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DOROTA KUBICKA https://orcid.org/0000-0001-8736-5800

Wydział Filozoficzny
Uniwersytet Papieski Jana Pawła II Kraków
Faculty of Philosophy
Pontifical University of John Paul II in Kraków

Stefan Szuman – the Unknown Pioneer of Cognitivism. Genesis of the Object Compared to Neisser's Cycle of Perception

Abstract. Urlic Neisser (1928–2012) is widely considered to be one of the leading figures of contemporary psychology. This scholar is also thought to have come up with an original idea concerning the constructive nature of the perception process referred to as Neisser's cycle of perception (1976, 1978). The thesis has contributed to the development of scientific psychology, but few notice that the idea ascribed to Neisser had been developed much earlier by Stefan Szuman (1889–1972) in his concept known as the genesis of the object (1932). Comparing the two concepts makes one reach the conclusion that they are strikingly similar and that novel ideas originating on the fringes of a given field are not given enough credit.

Keywords: genesis of the object, cycle of perception, cognitivism, cognitive processes

Słowa kluczowe: geneza przedmiotu, cykl percepcyjny, kognitywizm, procesy poznawcze

Since antiquity, the question of how human beings come to know and understand the world around them has attracted the attention of philosophers. This problem lies at the heart of the theory of cognition, and the history of the discipline shows how human thought has grappled with it throughout history in a creative way. In the 20th century – with the development of empirical sciences such as anthropology, linguistics, psychology, cybernetics, computer science, as well as the brain sciences (neurology, neuroanatomy, neurophysiology and neurochemistry) – a new interdisciplinary paradigm for practicing the science of cognitive processes, commonly referred to as cognitivism, emerged. Cognitivism proposed a new conceptual apparatus and a new, innovative approach to the study of mind's capacity to process information and represent knowledge, and above all, a new view on nature of the mind. First and foremost, cognitivists drew attention to the analogy between the brain and the electronic processor (hardware), and the mind and the brain's software (software). In this view, the cognitive system is a system of continuously active organised elements that play an active role in directing human behaviour from the 'centre' of the psyche and not merely from the peripheral arousal (as the behaviourists argued).

Many researchers have contributed to developing the new trend in thinking about mind, not to mention the tradition of the Western European philosophy of cognition led by Descartes and his belief in innate ideas. However, H. Gardner's monographic study on the history of science of the cognitive processes, *The Mind's New Science. A History of Cognitive Revolution* (1989) mentions only a few generally well-known names of the 'fathers' of cognitive psychology. Meanwhile, the author believes that Stefan Szuman can be considered the forerunner of cognitivism in Poland. To prove the

validity of this thesis however, we must mentally go back to the 1950s and 1960s, when the new ideas about mental processes and the nature of the mind itself were being crystallised in the minds of researchers, and recall some well-known and significant events from that period in the development of psychology.

Gardner sees the September 1956 symposium on information theory at the Massachusetts Institute of Technology (MIT) as the distinct beginning of the turning point. Apparently, three epochal papers were presented there on a single day (11 September): Allen Newell and Herbert Simon introduced the software Logic Theorist, with which they successfully generated a mathematical proof on a computer. Noam Chomsky then unveiled a formalised concept of generative-transformational grammar, and George Miller presented a thesis on the limited capacity of human short-term memory.

In the same year, Jerome Bruner – together with Jacqueline Goodnow and George Austin – described the results of the famous categorisation studies, which had already been carried out in open opposition to the behaviourist experiments, namely those on the assumption that as active subjects, individuals were capable of constructively solving the tasks given to them, rather than passively reacting to the stimuli provided. In 1960, Eugene Galanter, George Miller and Karl Pribram introduced the TOTE (Test–Operate–Test–Exit) sequence in place of the reflex arc as the basic unit of behaviour analysis based on the cybernetic principle of feedback while recognising that it could be incorporated into a higher order TOTE structure.

Since then, it has become increasingly common to describe human behaviour in terms of plans, images, goals, etc., i.e. mental representations (various types of symbolic systems and schemata) and procedures (programmes, strategies, scripts). The definitive sign of the crystallisation of the new discipline is Urlic Neisser's 1967 work *Cognitive Psychology*, the first monographic presentation of this trend, which gave its name to the whole new paradigm. A journal under the same name, *Cognitive Psychology*, was soon founded and has been published since 1970, while a quarterly journal, *Cognitive Science*, was launched in 1977.

This first 'hard' version of cognitivism, overly attached to the analogy between the human mind and the computer (i.e. the computer metaphor), was quickly challenged. Already in the 1970s – instead of computational, algorithmic and excessively rational models of the mind's functioning – other solutions were being proposed (modular models, processing level models, neuronal network models, discursive models, etc.), but this is a topic for another paper.

Neisser – synthesising the scattered thoughts of researchers in this academic field in 1967 – claimed that all cognitive acts, from simple perception to problem-solving, are constructive. It was a highly controversial proposition at that time, although it is nowadays one of the tenets of cognitive psychology. Firstly, Neisser argued that both representation and information originating from the environment are SIMULTANEOUSLY selected, structured, elaborated on, and consolidated, i.e. both, the bottom-up and the top-down processing take place concurrently. Secondly, drawing on the results of Frederic Bartlett's research from the 1930s, which undeniably demonstrated the active (re)constructional nature of memory processes, Neisser argued that representations are not stored in memory in an unchanging form (as the final product of a cognitive process) and are not used in an unchanged form. When necessary, representations are elected and reconstructed, with mind using traces of previous cognitive activity that are stored along with the final product (as representations plus procedures).

Neisser was particularly interested in the relationship between perceptual processes and the subject's attitudes as well as expectations in detecting what is needed for the action being performed within the environment. Assuming that people actively order sensory data in a certain way (i.e. construct representations), the researcher sought to answer the following questions: How do they know which perceptual data are to be carefully analysed and which to be ignored? How they do this? And how does a person know how to construct exactly THIS

and not something else? He reflects on this topic in two works, *Cognition and Reality: Principles and Implications of Cognitive Psychology* (1976), and more specifically in *Perceiving, Anticipating, and Imagining. Minnesota Studies in the Philosophy of Science* (1978).

In 1978, Neisser wrote, "Perception is indeed a constructive process, but what is constructed is not an inner image to be admired by the inner man; it is a plan for obtaining more information" (Neisser, 1978, p. 72). Perception is, therefore, an ongoing activity with no clearly marked beginning or ending but rather an alternating cyclical interweaving of phases of taking in pieces of information from the environment and confronting them with expectations. Neisser argues, "What people see depends on the anticipations they develop, the perceptual explorations they carry out, and the information they find available" (Neisser, 1978, p. 95). People have the ready-made anticipatory schemata consisting of generalised knowledge about a given slice of reality, abstracted from the subject's specific experiences. Thanks to these schemata, they can simultaneously receive information from multiple sources and make sense of it as they go along, which greatly simplifies the perceptual process. However, when an object changes, it can lead to perceptual errors.

Neisser attributes a special role in the perception process to explorations, which continually provide new information, supplementing what was previously contained in the schema. This new information perceived during exploration relates not only to the perceived object but also to the actions that preceded or accompanied the acquisition of this information. When, for example, we run our eyes (or hand) over an object or follow the course of an activity, not only do we learn about the properties of these objects, but at the same time, we register a sequence of movements and perceptual activities. Once the pattern is well established, these activities themselves become signals for the emergence of information; for example, eye movements accompany the imagining of objects and events in their absence, and movements of the articulatory muscles accompany the imagining of statements or other vocalisations. It can, therefore, be said that a person possesses a given piece of information as a consequence of certain perceptual activities.

Neisser's argument can sometimes lead to the conclusion that we only perceive what we expect. However, Neisser argues that there is a reciprocal relationship between perception and expectation. "We cannot perceive unless we anticipate, but we must not see only what we anticipate" (Neisser, 1978, p. 97). The perceived information changes the schema that guides further exploration of the new object, and this cycle is continually repeated.

The idea that perception is an activity that involves not only the sensory organs but also memory and motor activities runs through this concept; this connection is particularly evident in the processes of exploration. Exploration means not only the appropriate orientation of the sensory organs in relation to the sources of new data but also all those activities that we specifically perform to gain access to previously inaccessible data. Thus, before buying an unfamiliar object in a shop, we take it in our hands and – literally and figuratively – carefully '*feel and touch*' it. For this reason, perception is considered to be a semantic-operational activity: as a result of motor and mental operations, the human being tries to reconstruct the MEANING of the perceived objects.

The thesis of the constructionist nature of perceptual processes has found a permanent place in scientific psychology. Its authorship is attributed to Neisser in the world-famous textbook by P.H. Lindsay and A.D. Norman, *Human Information Processing. An Introduction to Psychology* (1972), (Polish edition 1984), and in many other works on cognitive psychology, such as T. Maruszewski's *Psychologia poznawcza*. Few people know that the idea attributed to Neisser was presented 35 years earlier by Stefan Szuman (1889–1972) in a concept known as object genesis (Szuman, 1932).[1]

Szuman and his team studied several children, aged between three weeks and nine months, by touching their hands in different places. Thousands of such trials were carried out, observing an increasingly more precise orientation of the hand surface towards the object

touching it until it was grasped and the child's gaze would beginn to be gradually directed towards the hand touched – with accompanying emotions of arousal and reassurance. As we know, Szuman found that the initial arousal usually has a stimulating effect, initiating the orientation of the body and other senses towards the object and the action of approaching it. It is only "the entry of the object into the realm of the second or subsequent senses" (Szuman, 1932, p. 26) that causes sedation, and thanks to the motor activity triggered by the first stimulus, there is an association of two or more sensory spheres, i.e. a poly-sensory grasp of the object. The resulting complex of sensations owes its integration, order, and coherence to "(...) the associative and linking activity between the sensory spheres, which, as the title of this work indicates, is DYNAMIC. Initiating stimuli induce a searching, striving activity aimed at regaining equilibrium; terminating stimuli put a stop to the foregoing movement and calm it down (...)" (Szuman, 1932, p. 28). "Based on these dynamic relations (...), we believe that a PERCEPTION OF THE SUBJECT is formed in the child during the first months of life" (Szuman, 1932, p. 30).

Szuman described in detail how, through poly-sensory perception and subsequent poly-sensory identification, something that we would now call a cognitive pattern emerges in the child's mind. To understand the originality of this concept, however, it is necessary to recall that in the 1930s, psychology held a very different view of the nature of the processes with which elements of consciousness are associated. Namely, it was thought that a sufficient condition for forming such an association was the simultaneous occurrence of these elements in consciousness or their direct succession, with the subject being completely passive. Szuman showed that even a young child does not react to stimuli but actively constructs increasingly appropriate responses to them, with its behaviour gradually coming under the control of these internal regulators (which, of course, were not yet called representations or schemata). He thus demonstrated how the basic structures of the mind are gradually formed based on and thanks to the active and dynamic organisation of the nervous system and how they subsequently regulate child's actions. This claim alone should have earned him a prominent place among the founders of cognitivism, who came to similar conclusions some 30 years later.

But the story does not end there. In fact, Szuman described in detail how this initial schema changes during the child's manipulative activity, referring to this process as experimental object identification. As the child performs a variety of activities with an object (and Szuman emphasised the genetic importance of manipulable objects in the development of the structures of the mind), it extracts new knowledge about the object and binds it into a single substrate. "Around each manipulable object a certain circle of associations, a certain sphere of 'knowledge' of its properties and manipulative functions, is formed in the child's mind over time" (Szuman, 1932, p. 36). This idea reappeared 35 years later in U. Neisser's concept, but not as a mechanism description of the formation of manipulable objects' representations in child's mind, but as a generalised thesis about the role of various exploratory activities (such as beholding with the eyes, following the gaze, pricking the ears, grasping, approaching) and active experimentation with the object in the construction of perceptual schemata. Szuman goes on to write that – over time – the circle of associations becomes so fixed in the mind that a single stimulus is sufficient to trigger it, and the child 'knows' in advance what it means and no longer needs to assert itself. "Internal associations replace external ones" (Szuman, 1932, p. 37), and therein lies both cognitive schemata's strength and weakness in regulating the behaviour.

A comparison of these two concepts leads to the conclusion that there is a surprising degree of similarity between them. However, Szuman looked at the phenomenon of perception in a somewhat broader sense, linking it to the development of speech (named as the centre for crystallising experience with a manipulable object) and the development of conceptual and abstract thinking. In the history of world psychology, Szuman's discovery has been attributed to Neisser, and this view is also widely accepted

by Polish psychologists.[2] However, the history of science shows that many original ideas have suffered a similar fate. In developmental psychology, one can recall the examples described by Urie Bronfenbrenner and Ann Crouter (1983) of the variable 'notation' of environmental models in developmental research and of many forgotten names. Bronfenbrenner and Crouter argue that novel ideas are born and mature over long periods of time in the minds of individual researchers on the fringes of official science and only 'explode' when they have acquired sufficient 'critical power.' Cognitivism, too, matured over the years, and even in the Szuman era, there were precursors to the field. For example, Howard Gardner – the aforementioned author of a history of cognitive psychology – considers Frederic Bartlett, who introduced the concept of schema into psychology, to be a precursor of cognitive constructionism. In his work *Remembering. A Study in Experimental and Social Psychology*, published in 1932, Bartlett defines a schema on page 201 as "an active organisation of past reactions, or of past experiences, which must always be supposed to be operating in any well-adapted organic response. That is, whenever there is any order or regularity of behaviour, a particular response is possible only because it is related to other similar responses which have been serially organised, yet which operate, not simply as individual members coming one after another, but as a unitary mass. Determination by schemata is the most fundamental of all the ways in which we can be influenced by reactions and experiences which occurred some time in the past."[3] It is also impossible to ignore the role that Jean Piaget's pioneering research on the development of cognition from the 1920s onwards played in the development of cognitive psychology and its influence on global psychological thought. In any case, the fact that both Piaget and Szuman were WAY ahead of the psychological thought of their time may be an indication of how inspiring a genetic developmental approach to the study of the human psyche can be.

NOTES

[1] This paper uses the edition of Stefan Szuman's *Dzieła wybrane Stefana Szumana, t. 1. Studia nad rozwojem psychicznym dziecka* (1985).

[2] Even earlier, another forgotten Polish pioneer of psychology, Anna Wyczółkowska (1853–1929), presented a similar idea, writing in *Skecze Psychologiczne* (*Psychological Sketches*), published in 1898, among other things, that the movements of articulatory muscles accompany the imagining of utterances or other vocalizations. I owe this information to Professor Cezary Domański.

[3] Source:https://archive.org/details/rememberingstudy00bart/page/200/mode/2up?view=theater&q=active (last access: 20 October 2023).

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