

In need of a Theory of Consciousness?¹

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Dr. Posner The puzzle takes over. You're not even trying to solve it anymore. Fascinating really... [...] Looking at increasing levels of complexity...

Nurse Monahan Until what?

P What do you mean?

M Do you ever get to solve the puzzle?

P No... When it comes down to it, research is just trying to quantify the complexity of the puzzle.

(Film dialogue, from: *Wit*²)

In the above film dialogue, the character of Nurse Monahan assumes that the aim of studying puzzles is to solve them. 'Dr. Posner' however explains that looking at a puzzle's complexity may well serve an entirely different purpose: he's fascinated by the complexity itself; his research is a means to an 'end' that lies within that complexity, not an attempt to rise above it.

Complexity

'Complexity' as a characteristic of natural processes, has two distinct and almost opposite meanings.

The first, and probably the oldest mathematically, goes back to Kolmogorov's attempt to give an algorithmic foundation to notions of randomness and probability³ and to Shannon's study of communication channels based on his notion of information⁴.

In both cases, complexity is synonymous with disorder and the lack of structure. The more random a process is, the more complex it is. An ideal gas, with the molecules bouncing around in complete disarray, is complex as far as Kolmogorov and Shannon are concerned. 'Complexity' in this sense refers to degrees of complication.

In the second sense however, 'complexity' refers to how structured, intricate, hierarchical, and sophisticated a natural process is. In this sense, 'complexity' is an indicator of how many layers of order or how many internal symmetries are embedded in a process. The human brain is complex in this sense because of the high degree of structure in its neural architecture, in the many different scales of information processing from perception to interpretation of stimuli, and in the intricate social behaviours it supports in human groups.

When confronted with a phenomenon, answering a simple question can reveal the distinction between these two meanings: is it complex or is it merely complicated?

¹ This paper is written in response to D. Roorda (2006), *Theories and Reality*.

² *Wit* (2001). Dir. Mike Nichols. Perf. Emma Thompson, Christopher Lloyd, Eileen Atkins, Audra McDonald, Jonathan M. Woodward and Harold Pinter. Home Box Office, Inc.

³ A.N. Kolmogorov (1965). 'Three approaches to the quantitative definition of information'. *Problems of Information Transmission*, Vol. 1, pp. 1-7.

⁴ C.E. Shannon (1948). 'A mathematical theory of communication'. *The Bell System Technical Journal*, Vol. 27, pp. 379-423 and 623-656, <http://cm.bell-labs.com/cm/ms/what/shannonday/shannon1948.pdf>. Retrieved: 5 February 2006.

Complexity theory is the – until now – last in line of the so-called decennial C-theories – cybernetics (1960s), catastrophe (1970s), chaos (1980s), and complexity (1990s) –, all bearing similar aspirations in formulating a theoretical basis for the interplay between simplicity and complexity. Going one step further than its predecessors, complexity theory not only asks how complexity arises from simplicity, but also how apparent simplicity arises from complexity.

The theory's main focus is the phenomenon of emergence, which exhibits a number of characteristics, such as:

- Pattern formation in which the patterns take on functional utility
- Spontaneous self-organization
- The emergence of cooperation
- Hierarchical structure
- Collective properties beyond those directly contained in the parts.

Reductionism

There is a distinction to be made between the *method* of analytical reductionism (*Rm*) and the *theory* of ontological reductionism (*Rt*), however often the two are bracketed together, like 'studying the puzzle' and 'solving the puzzle' were by Nurse Monahan.

Rm is a scientific rationality proclaiming that 'the best scientific strategy is to attempt to reduce explanations to the smallest possible entities'⁵, in other words: in applying Ockham's Razor and the Principle of sufficient reason, a system can be understood solely in terms of how its parts work.

Rt holds that eventually – and consequently! – a rigorous application of *Rm* will lead to an absolute and thus ultimate knowledge, deposited in the Theory of Everything.

Now, emerging events are hard to explain using a reductionistic approach, if at all, since the properties of the whole cannot be reduced to properties of its parts. The *Rt*-reductionist would probably rebut by stating that it is not disproved that any seemingly non-linear complexity is mere complicity, the linear properties of which are not yet understood. His problem, however: the methods at (his) hand seem to fall short...

It is widely acknowledged that *Rm* has produced valuable (scientific) insights, both deepening and broadening our perceptions of the world. And although its application is limited, *Rm* does not *a priori* deny events having a non-deterministic or emerging nature; it simply cannot be applied in these cases.

Rt however contradicts any emergence theory, in assuming all events to be deterministic. Isn't *Rt* thus based on an essentially fallacious reasoning, since, although *Rm* is necessarily prerequisite to *Rt*, *Rt* is not the necessary consequence of *Rm*, and probably not even a contingent one..? In that, *Rt* seems to fundamentally contradict itself...

Moreover, in its monistic ontology, stating that all is of the one essential principle deposited in the Theory of Everything – which must be knowable to us, for otherwise *Rt* would be 'mere' metaphysics, or even religion – *Rt* assumes there are no inherently unknowable facts. But how are we able to establish that this is the case? The assumption is an ideology.

Gödel's Incompleteness Theorem shows that in any formal system complicated enough to describe the numbers and operations of arithmetic, as long as the axioms don't lead to

⁵ Wikipedia, 'Reduction (philosophy)', [http://en.wikipedia.org/wiki/Reduction_\(philosophy\)](http://en.wikipedia.org/wiki/Reduction_(philosophy)). Retrieved 3 February 2006.

contradictions there will always be some statement that is not provable – and the contradiction of it will not be provable either. It also shows that there's no way to prove from within a system – a closed system by definition – that the system itself won't give rise to contradictions. So, any formal system worth bothering with will either sprout contradictions – which is bad news, since once you have a contradiction, you can prove anything at all, $2 + 2 = 5$ included – or there will be perfectly ordinary statements that may well be true but can never be proved.

This means we'll never fully understand the world, ourselves included: the mind can only be sure of what it knows about the world by relying on what it knows about the world. The rest is ideology...

So, the main problem is epistemic. And although the puzzle may be unsolvable, the aim of studying it may well be trying to further quantify its complexity.

Since the *Rm*-way of thinking doesn't seem to be appropriate to tackle the challenges that arise from complexity, perhaps scientific rationality should include the cognitive subject along with the method and the object, as well as their interrelationship in the cognition process. It would not only require crossing the borders – and consequently closing the gap – between the two cultures of natural sciences on the one hand, and social sciences and humanities on the other, but even more so, it would require understanding the very basis of the cognition process, our consciousness...

We say that everything has a beginning. This is one side of the matter. There is another according to which everything is without a beginning – beginnings, and endings also, being, but as it were, steps cut in a slope of ice without which we could not climb it. They are for convenience and the hardness of the hearts of men who make an idol of classification, but they do not exist apart from our sense of our own convenience.

(Samuel Butler, *The Note-books*: 'Ex nihilo nihil fit'⁶)

I think we're still a long way away from the next decennial C-theory, that of Consciousness, since any effort in stating anything about the human consciousness is seemingly bound to be self-referential, for we cannot jump over our own knees.

But maybe, as a friend of mine once put it, we'll be able to persuade cats someday to study us and let us know what they think...

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⁶ Samuel Butler, *The Note-books*. The Project Gutenberg eBook (2004), transcribed from the 1912 A.C. Fifield edition by David Price, <http://www.gutenberg.org/dirs/etext04/nbsb10h.htm>. Retrieved 3 February 2006.