Review of: "The Evolution of Consciousness Theories"

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Commentary on the Work of Ashkan Farhadi "The Evolution of Consciousness Theories"

> *One of the most highly developed skills in contemporary Western civilization is dissection: the split-up of problems into their smallest possible components. We are good at it. So good, we often forget to put the pieces back together again.*
>
> *Alvin Toffler*

Introduction

Let us start with the following words by Mark Latash:

> *For any area of science, questions have to be formulated in an adequate language. As of now, unfortunately, no such language has been introduced for biology*
> *[Latash, 2012, p. 1].*

Important: even more so for kinesiology, anthropokinetics, and psychology.

Mark is a trained physicist, neurophysiologist, and motor control specialist; I am an engineer working on anthropokinetics. We both have a physical-mathematical style of reasoning. It consists in creating an adequate language that defines – as clearly and concisely as possible – all the concepts necessary to later build any mental construct. In psychology, which

was essential to me in anthropokinetics, I encountered a different style of reasoning. At first, I had to read a thick book without short and clear definitions, and only later did I manage to get a vague idea of what the book was actually about.

Reading Ashkan Farhadi's interesting work, I couldn't help but feel that the multiplicity of theories of consciousness, along with the entanglement of attention and memory in them, is due to the lack of adequate, simple, clear, and universally accepted language. This is why psychologists don't understand each other, not to mention other scientists. The key fact is that it is the word that makes up the most primordial fabric of science (with a capital "S"): theory. For example, in one theory, consciousness is identified with awareness, while in another theory, they denote different mental constructs. Moreover, consciousness, identified with awareness or not, is considered to be a rather independent mental phenomenon.

Such a situation is – at least to some extent – justified by the fact that the matter of psychology is much more complex and multifaceted than that of physics. Here, the explanatory power of elegant, simple, and user-friendly mathematics is close to zero. Therefore, it is extremely difficult – if possible at all – to formulate concise but comprehensive definitions. Nevertheless, language, which is the basic material for theory, must be communicative. It therefore seems necessary to formulate simplified definitions. Here we are dealing with a specific compromise between simplicity and precision. In this context, the words of the prince of devils, Woland, to Immanuel Kant sound instructive:

> *As you will, Professor, but what you've thought up doesn't hang together. It's clever, maybe, but mighty unclear. You'll be laughed at [Bulgakov, 2008, p. 25].*

On the other hand, the inverted U principle, though often regarded as naïve, is commonly applied because of its simplicity. Crucially, if psychology is to be a full-fledged citizen of science and not a kind of magic, psychological problems must be described in language that is also accessible and understandable enough to non-psychologists.

It seems impossible to comment on all the theories mentioned by Farhadi in one short article. However, in order to sharpen my view of anthropokinetics (as well as psychology, insofar as it was necessary for the analysis of human motor behaviour), inspired by my guru, Professor Janusz Maria Morawski, I developed my own system-theoretical approach (STA). It is a theoretical description of the processes taking place in reality – and therefore also useful in the description of human motor behaviour – in which the cause-and-effect chains are systemic in nature. As a result, in STA, the meaning of any term is not due to its 'innate' nature, but rather to its connections to other elements, with which together it forms a coherent, goal-oriented system. It can also be seen as an attempt to solve, as far as possible and to some extent, the problem posed by Mark Latash.

Mathematics and system

The Queen of Science does not reign in anthropokinetics and psychology. Biologist Jack Cohen and mathematician Ian Stewart wrote:

> *Mathematics wallows in emergent phenomena. It also came to terms, long ago, with something that often puzzles nonmathematicians. By definition, mathematical statements are tautologies. Their conclusions are logical consequences of their hypotheses. The hypotheses already "contain" the information in the conclusions. The conclusions add nothing to what was implicitly known already. Mathematics tells you nothing new [Cohen, Stewart, 1994, p. 234].*

Unlike a mathematical equation, a system has a miraculous ability to create a qualitatively new, unpredictable system effect. For example, life, which cannot be derived from the properties of the chemical elements that make up a living organism, is a profound illustration of this fact. Moreover, anthropokinetic and psychological issues are much more complex than biological ones.

An equation is the product of a stable and invariant mathematical formalism. It can be used to solve many similar tasks. On the other hand, a system is a single-use project, strictly 'tailor-made' for the task at hand. Once this issue is resolved, the system disappears. To perform the same or a similar task again, it is necessary to create a new system. It is this elusiveness that creates the specificity of biology, anthropokinetics, and psychology. This is why Nature has used systems, not equations, in the process of evolution.

Paradoxically, invariance is the power of mathematics, and elusiveness is the power of psychology (and anthropokinetics). The latter determines the limited – if at all – usefulness in psychology of experimental research, modelled (or even aped) on physics or technology, and the use of mathematical methodology in such research.

Here we encounter the first significant difference between the many theories put forward by Farhadi and STA. In the latter approach, consciousness is not an independent concept and term. It is a link in the chain of information processing from the reception of stimuli (sensitivity) to the execution of a motor response in the physical environment. Motor – because in STA, movement is the only way to reveal what is happening in the mind, no matter how abstract the level of reasoning is at which it happens. In fact, evolution has shaped the physiological central nervous system (not the psychological mind!) only to control, as efficiently as possible, the movements of a living organism. Because it is movement that constitutes the only means by which a living being can influence the processes and phenomena that occur in the environment.

In short, in STA, consciousness is part of a system consisting of the brain and mind, and it is only in the system that it makes any sense.

The knowledge, the consciousness, and the stream of consciousness

An adult usually has very extensive knowledge of many fields: Plato's philosophy, quantum mechanics, the principles of motion, frying potato pancakes, the "Goldberg variations," and many, many others. Such extensive knowledge, as a whole, is not able to steer any particular mental-motor operation. For this purpose, it becomes necessary to 'cut out' from the entire body of knowledge only those elements that are necessary to perform a given task. In this context, the words of the philosopher William James are very instructive: "*The essence of genius is to know what to overlook."*And also the

‘007 Principle’ by philosopher Andy Clark, which reads, "*to know only as much as you need to know to get the job done*" In STA, this is the portion of knowledge that makes up consciousness [Petryński, 2014; Petryński, 2016a; Petryński, 2016b]. So, it has both time and information capacity limitations. It is only these limitations that make consciousness controllable. In this way, it enables the creation of a well-thought-out, goal-oriented benchmark for efficient – as far as possible – **motor operation**. Let the term denote a series of movements aimed at solving a specific task in the environment.

The consciousness itself cannot control directly any motor operation. However, it makes up a space for the series of processes that control such an operation – the **stream of consciousness** [Petryński, 2016b; Petryński, 2018; Petryński, Staszkiewicz, Szyndera, 2022]. It starts usually with extrinsic physical stimulus **reception** that evokes the creation of a physiological sensory impulse in a sense organ; roughly, this may be identified with a quale. Then, in the process of **perception**, the quale extracts a psychological chunk of knowledge from memory; ‘chunk’ is, after George Miller [Miller, 1956], the traditionally used name for a portion of information in anthropokinetics. At that moment, the stream of consciousness leaves the area of physiology and enters that of psychology. The next links are **attention**, **motivation**, and **intellect** (instinct, intuition, and intelligence). Such a series of events leads to higher and higher regions of abstractness, no matter whether in proprioceptive, contactceptive, teleceptive, verbal, or symbolic modality. At that point, the afferent (sensory) chain of the stream of consciousness ends and the efferent (motor) chain begins, from high regions of abstractness towards reality. It consists of the psychological **intellect** – in which a pattern of future motor response is formed – **foresight**, **decision**, and **skill**. This is followed by physiological motor impulses and their psychological ‘twins’ – **efferent copies**. Finally, there is the execution of the**motor operation** in physical reality. Important: the task is an essential element of the system. It is the task that gives purpose and meaning to the entire stream of consciousness, which is described in detail, e.g., in [Petryński, 2016b; Petryński, Staszkiewicz, Szyndera, 2022].

In such a model, a clear distinction can be made between the concepts of awareness and consciousness. Awareness is the product of reception, of a physiological nature, while consciousness is the product of perception, of a purely psychological nature. The first consists mainly of sensory experiences (qualia), while the second is made up of information.

The knowledge that creates consciousness can be assigned to three categories:

1. Reactive knowledge, immediately extracted from memory as a result of the reception of a stimulus,
2. Retroactive knowledge, formed in the past, extracted from memory spontaneously, without receiving extrinsic stimuli; it is a task of **instinct**,
3. Proactive knowledge, created on an ongoing basis in the imagination for the needs of future motor operation, the pattern of which is being developed; this is the task of **intuition**.

The point is that in STA, the ultimate ‘armed force’ of the intellect – the**intelligence** that finally shapes the pattern of future motor operation – needs all the information and all the rules of its processing to do its job. If reactive and retroactive knowledge are not enough, then proactive knowledge, which can only be born in the imagination and is driven by intuition,

becomes necessary.

It is worth noting that each of the categories of knowledge – especially the proactive one – can be a source of errors. In this case, even impeccable intelligence is not able to build a pattern for absolutely unfailing motor operation in reality. 'Iron logic' is therefore not as reliable a tool for thinking as in Arthur Conan Doyle's novels about Sherlock Holmes.

In STA, the concept of consciousness can therefore be defined as follows:

> ***Consciousness*** *– a dynamically changing component of a quasi-static whole; the multimodal knowledge of an individual, activated at a given moment by perception, directed by attention, aimed at dealing with a task at hand [Petryński, 2016a, p. 36].*

Intuition and cognitive emptiness

The most mysterious and elusive tool of the intellect – and consciousness as a whole – is undoubtedly intuition. It is the source of the greatest achievements of the human mind. It is not filled with knowledge, but produces it. However, the intellectual space of this process is by no means completely empty, but is what Stanisław Kowalik called '*cognitive emptiness'* [Kowalik, 2020]. In this way, it creates an orderly 'blank page' for knowledge that does not yet exist, i.e., a 'skeleton of future expertise' specific to a given person.

The nature of cognitive emptiness may be well illustrated by Janusz Morawski's work entitled "*Newton's Music or Bach's Physics? A mini-treatise on time, movement and dynamics in nature and music*" [Morawski, 1996]. Newton was about 40 years older than Bach, but – roughly – they lived in the same intellectual and scientific milieu of the seventeenth century. They were both geniuses. Accepting Kowalik's notion of cognitive emptiness, it can be said that if Newton's cognitive emptiness was musical and Bach's – physical, then Newton would have composed the "*Goldberg Variations*" and the "*Brandenburg Concertos*", whereas Bach would have written the "*Philosophiae Naturalis Principia Mathematica*." Symptomatically, the 'common denominator' of the achievements of both these Giants was mathematics. Unfortunately, the Empire of the Queen of Science includes neither the Principality of Psychology nor the County of Anthropokinetics. Therefore, that would be a topic for another article. To sum up, the imagination and intuition that co-build the consciousness for a given task are the most enigmatic and intellectually powerful instruments of the human mind.

By the way, in STA, consciousness usually involves a single stream of consciousness, acts almost instantaneously, and produces a single motor operation or part of it. However, it leaves behind a purely mental 'trace' – an efferent copy. Its task is, among other things, to build new knowledge and serve as a reference point for improving a given mental-motor operation. Thus, more complex mental tasks – especially those that involve intuition – may require multiple successive streams that form a coherent system for solving a given task. For example, Albert Einstein needed about 5-6 weeks to develop the special theory of relativity [Calaprice, 2011], but it took him 8 years to create the general theory of relativity (the theory of gravity) [Wróblewski, 2007]. The former may be assigned to 'common sense', verbal D-rung, whereas the

latter – to ‘crazy’, symbolic E-rung. In conclusion, in the presented model of consciousness, multiple streams of consciousness can perform not only immediate motor operations, but also achieve far-reaching intellectual goals.

Memory and attention

Ashkan Farhadi also wrote about memory and attention. In STA, memory is like a cloud, rising above consciousness and providing it – especially particular links of the stream of consciousness – with the necessary knowledge, like rain. With the stream of consciousness, it does not form a sum, but a system. It always acts as a coherent whole, so that it is impossible to discern in the operation of the system what comes from memory, what from instinct, what from intuition, and what from intelligence. By the way, that's why the intelligence quotient (IQ) doesn't make sense in STA.

STA makes it possible to combine already existing theories of memory into one coherent system. In the stream of consciousness, the short-term sensory store STSS, the short-term memory STM, and the long-term memory LTM of Richard Atkinson and Richard Shiffrin [Atkinson, Shiffrin, 1968] should be placed in the afferent chain, while the working memory WM [Miller, Galanter, Pribram, 1968] should be placed in the efferent chain of the stream. The afferent chain processes separate chunks of information, while the efferent chain processes sub-patterns and patterns of future motor operation. Episodic memory [Tulving, 1972] can be placed at the ‘sensory’ rungs of ML (proprioceptive A, contactceptive B, and teleceptive C), while semantic memory should rather be placed at the verbal D-rung and symbolic E-rung. The former resembles geometric, common-sense images of reality, as in Leonardo da Vinci or Rembrandt, and the latter – crazy, abstract representations, as in Pablo Picasso or Salvador Dalí. It is astonishing that in science some features of reality are more evident in the ‘topological’, apparently insane projection of the world around us (e.g., in quantum physics) than in its obvious, clearly visible image.

In STA, attention is one of the three ‘mindguards’, preventing the intellect from becoming overloaded. The first, independent of a person's knowledge, is the limited capabilities of the sensory organs. Therefore, not every physical stimulus triggers a sensory impulse and further information processing. The second, shaped in the course of a person's life, is attention. It selects only the important chunks of information (affordances) and discards the useless ones. The third is skills that prevent the development of patterns that already exist in memory. By the way, it is the miraculous ability of the stream of consciousness, connected by the ‘bracket’ of memory, that the intellect somehow ‘knows’ in advance what skills it has, working out a pattern of future motor operation.

Final remarks

My article is a commentary, not a review. I would like to present a different philosophy of consciousness (and the phenomena associated with it) than the one by Ashkan Farkadi. In this regard, the words of psychologist John Cacioppo seem very instructive:

> *Contemporary psychological scientists stand on the shoulders of those who went before. From this perch it is now*

> *possible to see that the bounded fields of the 20th century are related parts of the same landscape. This is a requisite step for bringing research on pieces of related problems together to address bigger questions and to develop more comprehensive scientific theories [Cacioppo, 2008].*

On the other hand, in the opinion about my book "Motor Control in Humans. A System-Theoretical Approach," kinesiologist Timothy Lee wrote:

> *Wacław Petryński's book is an important historical/philosophical/psychological treatment of the field of motor control and learning. It pulls together a diverse literature via a systems approach, and connects many heretofore areas that previously existed in their own vacuums. It is not an easy read, but a necessary one for the student of motor control who wishes to gain a larger conceptual understanding of the field [Petryński, 2016b].*

Therefore, I hope that my comments will shed new, original light on psychological issues and show a model – like the crazy paintings of Picasso or Dalí – that will allow us to better understand the complex phenomenon of consciousness.

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