CHALLENGING PSEUDOSCIENCE FOR FIFTY YEARS

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The Apparent Mental Causation of Science and Pseudoscience

The history of science is full of examples of the persistence of pseudoscience in the academic world. These processes can be explained by analogy to the apparent mental causation theory by Daniel Wegener.

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In his lecture "On Freedom," famous Polish philosopher Leszek Kołakowski said:

> You can, and even, I think, should, believe in the freedom of choice and the creation of new ones; freedom is our elementary experience, the experience of everyone—it is so elementary that it cannot be broken down into parts that can be analyzed separately, which is why freedom may seem to be an unprovable reality. ... We are truly the perpetrators of actions, not just the tools of various forces that clash in the world, although, of course, we are subject to the laws of nature. ... This freedom is therefore given to people together with their humanity, it is the foundation of this humanity, it creates man as something distinguished in being itself. (Kołakowski 2003)

His words reflect the attitude of our civilization toward the issue of freedom of choice fairly well. We perceive it as the foundation of humanity, at the same time treating it as the foundation of social life. Without a belief in freedom of choice, the concept of responsibility would become useless, and the law would cease to function. And yet, for some time now, science has been providing us with evidence that freedom of choice may be just an illusion.

Among the evidence showing that we should replace our current introspective belief in intentional and voluntary action with knowledge about neuropsychological mechanisms are the results of Leon Festinger's experiments and the theory of cognitive dissonance that he formulated. This shows that it is very often only after the behavior has occurred that we justify its motives, and the main purpose for which they are formulated is to defend our well-being against the negative consequences of a perceived lack of consistency of behavior with the declared attitudes (Festinger 1957).

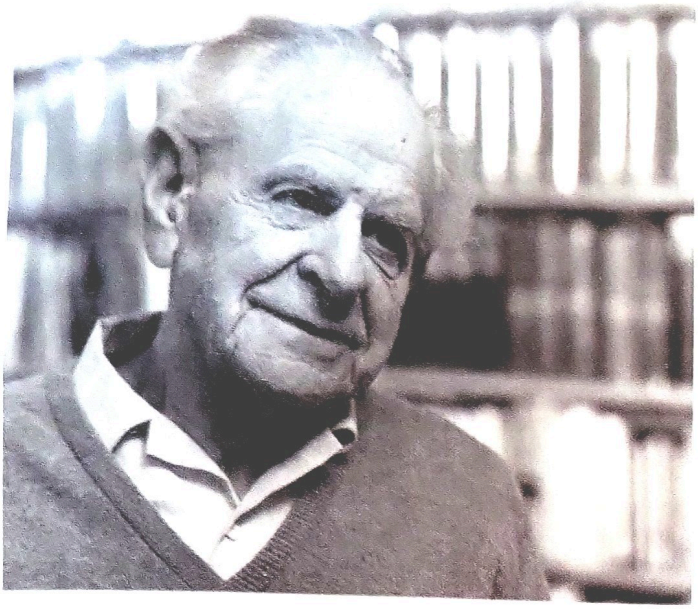
Concepts that question the existence of free will and intentional action also include the left-brain interpreter concept developed by psychologist Michael S. Gazzaniga and neuroscientist Joseph E. LeDoux, who observed patients with a severed commissure magnum (Gazzaniga 2011). In such people, the cerebral hemispheres do not communicate with each other; they function independently. Although both perform some work, only the results of the work of the dominant hemisphere, usually the left one, are fully recognized. The left hemisphere attempts to rationalize decisions and actions caused by the right hemisphere's processing of information and stimuli. The left hemisphere then becomes a kind of interpreter explaining the behavior, without access to its actual causes and the stimuli that triggered it.

Clumsy Fingers

However, the most influential incident for understanding the freedom of choice was the results of a fateful experiment conducted in 1983 by Benjamin Libet and his colleagues, in which they showed that in the people they studied, spontaneous finger movement was preceded by 550 milliseconds of increasing activity of the premotor cortex, but the conscious will execution of this movement occurs only about 200 milliseconds before the movement (Libet et al. 1983). This result suggested that the brain begins to prepare for movement 350 milliseconds before the subject becomes aware of the urge to move a finger. These simple results shook the concept of free will, long attributed to humans and carefully guarded by many thinkers for millennia. Empirical data from Libet et al.'s study, its replications, and other experiments inspired by the first results forced thinkers to revise existing views on free will. They also contributed to the development of the apparent mental causation theory by Daniel Wegener in 2003, which explains the results of Libet's research but questions what we previously thought about intentional action. Wegner defined *intention* as a kind of construct that enables an agent to understand his own behavior in causal categories, where his mental state (intention) appears to him as a cause and his action as an effect.

Toward a Horizon of Objective and True Knowledge

In his vision of the development of science, one of the greatest philosophers of science—Karl Popper—perceived scientists as impartial researchers heading toward a horizon of objective and true knowledge. Today, in the face of empirical data on the one hand and the development "successes" of pseudoscience on the other, the image of the functioning of this community hardly fits into Popper's vision. Many phenomena commonly occurring in science falsify Popper's view. One of them is certainly the phenomenon referred to by scientists themselves as junk science, which involves the production of scientific publications that no one ever reads or cites. The numbers illustrating the phenomenon of "junk science" are mind-boggling: 20 percent of all articles published in journals included in the Master



Karl Popper

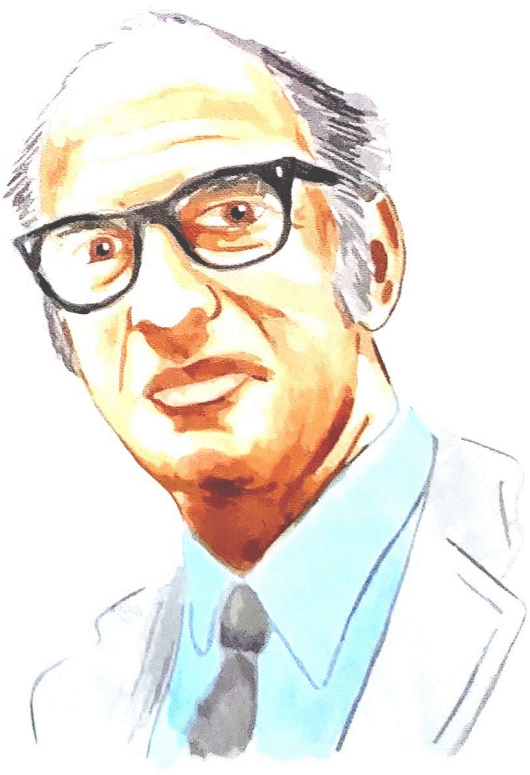
Journal List,[1] perhaps the most valued in the scientific world, have never been cited (not even once) since their publication (Grabski 2006). If we subtract from this the self-citations and single citations that are so common among scientists (which are often polite and result from a sense of reciprocity or gratitude), the scientific garbage pile grows before our eyes. Given the fact that scientists are expected to cite all texts on which they base their work, this means that an article that has never been cited has had no influence on any scientist in the world and, therefore, no influence on the development of science. This uncited production of the scientific community remains untested, nonreplicated, and probably *not even read by anyone.* The citation indexes of works published in scientific journals outside the list are much worse.

This is not a problem that has just arisen today as a result of the exponential growth of publications. As early as 1956, Donald Urquhart, then an employee of the central Science Library in London, analyzed the 1956 crop of 53,000 external loan requests filled by the library from its holdings of 9,120 different scientific periodicals. More than 4,800 of the current titles were not used at all during the year—and 2,274 of them were used only once.

Popper's vision is also contradicted by the prevalence of fraud, involving fabrication of false research results, manipulation of results that do not confirm hypotheses, selective analysis of data, plagiarism, and the like. In 1976, the monthly magazine *New Scientist* asked 70,000 of its readers whether they knew anything about cases of scientific fraud or whether they suspected anyone of intentionally manipulating data. In response, 204 completed questionnaires were received. Of those who completed and submitted them, 92 percent said they knew directly or indirectly about academic fraud (St. James-Roberts 1976). Another, slightly more reliable, attempt to measure the prevalence of scientific dishonesty was carried out in the United States on a population of several thousand scientists at various levels. The result was shocking: As many as 33 percent of all anonymous respondents admitted to having committed at least one of the ten behaviors considered to be in violation of the principles of scientific honesty in the previous three years (Martinson et al. 2005). It is worth noting that the results come from a country where intensive preventive activities have been carried out for years to counteract unfair behavior by scientists. It can be assumed that in countries where there are no developed mechanisms to control and prevent scientific dishonesty, the situation may be much worse.

Paradigm Wars

Paradigm wars and defensive specialization cause a chronic lack of attempts at synthesis, broad-based theories, and a constant drifting apart. In the social sciences, particularly unfavorable phenomena that distance us from Popper's idealistic vision are a common lack of replication of previously conducted research and excessive research from practice. Therefore, ideas concerning the processes of development of science created by another giant of the philosophy of science—Thomas Kuhn—may seem much closer to reality. In Kuhn's opinion, scientists gathered around well-known and widely recognized paradigms resemble defenders of a fortress, whose efforts are directed against those trying to change these paradigms, most often using the results of empirical research.



Thomas Kuhn Portrait. Source: Davi.trip | Wikipedia.

1. The Master Journal List is the set of scholarly journals indexed in the citation databases originally created by the Institute for Scientific Information in Philadelphia, now reflected in Clarivate's Master Journal List and Journal Citation Reports. It is perhaps the most valued such list in the scientific world.

Kuhn's vision, however, very accurately describes the behavior of scientists who have devoted themselves to pseudoscience. Here it is easy to find examples of persistence in defending valueless paradigms. An unprecedented example of such a defense is the attempt to keep alive—contrary to research reports—the psychoanalytic method of explaining human behavior. Defenders of this paradigm, despite crushing criticism, have been making efforts to preserve it for over 100 years. Recently, there have been totally open attempts to transform psychoanalysis into neuropsychoanalysis. These attempts most often involve searching for anecdotal research reports that partially confirm the overall concept of the functioning of the psyche as created by Freud (Cozolino 2002). The same research often falsifies the basic assumptions of psychoanalysis.

Another example of the persistence described by Kuhn is homeopathy. The concept, created over 200 years ago by Samuel Hahnemann, is contrary to all the knowledge we have today of chemistry and medicine. Proponents are looking for theoretical justifications everywhere, especially in quantum physics. An example of such a search is the water memory hypothesis. Perhaps the most famous supporter of the idea that water remembers the medicinal substance it comes into contact with is French immunologist Jacques Benveniste. According to him, molecules of chemical compounds emit specific electromagnetic radiation, and then this encoded information about their properties is transferred to the water in which the substance was shaken during subsequent dilutions in accordance with homeopathic procedure. Benveniste not only performed several different experiments, whose results have not yet been replicated anywhere in the world, but he also claimed that this phenomenon could be used to store large amounts of information. His efforts won him the Ig Nobel Prize in 1991.

Apparent Mental Causation

Popper's and Kuhn's visions are not precise scientific hypotheses but rather the result of a synthesis of their own views and observations. Assessment of their accuracy will necessarily be as subjective as the views are. However, when criticizing them, it would be necessary to propose an alternative vision, the validity of which would be defended by other examples from the history of science. In my opinion, the analogy that most precisely reflects the way the contemporary scientific community functions is the apparent mental causation theory. According to this, the undirected, uncontrolled, fuzzy nature of neural processes is reinterpreted by the mind as a purposeful process. The development of science and pseudoscience is similarly undirected and blurred, and, analogous to how the mind explains our alleged intentionality of actions, the scientific community gives signs of purposefulness and directionality to phenomena that may be the result of either chance or error.

The history of science is full of examples documenting this thesis. One extremely eloquent illustration comes from medicine. Egas Moniz's name still appears on the honorable list of Nobel Prize winners. This Portuguese neurologist, surgeon, and politician received an award in 1949 for developing "a method of treating serious mental disorders by cutting the neural con-



nections of the frontal lobes of the brain," now called prefrontal lobotomy, or leucotomy. In 1936, he was the first to perform surgery to cut the nerve fibers connecting the frontal lobes of the brain with the structures of the diencephalon to eliminate the symptoms of agitation, depression, or panic attacks in patients. The method was popularized and widely used by Walter J. Freeman. Freeman performed over 2,900 procedures, and in the United States alone, approximately 50,000 were performed between 1936 and 1960; almost 60 percent of patients died. In some patients who managed to survive the procedure, some of the symptoms disappeared or, along with the simultaneous loss of excessive stimulation, they fell into apathy or the emotional sphere of their lives was completely destroyed. Still others showed far-reaching disinhibition, especially of sexual drive. Most suffered from postoperative epilepsy and personality deterioration. Nowadays, almost no one uses lobotomy as a treatment method; its tragic consequences are widely known. Yet the Nobel Committee not only did not admit its mistakes but refused to revoke the award from Moniz, even though such a request was submitted by Christine Johnson together with people whose relatives were lobotomized in the 1950s.

Many agree the Nobel Committee represents the scientific community. Its decision to maintain the lobotomy reward neither fits Popper's vision nor defends any paradigm. If it serves any function, it is to create the illusion of purposefulness and directionality in the activities of the scientific community where only a combination of chance and errors was important.

Another example in which the scientific community devoted its energy to assigning purpose to chance for nearly ten years was the discovery in 1962 by Nikolai Fedyakin of an alleged polymer of water called polywater. Even though scientists at that time had sufficient analytical equipment and techniques to detect errors, most of them confirmed the existence of a water polymer and developed theoretical concepts justifying the possibility of such a form of water. One of them was Leland C. Allen, who was a very active theorist and researcher supporting the polyhydrate hypothesis. However, after

years of [illegible] illusion turned out to be a "discovery." [illegible] calculations discrediting the existence of the water [illegible] statement illustrates quite well why the processes of [illegible] the purposefulness of scientists' actions [illegible] prevail over criticism and skepticism, which are inherent elements of scientific thinking. Allen stated:

> My personal involvement in the polywater phenomenon has seriously strengthened my faith in the scientific method. I was strongly stimulated by both human and scientific experience, and the attention given to my first publication on this subject strengthened my belief that I had made a real contribution to the progress of science, more than I had felt in other research efforts that had been conventionally successful. (Allen 1973)

Although fascination with the phenomenon of cold fusion lasted for a shorter period of time, it had a similar power. The discovery was confirmed by sixty physicists from important scientific centers around the world immediately after the announcement by Martin Flieschmann and Stanley Pons in 1989 that it had been carried out. The following year, when the phenomenon of cold fusion turned out to be a hoax, 230 physicists, chemists, and mathematicians gathered to celebrate the anniversary of its discovery, and in subsequent years the discovery of methods for carrying it out was announced several more times. Most of them contained errors or were based on fabricated data.

Unmask the Agent

The history of science is full of analogous examples, and the reactions of the scientific community to similar discoveries indicate that one of the main goals they pursue is to justify the purposefulness and directionality of scientific development. The defense of this intentionality largely resembles the actions of our mind, which attribute intentionality to behaviors caused by factors inaccessible to our awareness.

Analysis of the behavior of individuals, groups and communities—including the behavior of scientists and the scientific community—goes beyond the philosophy of science and enters the domain of social sciences. These are characterized by a unique property in that the research results, theoretical concepts, and, finally, even the proposed analogies and metaphors they generate can influence the object being studied, observed, or described. For example, the announcement of the results of research on the population size of the wood sandpiper in Poland will in no way affect the behavior of this bird. An announcement about a country's low crime rate may convince more timid criminals to commit theft or other crimes. The broadcast of the film *March of the Penguins* will not change the behavior of these beautiful creatures one bit, but the mass publication of reports about domestic violence may have the effect of lifting the inhibitions that many people have about committing it. Over time, initially inflated statistics may turn out to be the grim truth. People's behavior will be similarly influenced by publishing irresponsible recommendations on the need to release "accumulated" aggression and broadcasting films showing exemplary examples of this.

If scientists adopt Popper's vision as an accurate description of the functioning of the research community, it may result in a reduced sensitivity to the unethical behavior of scientists and negligence in creating effective social systems of science control. This phenomenon, as I showed earlier, does occur. In turn, accepting Kuhn's description as accurate will most likely contribute to the formation of defensive attitudes, create divisions between supporters of different paradigms, and may even prevent cooperation among representatives of different disciplines. Also, manifestations of this behavior are common. Many representatives of exact sciences treat representatives of social sciences with great distance, generally treating them as pseudoscientists. For many of them, adopting the paradigm of probabilistic event description seems to be inconsistent with the mathematical model they adopted.

The analogy I propose, which may be useful in describing the processes of scientific development, does not carry the above-mentioned dangers generated by the previous two. However, it allows us to appreciate the importance of chance and unmask the persistent justification of statements resulting from errors, and it encourages us to look for real, often hidden, causes of the occurrence of certain phenomena in science. However, it also generates threats. In this approach, the search for randomness and unmasking the actions of an "agent" that gives the hallmarks of intentionality may also lead to depriving scientists of merits where they should be unquestionable. Excessive focus on the importance of errors and the need to expose them may have a negative impact on the reception of new valuable discoveries. A permanent feature of research work is skepticism and critical thinking, and many modern scientists lack these. Taking as an apt analogy the apparent mental causation of the processes of development of science and pseudoscience can restore the importance of these basic attributes. ■

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