a nervous cell causes the synaptic connection to connected cells to strengthen. (Kandel, 2006.) Practice, indeed, does make perfect: everything we experience, and more forcefully, everything that we deliberately practice, shapes our nervous system so that the results typical to our domain of expertise become easier to produce. By consciously taking effort to learn new skills and ways of thinking – new habits – we are able to create new non-conscious System 1 structures that, while specific to our domain of expertise, enable us to utilize the massive processing capacity of System 1 to produce viable results.

Acquired habits are at the core of our existence, and they certainly are structured in a given way. All the same, they are also dynamic in terms of our hopes and wishes, as well as environmental variables. Habits are not only “in the head”, but they are embodied, and ultimately systemic. If a musician has the habit of playing Chopin on the piano on Friday nights, she cannot fulfil this habit if there is no piano available. In other words, the object itself is an essential part of the habit. One could of course replace the piano with a cembalo or a synthesizer, but with no instrument there would be no music either. The instrument is just as critical for the habit to be fulfilled as the nervous pathways that practice has grown in the musician's brain. The result would not be produced and the habit would not be fulfilled.

*Conclusion*

At the very core of intuition are the habits that we have generated by experience and practice. By acting in an environment, our nervous system and bodies adapt to work in it better, and so we gain the capacity to produce desired results autonomously, without the necessity to recourse to conscious thought. Intuition is not a magical innate know-all capacity to have great ideas by chance, but rather a quite predictable sign of expertise based on acquired habits. Intuitive thought works best when we hone our habits to best serve our interests by deliberate practice in our domain of expertise.

The present-day scientific research quite emphatically points to an interpretation of the human mind as consisting of two functionally different systems. Out of these systems, the System 1 that is in charge of non-conscious thought is central to intuition.

Intuition does not, however, concern all of our non-conscious thought. Many thoughts that occur to one are anything but intuitive; some are outright detrimental. Intuition concerns, in fact, only those ontogenetically developed processes that enable us to better adapt to an environment: acquired habits that have been generated by experience and practice.

Central to intuition are the habits that we acquire by experience and practice: the malleable dispositions to produce desirable results in a given context of action. Intuition is the non-conscious capacity to produce desirable results by relying on our acquired habits.

### *References*

- Csikszentmihalyi, M. (1990). *Flow: The Psychology of Optimal Performance*. New York: Harper Perennial.
- Dane, E., & Pratt, M. G. (2007). Exploring Intuition and its Role in Managerial Decision Making. *Academy of Management Review*, 32(1), 33–54.

- Dijksterhuis, A., & Nordgren, L. F. (2006). A Theory of Unconscious Thought. *Perspectives on Psychological Science*, 1, 95–106.
- Ericsson, K. A., Krampe, R. T., & Resch-Römer, C. (1993). The Role of Deliberate Practice in the Acquisition of Expert Performance. *Psychological Review*, 100(3), 363–406.
- Evans, J. S. B. T. (2003). In Two Minds: Dual-process Accounts of Reasoning. *Trends in Cognitive Sciences*, 7(10), 454–459.
- Evans, J. S. B. T. (2010). *Thinking Twice*. Chippenham and Eastbourne: Oxford University Press.
- James, W. (2007). *The Principles of Psychology, vol. 1*. New York: Cosimo.
- Kandel, E. R. (2006). *In Search of Memory: The Emergence of a New Science of Mind*. New York: W.V. Norton & Co.
- Miller, G. (1956). The Magical Number Seven, Plus or Minus Two: Some Limits on our Capacity for Processing Information. *Psychological Review*, 63, 81–97.
- Peirce, C. S. (1934). *Collected Papers of Charles Sanders Peirce volume V: Pragmatism and Pragmaticism*. Cambridge, MA.: Harvard University Press.
- Peirce, C. S. (1998). *The Essential Peirce: Selected Philosophical Writings, Volume 2 (1893–1913)*. Bloomington, IN: Indiana University Press.
- Zimmermann, M. (1989). The Nervous System in the Context of Information Theory. In R. F. Schmidt & G. Thews (Eds.), *Human Physiology* (pp. 166–173). Berlin: Springer-Verlag.