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Between science and fringe
The Vienna Circle on pseudoscience

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Abstract
Anyone engaging with the history and philosophy of pseudoscience, particularly the demarcation problem, will quickly land on Karl Popper and the campaign of the Vienna Circle of logical positivists against irrational metaphysics. The demarcation problem – how to identify the hallmarks of a serious and universal science-pseudoscience distinction – began with demarcating science from metaphysical fraud and dilettantism. Not much is known, however, about the Circle's attitude towards typical pseudoscientific activities like parapsychology and psychic phenomena, spiritualism, psychoanalysis, and the social role and responsibility of scientific philosophy with regard to fringe and pseudoscientific endeavors. This paper provides the first systematic approach to the early history of the demarcation problem, with a special focus on logical positivism, which is supposed to be the standard-bearer of a rational, socially engaged but fallible scientific philosophy in demented times. As it turns out, most logical positivists were not just interested in pseudoscience as skeptical experimenters, but viewed it as holding various values, merits, and promises that they even imagined to be compatible with their empiricist and scientific world conception.

Keywords: Vienna Circle, demarcation, pseudoscience, parapsychology, psychoanalysis

1. The scientific embrace of the supernatural

The Vienna Circle lived not just through 'demented times' (Sigmund 2017), but also through turbulent ones. This turbulence was not only observable in politics and culture, given that science also had its fair share of tempestuous discourses. By subsuming new phenomena of the world, science experienced radical changes in its structure (including its institutional make-up and publication arrangements), its ontological commitments, and its types of legitimate (non-mechanical) explanation, with the boundaries and edges of consensually accepted doctrines often becoming blurred. During the *fin de siècle*, a lot of new things that were unseen or unthinkable before became real; thus, the so-called fringe studies, that is, studies on the periphery of science, got thicker, and nobody was able to have a firm, established, and definite opinion on what would eventually enter the mainstream and what would turn out to be purely pseudoscientific after all.

This kind of interpretative or pragmatic approach to issues lingering on the edges of the consensually established professional sciences is something that many debunkers of pseudoscience would flatly reject. There is no use or truth in pseudoscience, and thus no pragmatic engagement would do any good. As many scientists operated on a firm and solid materialist foundation in the late 19th and early 20th centuries (Sommer 2014), any deviation from it or flirting with a metaphysical viewpoint was unacceptable.

That was not the attitude of most members of the Vienna and Berlin Circles – for the sake of simplicity hereafter referred to as *logical positivists*. Due to its internal diversity, one cannot really postulate any concrete or official stance of logical positivism on this matter; nonetheless, when these philosophers engaged with fringe or pseudoscience, they often referred to the open-minded, naturalistic empiricism that indeed formed the basis of their scientific world conception (Carnap, Hahn, and Neurath 1929/2012). That conception flatly rejected metaphysics and therefore treated the idealism *and the materialism* of physicists and psychologists equally; when scientists rejected the newly emerged non-materialistic issues because of their metaphysical commitments, positivists had to figure out something else and take a more refined attitude.

But why bother with logical positivism in the context of the philosophy of pseudoscience at all? First, we can easily get the feeling that the anointed philosophers of the scientific method and rationality had to speak out against the pseudoscientific, or at least suspicious, practices and theories of their time to preserve society's mental hygiene (to enable and empower the masses for democratic participation in Red Vienna). By the 1920 and 1930s, when the Vienna Circle was most active, countless pseudoscientific theories were present in social and scientific circles: various forms and versions of parapsychology and extrasensory perception, numerous medial quackeries like homeopathy, the last remnants of phrenology mixed with eugenics,[1] flat-Earth theory, and spiritualisms of various kinds. One would thus rightfully expect to see a coordinated attack against the enemies of science by scientific philosophers.

Secondly, it is all too easy to find examples from the secondary literature that states that the Vienna Circle and positivism more generally did exactly that (Lack and Rousseau 2016, 31; Boyd 1991, 5; Dryden 2012, 146). The Vienna Circle and logical positivism were indeed very much concerned with the rationality of science, the debunking of metaphysics, and a detailed and laborious search for the cognitive meaningfulness of scientific discourses. Nonetheless, going through the major texts of the logical empiricists, one hardly finds any mention of 'pseudoscience' as such, and the story of the field could be discussed without much of a reference to the positivists;[2] even references to actual pseudoscientific activities and theories are rare, and do not add up to a *systematic philosophy of pseudoscience*. Popper (1959) was somewhat different, in that he was the philosopher behind the so-called demarcation problem. Moreover, very interestingly, no member of the Vienna Circle ever used the notion of *falsification* as such to demarcate science from pseudoscience, not even after the Second World War.

But this does not mean that the logical positivists were not concerned with pseudoscience or the fringe. It is worth collecting their remarks and stories here to show that the members of the movement had some kind of knowledge about most of the

[1] It might be noted here that Neurath was one of the translators (with his first wife) of Francis Galton's *Hereditary Genius*, a notorious work within the eugenic movement. Uebel (2010) has argued that Neurath was not committed to eugenics and had different purposes in translating the book. For more on logical empiricism, racial explanations and the concept of race, see Bright (2017).

[2] The only mention of 'pseudoscientific' appears in a 1929 letter from Rudolf von Mises to Rudolf Carnap, in reaction to the Circle's manifesto and the new Ernst Mach Society. He wrote that there is no point in fighting 'astrological and similar pseudoscientific [scheinwissenschaftliche] tendencies only to give space to an apocryphal "Lebensmechanik" and to consider a "soziologische Graphik" important for a scientific world view' (quoted in Siegmund-Schultze 2004, 348).

strange theories of the interwar period and struggled to include and integrate them into their scientific world conception. In fact, one can even point out that very similar approaches were taken by the positivists than many philosophers of the pseudoscience do nowadays (like those advocating multi-criteria approaches or epistemic tolerance).

Every following section will therefore describe a given pseudoscientific theory or field and list all the available logical positivist discussions and references. Consequently, Section 2 deals with psychoanalysis, Section 3 with parapsychology, while Section 4 looks at extrasensory perception. Finally, Section 6 contains my conclusions, wrapping up the logical positivists' most important insights about pseudoscience.

2. The practical utility of psychoanalysis

One of the most important fields where charges of pseudoscience were and still are abundant is Sigmund Freud's psychoanalysis (Cioffi 1998). As common sense has it, Popper was quite harsh on Freud. There are good reasons to think this, given statements like the following:

> [T]here seems to be no conceivable human behaviour that could refute psychoanalysis. If a man saves another's life by risking his own, or if he threatens the life of an old friend – whatever unusual human behaviour we might imagine – it will not be in contradiction with psychoanalysis. In principle, psychoanalysis can always explain the most peculiar human behaviour. It is therefore not empirically falsifiable; it is not testable. (Popper 1972/1999, 17; cf. 1957/1969, 37)

But as one author has recently put it succinctly, 'still, a thinker of Popper's magnitude act[ing] like an amateur militant in criticizing psychoanalysis requires explanation' (Kayaalp 2021, 27). Popper indeed did not cite many of Freud's works or go often into the actual details and specifics of the theory – his rejection is grandiose, usually operating on a general level.

But there is definitely something to explain here. It is less known that Popper was more accepting of psychoanalysis on a *practical level*. In fact, he wrote that 'I personally do not doubt that much of what [Freud and Adler] say is of considerable importance, and may well play its part one day in a psychological science which is testable' (1957/1969, 37), as it comes with 'many correct insights' (1972/1999, 17). This means that 'being true,' 'being useful,' and 'being scientific' are not co-extensive terms – something can be true and/or useful without being scientific. Up to a point, this is trivial: Novels are not scientific, but they are nonetheless often useful in understanding one's cultural environment. Popper (1974, 985) accepts that psychoanalysis is 'an interesting psychological metaphysics (and no doubt there is some truth in it, as there is so often in metaphysical ideas'). That is, parts of psychoanalysis could be (and possible are) true, without being scientific. But if psychoanalysis is a pseudoscience *par excellence*, this would lead to the conclusion that some of its ideas or theories could be both true and useful. This is a far more radical and interesting conclusion than what is often attributed to the father of the demarcation problem.

While seemingly, it was mainly Popper who turned psychoanalysis into a systematic target of analysis for scientific philosophers, most of the logical positivists had something to say about it independently. Based on rigorous methodological arguments, critics of psychoanalysis thought the theory to be incompatible with logical

positivism, deeming it to be meaningless, unscientific, or even worse. For example, Sidney Hook was greatly surprised by the *actual* take of the positivists.[3] 'I should note the curious fact,' he wrote, 'that all the logical empiricists or positivists I have known were quite vehement in defending the scientific validity of Freud's basic views – something which in my obtuseness I could never square with their professed philosophy of science' (Hook 1978, 34). But he was wrong.

Philipp Frank (1959, 308) wrote, in the 1950s, that 'it is a matter of fact that among the founders of Logical Positivism [...] there have been quite a few scientists who exhibited a certain sympathy with the teachings of psychoanalysis.' Frank was the member of the Circle who was most sympathetic to Freud's *theory*, since he considered positivism and psychoanalysis to have common 'roots' in the 'intellectual and social climate of Vienna' and a similar relation to the scientific method. As a defender of underdetermination and conventionalism, he thought that theories are insufficient in themselves to give us predictions, because they need further coordinative, corresponding, or operationalist rules to establish a connection with facts – while the choice of these rules leaves space for extra-scientific factors, such as convenience or economy.

Frank (1959, 311) was explicit about his attitude: 'We can say that one theory is more practical or convenient than another one, but it does not make scientific sense to say that one theory is completely confirmed or completely refuted.' This type of pragmatism extended to psychoanalysis as well. 'The truth of Freudian or similar theories,' wrote Frank (1959, 311), 'must not be understood otherwise than pragmatically. It may be convenient or not to accept them.' At this point, a certain dilemma arises in Frank's view. A theory can do basically two things: It can systematically and logically cover many already observed facts (call this *conservatism*), or it can vaguely cover many new facts (call this *innovation*). The best option, of course, is when a theory can cover new facts, while still being able to systematically accommodate already observed ones.

But in many cases, Frank noted, a compromise is needed. Such compromises between conservatism and innovation come from a specific social context, and beyond 'agreement with scientific observations,' one has to deal with 'agreement with the experience of everyday life, with the general philosophy of the period, the fitness to support some ways of life, some political, moral, and religious creeds' (1959, 311). In the case of psychoanalysis, whether one pursues it or not greatly depends 'upon whether one believes that a theory like that [...] provides important practical help in life or not.' In other words, if the question comes down to pragmatic decisions about conservatism and innovation, 'there is no reason for disliking psychoanalytical theories,' and their legitimacy should be determined 'by actual research, by observations and logical chains' (Frank 1959, 313).

Although Neurath and Popper are often viewed as archenemies (Cat 1995), on psychoanalysis, they did agree with each other – in fact, Neurath was perhaps even more optimistic. Neurath wrote to Carnap in 1945 that they viewed most things in Vienna with a healthy skepticism, and while they used Freudian analysis and 'estimated [it]

[3] In 1958, Hook organized a major conference about psychoanalysis and the scientific method at New York University, which included papers from such positivists as Ernest Nagel and Philipp Frank; see the essays in Hook (1959).

highly,' they were also able to joke about it and 'never became addicts of Freudianism.'[4] Neurath's writings rarely discuss Freud and psychoanalysis in detail; one can point only to a few explicit places, though perhaps a comprehensive discussion of Neurath's views on magic, theology, taboo, and tradition would be able to connect some dots (Brusotti 2022).

It suffices here to point out that when Neurath (1931/1983, 74) did discuss psychoanalysis, he viewed it as a scientific theory with 'certain metaphysical components.' This was understandable historically, given that the empiricist psychoanalysts did not have the necessary physiological toolkit and vocabulary to diagnose the localized bodily symptoms in question and hence resorted to 'the words of the patient and certain forms of behaviour' (Neurath 1932/1987, 20). Thus, Neurath (1932/1987, 21) offered linguistic analysis as a remedy for those psychoanalysts who practice 'empiricism faithfully' and 'torture themselves with formulations part of which can simply be deleted' or reworded linguistically. Psychoanalysis was a *protoscience*, representing an important transitory step from previous mythical, purely metaphysical thinking to behaviorism.

Psychoanalysis had significant 'success in releasing people from serious inhibitions' (Neurath 1931/1973) and therefore came in handy in practice; it was also a 'highly productive field' still in need of 'behaviorist transformation' (Neurath 1931/1983, 74), with a significant potential to contribute to the cause of scientific world conception and unified science – it was a protoscience.[5] Neurath even went so far as to take Freud's work to a smaller group within the Circle and tried to physicalize it 'sentence by sentence,' as Carnap (1963, 58) remembered.[6] At one point, Neurath (1932/1987, 10) described psychoanalysis as an 'endangered science.' Hence, his physicalization could be seen as an effort to save psychoanalysis from those who aimed to shape it into a 'mentalistic science.'

Although Carnap was not present on those occasions, having already moved to Prague, he was surely interested. He contributed a few thoughts about the analysis of theoretical concepts and the way they could be reworked into behavioristic and physicalistic frames (1963, 58). While Carnap did not mention or discuss Freud or psychoanalysis much in his published writings, he noted that he had learnt a lot about 'the development of the individual's picture of the world' from Freud's investigations (1963, 8).[7]

But we know that Carnap was not just interested in the theory and the field of psychoanalysis but went through extensive therapy himself in the early 1950s. Searching for a remedy for recurring back pains that often confined him to bed for weeks in the 1940s, Carnap accepted the suggestion of others to do some therapy sessions. Processing his personal, internal struggles from the early years of his employment in

[4] Otto Neurath to Rudolf Carnap, June 16, 1945 (quoted in Damböck, Friedl, and Höfer 2024, 537).
[5] The most detailed (internal) account of psychoanalysis and unified science is by Else Frenkel-Brunswik (1954), who noted that she was originally invited by Otto Neurath to 'clarify the standing of psychoanalysis in the framework of the Unity of Science movement inaugurated by him at that time' (1954, 273). For an analysis, see Borchers (2003).
[6] This is also confirmed in Carnap's diary (December 14, 1932, quoted in Damböck 2022, 572).
[7] Based on his reading list (Damböck 2022, 734-757), Carnap had read the following two works of Freud: *Vorlesungen zur Einführung in die Psychoanalyse*, and *Das Unbehagen in der Kultur*.

Chicago in numerous sessions, Carnap's somatization seemingly diminish, and with it also his back pains.[8]

Beyond Frank, Neurath, and Carnap, there were other Circle members with a keen interest in psychoanalysis. Hook noted, for example, that he was shocked by Reichenbach's positive attitude towards psychoanalysis and his defense of the scientific character of Freud's theory. While Hook (1978, 33) always thought that on Reichenbach's 'own criteria of scientific verification … psychoanalysis was no more scientific than Christian science,' Reichenbach was not just deeply interested in the theory as such but also devoted considerable energy and time to studying and applying it. Already in 1918, he wrote that Freudian psychoanalysis, which 'undoubtedly possess[es] proper scientific qualifications,' is often excluded from universities because of 'objections of morality or of taste derived solely from the class attitudes of this narrow bourgeois stratum' (Reichenbach 1918/1978, 147). In *Experience and Prediction*, he (1938, 208) argued that Freud deserves great epistemological recognition, since psychoanalysis showed 'for the first time how to construct a causal connection between the two worlds of waking and dreaming.'

Later, in the early 1940s, Reichenbach attended a couple of meetings of the Psychoanalytic Study Group of Los Angeles, whose president, Ernst Simmel from Berlin, he knew personally. Reichenbach gave several lectures and developed a name for himself as someone who knew psychoanalytic theory and approached it with a genuinely interpretative attitude (Brunswick 1978, 55).

What these cases show are two things. First, there was a great interest in and even enthusiasm for psychoanalysis, and the logical positivists did not reject Freud's theory over of its alleged unfalsifiability. Recognizing its potential to create new facts, bring new orders into experience, and move old debates onto new fertile grounds, they advocated more reflection, discussion, and analysis of the foundations and fundamentals of psychoanalysis.

On the other hand, some positivists also recognized that being true / being scientific are not necessarily co-extensive notions. Even non-scientific things can be true and useful (Popper) and being scientific often coincides with just being useful (Frank). Deciding about a theory cannot be a one-dimensional issue – as science is a human-made enterprise, done in a sensitive social web, encapsulating numerous values (that are often in tension with each other), one had to weigh multiply criteria. Recent developments in the philosophy of pseudoscience also show a great tendency to move from old single-criteria (e.g. 'falsifiability', 'verifiability', etc.) demarcations to multi-criterial systems (see Bárdos and Tuboly 2025), and some of the positivists had very similar thoughts in the context of psychoanalysis.

Furthermore, psychoanalysis might be able to provide recipients of therapy with some kind of self-knowledge, relaxation, and mental hygiene. Reichenbach, for example, argued that while the best method to differentiate a person's different internal states would be precise physiological description, physiology was not yet able to achieve that. Consequently, he considered the stimuli and reaction language of psychoanalysis, based on introspective observation and analysis, to be highly adequate (even if uncertain and indeterminate), as it provided 'deep insight into certain internal states […]. This is why psychoanalysis is used as a special medical method in cases in

[8] On this point, see the still unpublished diaries of Carnap (1936-1970), available at https://valep.vc.univie.ac.at; cf. Damböck and Korninger 2025).

which those of physiology fail' (Reichenbach 1938, 246). Viewed this way, even Popper admitted the legitimacy and usefulness of psychoanalysis in a clinical context.

3. Scientific objectivity and parapsychology

While from our current perspective, we would expect members of the Vienna Circle to flatly reject any issues around parapsychology as unverifiable or unfalsifiable and thus plainly pseudoscientific, this was not the case. Quite the contrary, most positivists took a quite open-minded attitude towards the factual status of parapsychology and how mediums and their practice should be viewed.

Parapsychology is essentially an umbrella term, as it covers very distinct skills, abilities, and phenomena of the world, though all relate somehow to the human mind. This can include extrasensory sensations and perceptions like telepathy and clairvoyance; psychokinesis and teleportation, or the production of physical effects with the mind; mediums and ghosts; and finally, near-death and out-of-body experiences. For the sake of simplicity, I will talk about typical cases of mediums and individuals allegedly endowed with special psy-powers in Section 5.1 and then examine extrasensory perception in Section 5.2 as a more epistemological issue.

3.1. Parapsychology in Vienna

As the historian Peter Mulacz (2017, 152) puts it, 1923 was a kind of 'annus mirabilis' of Viennese parapsychology – in November, the Viennese police officer Ubald Tartaruga had established the 'Vienna Parapsychic Institute,' and in December, the 'Viennese Metapsychological Institute' was founded to communicate about and conduct research into mediums. Both functioned as clubs and smaller gatherings, but did not have the legal status of associations, as their requests were rejected several times.

With all this institutionalization, critical voices emerged as well, and a new evaluative body (a so-called 'professors' committee') was formed by famous Viennese professors in November 1923. The committee was led by the physician Julius Wagner-Jauregg (who won the Nobel Prize for Medicine in 1927) and comprised the psychologist Karl Bühler, the physiologists Arnold Durig and Paul Libesny, the physicist Felix Ehrenhaft, the engineer Arthur Ehrenfest-Egger, and, finally, Moritz Schlick.

In parallel, Hans Thirring gathered further physicists – like Stefan Meyer and Karl Przibram – around him and started another independent research with mediums. Soon he was joined by theologians Gustav Entz and Richard Hoffmann, the professor of engineering Karl Wolf, the physicist Gustav Schwaiger, and Hans Hahn. According to Mulacz (2017, 154), the two committees ran in parallel for a while, with Thirring's operating at the Institute for Theoretical Physics and investigating similar and occasionally the same cases as Wagner-Jauregg's.[9]

Although in March 1925, the professors' committee abruptly stopped its work, things took a new turn in 1926 for Thirring and Hahn when Eleonore Zugun, a 12-year-old Romanian girl, was taken to Vienna to be investigated for her alleged abilities of telekinesis. Eleonore became one of the most notorious of Thirring's cases in the late

[9] Mulacz (2017, 159) lists five occasions over the course of less than two weeks in December 1924 when the committee investigated paranormal activities. Four of these investigations involved Hahn, while only two of them included Schlick, who soon withdrew entirely from these pursuits.

1920s and often appeared in national and international newspapers.[10] Using the public interest in the young girl, Thirring submitted a new proposal to the Austrian government to establish an association, and this time it was approved. Thus, in 1927 – following the example of the British 'Society for Psychical Research' established in 1882 – the 'Austrian Society of Psychic Research' was founded. According to a newspaper article, the society' did not promote occultism unconditionally, but aimed to be a purely scientific gathering for the unprejudiced theoretical and experimental exploration of the fringes of mental life on the disputed borders of the sciences (*Neues Wiener Journal*, January 8, 1928, p. 22).

3.2. Hans Hahn and matters of the heart

While Thirring became the president of the Austrian Society of Psychic Research, Hahn was also one of its founding members and joined its board. In fact, Hahn gave the very first public lecture at the society's premises on January 24, 1928, about the criticism and anti-criticism of psychic mediums (Mulacz 2017, 167).

Members of the society attended the Fourth International Congress for Physical Research in Athens in 1930, Hahn included, although he did not give a talk, despite preparing one initially. After getting back to Vienna, Hahn lectured at the Institute of Physics about the congress (*Volks-Zeitung*, May 31, 1930, p. 6; cf. Pallikari 2017). Beyond that, he presented numerous public and popular lectures about occultism and psychic phenomena, meaning his active engagement with the paranormal was never a secret in Vienna. In these lectures, he acted like a pedantic, neutral professor, going into the details, weighing up the pros and cons, handling 'questions from doubting Thomases' and criticizing 'fakers who harmed the relevant research' (Taussky-Todd 1952, 3).

Hahn remained active in this field throughout the 1920s and played a substantial role in different investigations even in 1930. It is unclear,however, why Hahn took part in these investigations. Menger (1980, xvi) claims, for example, that Hahn and Thirring 'were not convinced that any of the phenomena produced by the mediums were genuine; but they were even less sure that all of them were not.' In fact, Hahn was more enthusiastic. Certain mediums claimed that great thinkers and poets were speaking through them, but the lines they produced were quite obviously of lower quality than those of their alleged authors. Most people argued that the mediums were saying what *they* thought the poets would say, and given their level of education, they obviously did everything wrong, thus proving that they were charlatans. But Hahn had a different opinion; as Menger (1994, 59) remembered, he 'pointed out that many of those mediumistic revelations are indeed *so* trivial and incoherent that even a medium with little education would not consider them as utterances of those writers – in fact, they are definitely below the medium's *own* level.'

Because of that, argued Hahn, such chatter would indeed be subconscious, since even uneducated people would be conscious of the low quality of their mimicking. Independently of what we think about this argument – which seems rather weak, given that people's self-confidence is often directly proportional to their lack of education – it led Hahn to the following conclusion: '[The events'] very triviality, combined with the tormented stammering in which the babble is frequently uttered, suggested to Hahn

[10] Some details of Zugun's story are summarized aptly in Josephson-Storm (2017, 258–262).

that in many cases one is dealing with a genuine phenomenon of some kind' (Menger 1994, 59).

Apparently, at least according to Neurath, Hahn interpreted Hans Driesch's ideas about the survival of the soul after death 'with noble indulgence,' expressing perhaps some kind of belief or commitment. Driesch also attended the Fourth Congress of Parapsychology in Athens, and Hahn thus surely knew his views in detail.[11] Furthermore, Carnap noted in his diaries that Hahn believed in 'telekinesis'.[12] Possibly as a result, Neurath had even planted the bug in Carnap's ears that Hahn did not accept physicalism. When questioned about it, Hahn told Carnap that he had simply not yet heard any clear formulations of the idea, and that his dispute with Neurath was only about the idea of comparing statements with statements. Be that as it may, Hahn was still 'closer to Neurath than Schlick,' as Carnap noted. When he broached this issue with Neurath, the latter responded somewhat cynically, arguing that Hahn, of course, accepted physicalism as long as it did not threaten his 'occultism.'[13]

Hahn played an important role in Eleonore Zugun's case. Mulacz (2017, 164) notes that while Hahn attended relatively few séances with Eleonore, he seems to have witnessed more paranormal phenomena with her than with any other medium. Various accounts of the meetings appeared in the *Zeitschrift für Parapsychologie*, all noting Hahn's important involvement. The British psychic researcher Harry Price (1927, 25), who was known for exposing fraudulent mediums, wrote that while Thirring was unable to experience any paranormal events with Eleonore, 'his colleague, Professor Hahn, on the other hand, saw many phenomena that made a strong impression on him.'

The famous Countess Zoë Wassilko-Serecki, an Austrian occultist and parapsychologist who led the investigation of Eleonore, provided an illuminating example. She sat down with the young girl and Hahn in an examination room, and both took Eleonore's hands in full light. Nonetheless, even under these transparent conditions, new marks appeared on her hands and forearms that they identified as bites. They saw numerous marks of teeth, 'once six bites came out at the same time, next to each other,' while holding her hands. As Wassilko-Serecki (1927, 73) recalled, 'during the hour that Professor Hahn and I sat around the round table with Eleonore, she was "bitten" about 25 times under the most impeccable conditions.' Even more importantly for us, 'Professor Hahn was willing to confirm to everyone' the existence of these bites.

Hahn was so convinced by what he had seen and experienced that in February 1927, he published a short article with his colleagues in the *Neue Freie Presse*, describing the investigations. In it, he confirmed again that numerous spontaneous skin injuries appeared on Eleonore's hands and forearms, as well as on her face and neck. Hahn indeed stood by his opinion in the public. The report was also published in the Austrian journal of parapsychology and thus reached not just the Viennese public, both the international community of researchers as well (Hahn et al. 1927a, Hahn et al. 1927b).

As noted above, Thirring was about to introduce stricter methods to ensure objective outcomes. Likewise, Carnap (1963, 23) wrote that Hahn took 'active part in

[11] Otto Neurath to Rudolf Carnap, April 12, 1930 (quoted from Damböck, Friedl and Höfer 2024, 57-58). On Driesch and parapsychology as a 'super-normal' issue, see Pareti (2017).
[12] Carnap's diary entry, July 12, 1933 (quoted from Damböck 2022, 589).
[13] Carnap's diary entries, July 12 and July 16, 1933 (quoted from Damböck 2022, 589 and 591).

séances in an attempt to introduce stricter scientific methods of experimentation (without success, unfortunately).' But beyond these agreements about the methodological requirements, Gustav Bergmann noted that Hahn's case differed from Thirring's in other ways. Although Bergmann (1993, 202) described Hahn as a man who 'conveyed little warmth' and thought in a 'coldly abstract' manner, acting like the 'ideal-typical representative of neutral science of the liberal era,' parapsychology was a different issue as 'for Hahn spiritism was a well-known affair of the heart.'

Undoubtedly, Hahn was a man of various commitments, many of them arising from different sources and experiences, but all culminating in a special understanding of the scientific conception of the world. As Hahn noted, there are world-denying (mainly metaphysical) and world-affirming (mainly empiricist) philosophies:

> One person enjoys multiplicity, the variegation and capriciousness of change, the confusion in the sensible world which is so difficult to unravel, and he therefore continues to affirm this world, whereas another who has been denied the pleasures of the sensible world denies this world and tries to make up other worlds behind it. (Hahn 1930/1980, 19)

Within that multiplicity, even strange and eccentric phenomena could have their place, and for Hahn, 'the variegation and capriciousness of change' seemingly did not exclude para-phenomena. In light of the uncertain cacophony of the 1920s and 30s, it is not accidental, then, that Hahn was often described using contradictory terms. Olga Taussky-Todd (1952, 2) remembered, for example, that Hahn was a 'powerful mathematician of great breadth and depth,' a scholar who was 'politically active for the socialist party,' and finally 'an ardent follower of ESP (Extra Sensory Perception).' This characterization is matched by Bergmann's (1993, 202): 'The masterfully clear mathematician, the acute advocate of our philosophy, the socialist university professor – and table-tipping countesses, a striking image of Austria between 1918 and 1938.'

That being said, Hahn retreated from parapsychological investigations after 1930, for unknown reasons (Mulacz 2017).[14]

3.3. Neurath and Carnap: rejection and freedom

There were those, of course, who rejected all para-phenomena and conceived all psychic issues as quackery and fraudulence, something that had nothing to do with science. Because of that, any official and scholarly approach to deal with the alleged abilities of mediums would come with professional and social risks, as it would give parapsychologists a place at the table. That was Neurath's thinking and argument in the 1920s and 30s. Participation of respected scholars in séances would, Neurath argued, 'strengthen supernaturalism and thereby [...] weaken political progress' (Carnap 1963,

[14] In a letter, though, Olga Hahn-Neurath (Hans Hahn's sister) indicated to Carnap that Hahn was willing to give a talk about parapsychology at a psychology conference during the summer of 1933. As she wrote, Hahn 'hasn't dealt with this matter for quite some time, but now he is not reluctant to return to this old love' (Olga Neurath to Rudolf Carnap, February 17, 1933, quoted from Damböck, Friedl, and Höfer 2024, 153). In a letter also dated 1933, Neurath likewise indicated that Hahn was still pursuing some kind of parapsychological research (Otto Neurath to Rudolf Carnap, April 6, 1933, quoted from Damböck, Friedl and Höfer 2024, 158).

23). Neurath even 'reproached Hahn' and expressed his rejection and disdain on every possible occasion.[15]

Carnap was different from Neurath, however. Unlike Hahn, he was only 'theoretically interested' in the subject, and did not participate in actual séances.[16] It is less clear, however, what his 'theoretical interest' consisted of. On the one hand, he defended, against Neurath, 'the right to examine objectively and scientifically all processes or alleged processes without regard for the question of whether other people use or misuse the results' (Carnap 1963, 23). Carnap was a strong and loud advocate of scientific and academic freedom and often took a stand in related public matters (Yap 2024). He had a broader scientific and cultural network that included people from the left and the right (like Hans Freyer, his friend from the German Youth Movement) and pursued, out of curiosity, more questions than Neurath would have accepted. Carnap always tried to be objective about empirical matters and sought to lay down logical principles for discussion to see where strange or heretic ideas might lead.

On the other hand, Carnap did not just defend the right to research in a vacuum but also reflected extensively on the existence of various para-phenomena and the pros and cons one to be weighed in each context. Menger (1994, 64) recalled that, Carnap 'strongly favored the idea that they can be carried on in a truly scientific spirit.' After discussing the matter with Thirring and Hahn occasionally,[17] he even brought the issue up in a conversation with Ludwig Wittgenstein, who was very much against it. 'The alleged messages produced in spiritualistic séances,' as Carnap recalled Wittgenstein's argument, 'were extremely trivial and silly.' While Carnap tended to agree that the quality of the accompanying discourse was generally low, he remarked that 'nevertheless the question of the existence and explanation of the alleged parapsychological phenomena was an important scientific problem. [Wittgenstein] was shocked that any reasonable man could have any interest in such rubbish' (Carnap 1963, 26).

In his comprehensive book on *Positivism*, Richard von Mises (1951) formulated succinctly the relaxed and flexible attitude of positivism on all matters supernatural. After noting the general, though 'historically unfounded,' opinion that empiricism is incompatible with the idea that psychological and physical processes could interact, von Mises went on to state that:

> Each of us is familiar with such phenomena as blushing during a conversation, or shortness of breath at imminent danger, watering of the mouth at the sight of certain foods, and many other influences upon bodily organs by way of the intellect. Certainly there are also phenomena in this field which are rarer, less well observed, and of a more unusual kind. (von Mises 1951, 194)

Because of the familiarity of such everyday phenomena, argued von Mises (1951, 194), 'there is no reason to declare from the outset, without closer examination, that claims about the intentional formation of swellings by hysterics, or the creation of a facial rash

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[15] Neurath argued that only 'uncritical, run-down aristocrats and a few supercritical intellectuals such as Hahn' would investigate these matters (Menger 1994, 61). Bergmann (1993, 202) also noted that 'in fact Hahn actually did meet in spiritist salons with high-society, the ladies of the old Austrian aristocracy.'

[16] Anders Wedberg (1984, 225) has argued that Carnap would be willing, for example, to discard the four-dimensionality of the world if observations called for it: 'The kind of observations which Carnap had in mind were those which parapsychology and spiritualism claim occur at seances.'

[17] See, for example, Carnap's diary entry from May 11, 1926 (quoted in Damböck 2022, 281).

through an imagined contact, etc., are unworthy of belief, or even to think that such occurrences are impossible.'

4. Extrasensory perception and statistical design

Within parapsychology, as noted above, extrasensory perception (ESP for short) has an important place. The term refers to psychic abilities of the mind that allegedly enable people to obtain new information about the world without using any of the five traditional senses (sight, smell, touch, taste, and hearing). Occasionally, this information could be about the future (this is called precognition) or about the past (remote viewing).

4.1. Uncertainty in a new world of discoveries

In the late 19th century (when most of the positivists attended elementary and high school) and early 20th century, people still vividly remembered and experienced the new forces and energies of the natural world that had only recently been discovered – radiation, waves, fields, different types of energy, telegraphs, wires, and many other new, empirically tested, and verified matters that extended our understanding of the natural world, despite not being directly accessible to the senses.

A version of this idea was used by Hahn in his public lectures on parapsychology, as reported by Menger – he wrote that Hahn took the idea from the French physiologist and Nobel Prize-winning immunologist Charles Richet. Imagine a world where only a few exceptional people have the ability to smell. Now take two people, one with that ability and one without it; on their regular walk, they pass by a huge stone wall, and the one with the sense of smell says, 'There are roses behind this wall,' which they then verify by looking behind it. To emphasize the point further, Hahn added his own version: After checking a drawer, one of the two people says that there is lavender in the drawer. If they find none, the one with the ability would then insist that there was lavender in it previously. Suppose that it turns out that there had indeed been lavender in the drawer a few years earlier – how would these two stories differ from those of people with alleged psychic powers? As Hahn asked, according to Menger (1980, xvi; cf. 1994, 59), 'are mediums with extraordinary perceptions and exceptional abilities in our world what the few people with a sense of smell are in Richet's?'. As mentioned above (Section 4), Hahn indeed believed in telekinesis.

In a chapter of his *Positivism* book on 'Miracles,' Richard von Mises (1951, 197) also recounted Richet's story of how people might lose and perhaps develop their senses, and how it relates to the interpretation of clairvoyance and extrasensory perception. Going through various approaches to understanding miracles and violations of the causal net of the natural world, he concluded that the supernatural (which supposedly relates to or contains miracles) exists only '*relative* to a certain state of scientific knowledge' (von Mises 1951, 195, original emphasis). Admitting the existence of supernatural phenomena will prompt one to believe in the repeatability of events based on certain abilities, skills, or mechanisms of the world, thereby instantly incorporating them into the fabric of one's extended natural reality. Referring to Richet, von Mises (ibid.) thought that most instances of the supernatural, rare events, or 'sixth senses' and similar occurrences 'lie, in our opinion, outside the range of natural science.' What needs to be done is to systematically investigate and evaluate all the

available data with an open mind. 'All factual questions are in a way always open' (ibid.), and fallibilism rules all the way down. There is no point in distinguishing the natural from the supernatural, because either something exists, and then it is natural, or something does not exist, and then it is not even supernatural.

Von Mises offered two examples. The first considered the alleged healing powers of water at a specific location in the late 19th century. Although actual physico-chemical knowledge excluded the possibility that water could have such effects on the human body, it turned out that radioactivity was present, which explained some of them. 'Hence an "objective" reason was found which until a few decades ago was not as yet conceived of by science' (von Mises 1951, 196). In other words, as soon as science changes and revises its epistemological and even ontological assumptions, superstitious and allegedly supernatural phenomena can be brought under its aegis.

The second example comes even closer to what we would today regard as a typical pseudoscientific idea, namely the *perpetuum mobile*. Just as radioactive radiation was at one point seen as contradicting not just our existing knowledge but the very laws of nature, it is not impossible that our world conception would, in the long run, require further revisions. Von Mises argued that

> if today we reject without hesitation a quite naïve attempt at a *perpetuum mobile* mechanism, we rely primarily upon an extensive experience with similar mechanisms, and not upon an absolutely valid principle of greatest generality derived from these observations. In case of more subtle suggestions, a closer examination, despite the existence of an accepted principle, can by no means be avoided.' (von Mises 1951, 197)

Although there is no concrete and convincing evidence of palmistry – reading someone's future by examining her hand – it cannot be excluded either. Von Mises did not think that it is an 'absolutely absurd idea' to suppose a connection between an individual's life expectancy and physiological marks and organs. Yet gain, an open mind is required, despite all the seemingly useless ideas that are hard to test or evaluate with the required precision.[18]

That kind of openness, especially on supposedly non-material issues, was characteristic of another logical positivist, namely Herbert Feigl. He thought that the current laws of nature, or at least how they are depicted in our best scientific theories, leave too little room for paranormal phenomena. While he flatly rejected the theological and metaphysical interpretations of 'unusual' mystical experiences, he was more relaxed with fringe approaches, in order to understand the issues emerging along the unknown and unexplored edges of consensual science. As he wrote:

> If it were fully established that the phenomena of extrasensory perception, i.e., clairvoyance and telepathy, and perhaps even precognition and psychokinesis, do not result from experimental or statistical errors (not to mention self-deception or outright fraud), then our conception of the basic laws of nature may well have to be revised at least in some essential aspects. (Feigl 1963, 240)

[18] Von Mises's moderate standpoint and judgement about these occult sciences were noted already by Willem Frederik Zuurdeeg (1946, 80-81).

At one point, he even made it mandatory for himself as an empiricist to 'go through the motions of an open mind' regarding ESP, to see whether any allegedly supernatural events required revision of the basic unified physical picture of the world (Feigl 1974/1981, 17). In the same article, he contrasted his 'Victorian' outlook, according to which mental processes are just part of nature, with his more positivist attitude about revisability: 'the world conception of modern physical science, impressive as it is, can hardly be final' (Feigl 1974/1981, 17). This would also leave open the possibility of the existence of experiences that would not necessarily have a place in a deterministic and Victorian world. If this were to occur, 'emergentist or even interactionistic explanations' of the mind-body relation would be needed to complete and supplement the traditional physicalist reductionist programs. (Tellingly, Feigl (1960/1981, 343) put 'psychosomatic phenomena' and 'the still extremely problematic and controversial "facts" of parapsychology' in the same category, albeit with some refinement.)

But why should one be prepared to do that, especially as an empiricist? For Feigl, 'a really open-minded empiricism' has to display that same kind of attitude towards existential questions. We always have two choices in scenarios of irregular events: We can either deny their reality to the extreme and thus rescue the inherited patterns of science; or we can find a place for them in our knowledge of the world. Openness is warranted because of our general clumsiness in properly addressing such rarities. In fields where 'empirical regularities are only very incompletely established,' we can hardly develop a comprehensive theoretical framework for dealing with them. Thus, our lack of precision, knowledge, and perspective on them cannot be a genuine counterargument. More data and evidence are necessary, and an empiricist should follow where they lead. If, for example,

> in the disputed fields of extrasensory perception (or in the still more questionable fields of mediumism) the claimed empirical regularities should prove unexplainable by means of the theoretical frame of present-day-science, some emendation or even radical alterations of the network may quite conceivably be required. (Feigl 1950/1981, 219)

Although Feigl quickly dispelled any suspicion that he would accept 'the alleged findings' of psychical research, he did adopt a similar perspective on how rare events could break the already damaged chain of causality in the physical world – something that suited von Mises as well.

Feigl, who developed a very special philosophy of the mind within logical positivism, was thus hesitant *for the time being* about the status of alleged extrasensory perceptions and their reality. The mind, independently of its ontological and metaphysical rendering, was a genuinely special and hardly known entity. And while some of the extreme interpretations of ESP phenomena were 'suspect and undesirable,' they 'cannot be decided by a priori philosophical considerations' (Feigl 1967, 21).

This discussion points to another contemporary approach to pseudo and fringe sciences. Just as von Mises has noted that strange ideas might become mainstream in time, recently Laura Gradowski (ms.) has argued that one shall practice epistemic tolerance in matters of the fringe. Fringe theories come with "significant epistemic payoffs" as they force us to be open, innovative, fresh, and enlarge the boundaries of our critical thinking. "Do our protective and conservative instincts to dismiss and suppress fringe theories", she asks, "come into conflict with our interests in the expedient uptake

of innovations that can be gained through theory change?" For Gradowksi (ms., p. 3), the value of fringe theories is that they are "invitations, indeed, often requests, for more open and imaginative scientific inquiry." That was also the point of von Mises, Feigl, and even Carnap, Hahn included.

4.2. Statistics, significance, and playing with numbers

After 1930, Duke University established a new research center, having invited the American botanist Joseph Banks Rhine to test the alleged claims and abilities of various mediums. A 'Parapsychology Laboratory' was thus founded, which Rhine then led for decades (for more detail about the context, see Asprem 2014, Chapters 8-9). He conducted several well-known experiments (often with so-called Zener cards, where the subject of the experiment has to guess which card is being observed by the experimenter) and ran numerous statistical analyses on them, trying to perfect the underlying mathematical methods (see Utts 1991).

Regarding telepathy, clairvoyance, precognition, psychokinesis, and similar issues, Feigl suggested keeping an 'open mind,' as he believed, in the 1950s, that 'the chances of explaining the "facts" away as due to experimental or statistical error, let alone as outright hoax or fraud, seem now rather remote' (1967, 21). He seemed to think that humanity had by then passed the point when simple statistics could answer all the substantial scientific, empirical, and ontological issues raised by supernatural phenomena. This openness, however, still did not mean that Feigl admitted 'immaterial souls or selves' into his ontology but simply raised the possibility that this might one day happen.

In 1949, von Mises presented a paper at the annual meeting of the American Association for the Advancement of Science in New York. Although not much is known about the occasion, he stated at the beginning that he had been invited to speak about extrasensory perception and the research done at Duke University by some sponsors (possibly of the university). Be that as it may, the posthumously published paper testifies to von Mises' enduring interest in paranormal and supernatural phenomena. As he emphasized, probability and statistics played a larger role in this field than in most of the physical theories, and that 'the problem is linked to the very basis of the logic of science' (1949/1964, 530).

In the paper, however, von Mises directly addresses Rhine's experiments and their statistical evaluations, without delving much into the philosophical foundations or the framing of the issue. Although the paper is quite short, von Mises points out numerous mathematical problems with the setting and analysis of the results and the designs of the experiments. He summarizes his conclusions in three points.

First, there is nothing that would exclude extrasensory perception a priori. 'On the contrary,' he says, 'general experience in other branches prompts the belief that some kinds of perception not channeled through the traditional five senses is possible' (1949/1964, 535) That is why he argued that such phenomena should be called 'extra-five-senses perception,' hinting at the idea that our five senses are historically and evolutionary contingent – should new forms of perception appear, they therefore do not have to be supernatural or irrational per se (1949/1964, 530). In his famous book on *Probability, Statistics, and Truth*, von Mises brings up parapsychology as an example of how the rolling of dices is affected by throwing techniques and 'delicately balanced

psychological or physiological phenomena.' Although he did want to 'defend the occult sciences' to the extreme, he also did not want to close all doors to them, as he was

> convinced that further unbiased investigation of these phenomena by collection and evaluation of old and new evidence, in the usual scientific manner, will lead us sooner or later to the discovery of new and important relations of which we have as yet no knowledge, but which are natural phenomena in the usual sense. (von Mises 1957, 74)

What counts as natural or supernatural is thus, once again, relative to our knowledge and best theories of the world. And to arrive at our best theory, strict methods have to be followed.

Thus, secondly, von Mises was unconvinced by the general design of the experiments and the research plans of the parapsychology department. Instead of fishing in the mud for ad hoc manifestations of individual mediums, he argued that comprehensive, well-planned, and consistently structured statistical research should be conducted. Random individual experiments were just too incoherent and inconclusive (von Mises 1949/1964, 535).

And finally, while in the 1930s (in *Probability, Statistics, and Truth*, see above), von Mises only expected few promising results, he admitted by the late 1940s that 'the ESP experiments supply a slight indication for the existence of some ESP ability in certain individuals' (1949/1964, 536). But yet again, inadequately designed random experiments are just indications and not scientific results. 'To establish [the ESP indications] as a fact,' he says, one should follow the individuals in question for years to observe them in a more systematic and enduring fashion, while exposing them to various examinations.

5. Implications and conclusion

In addition to the topics mentioned above, it is interesting to note graphology and the so-called 'Ausdruckskunde,' i.e., the 'science of expressions,' where von Mises' verdict was more balanced. Graphology is still a contested field; some argue against it vehemently, saying that there is no evidence for determining someone's personality based on handwriting (see some of the essays in Beyerstein and Beyerstein 1992), while expressed a less skeptical attitude about "soft biometrics" (Thorpe 2018).

Von Mises thought it obvious that 'nobody will deny' that there are 'observable connections' between one's bodily appearance and 'his disposition and moral character.' Graphology was also interested in the physical expression of internal states and habits where important correlations and connections had to be discovered. Although these investigations were still in their 'infancy' before WWII – and thus even more care and circumspection were needed – 'it is as unjustified to reject all [these] claims in principle as it is to assign to [their] assertions, compared to those of the positive sciences, the status of a "higher" truth' (von Mises 1951, 194).

Carnap was more optimistic, however. During the early 1930s, when he published most of his works on the physicalization of all scientific fields, psychology had a special place in his program. Carnap (1932/1959b, 188) thought that the best way to foster the program of physicalization was by propagating graphology, which had 'made some significant discoveries.' The early Carnap was convinced that graphology was scientific and worthy of respect, and even that it represented the most successful

phase of physicalization. When Carnap's paper was published in English in 1959, he wrote a short commentary about the changes in his views regarding dispositional and theoretical concepts but said nothing about his withdrawal or rejection of the scientific status of graphology.

After citing Carnap's attempt at physicalizing graphology and Neurath's short-lived project to physicalize Freud's work (see Section 2 above), Thomas Mormann (2012, 161, n. 15) notes that a 'mischievous observer might have come to the conclusion that in the 1930s physicalism had a curious inclination toward pseudo-sciences.' What this paper has aimed to show is exactly that one does not have to be such a 'mischievous observer' to come to this conclusion. The adherents of logical positivism did much to understand and evaluate the pseudosciences. Some of them, like Neurath, wanted to shape them in accordance with their own standards and ideals (that is, 'physicalization'), while others were happy to revise their standards and ideals in accordance with the latest developments, even if they were unexpected.

Massimo Pigliucci (2013) argues that 'science' should be taken as a cluster concept that works just like a Wittgensteinian family resemblance term. There are many scientific fields that share various features and characteristics, but there is no single criterion that applies only to the sciences and could thus demarcate science from pseudoscience universally. Consequently, Pigliucci (2013, 22-23) asks us to imagine a coordinate system instead, where the horizontal axis stands for 'theoretical understanding' and the vertical one for 'empirical knowledge.' The former represents the ability of a given theory or field to provide concepts, laws, and categories for understanding the world, while 'empirical knowledge' covers the theory's empirical basis and supporting facts. According to Pigliucci, particle physics could be placed in the upper right corner, as it comes with a wide theoretical understanding and comprehensive empirical support. String theory would be located a little further down, since it is still theoretically sound, but less empirically supported. In the upper left corner, one would find psychology and sociology, which are 'rich in evidence, but for which the theory is incomplete or entirely lacking' (Pigliucci 2013, 23). Astrology and HIV denialism, for example, would be placed in the bottom left corner, for lacking both empirical support and theoretical soundness.

This picture comes with various advantages, for example its sensitivity to the merits and drawbacks of the various sciences, without emphasizing only one factor in demarcation. It also highlights the continuity and interconnectedness between different scientific fields and allows for a given theory to move further to the right in the event of growing empirical support, and up along the vertical axis if its theoretical power increases – or vice versa as the theory's theoretical and empirical strength declines.

In fact, logical positivism was interested in a similar division of theories and fields. It was Otto Neurath who distinguished between 'logical' and 'empirical' components and argued that the history of Western science could be seen as a sort of struggle between the two. In a provocative paper, Neurath (1930/1983, 34) argued that ancient magic and sorcery were empirical matters where one worked with observable and tractable changes in the world and there is only a difference in degree between magical and modern scientific thinking – both fall on the axis of empirical knowledge, though at different points.

Empirical thinking of magic was replaced in the medieval times by theological-rationalistic and logical thinking (that actually brought with itself metaphysics). This kind

of approach basically broke with the previous tradition, and the prophets of theology became unaccountable: 'God decides independently of the prophet; there is no possible appeal, no calculation to which his decision could be subjected' (Neurath 1930/1983, 38). If something goes wrong with a prediction of the prophet, no one can be blamed, and nothing could be repaired or revised. Nonetheless, the theological way of thinking went hand in hand with significant progress in our theoretical understanding of the world, by fostering conceptual and categorical refinement via logical thinking, argumentative strategies, and deductive mastery. As Neurath (1930/1983, 40) wrote, "*The logical side of scientific thinking was greatly advanced, the understanding of empirical fruitfulness rather weakened*. Attention was mainly concentrated on a sphere beyond sensual perception" (my emphasis). Neurath's picture of how Western scientific and philosophical thinking developed, interacted, and changed throughout the centuries is obviously and grossly oversimplified. Nonetheless, it serves a useful heuristic function by establishing a connection to the modern scientific literature.

What this paper has shown is that the positivists' treatment of the different pseudoscientific fields could be seen in this light. According to Popper (1972/1999, 19), for example, although psychoanalysis did not progress on all fronts, 'its logical content is certainly high, but its empirical content is nil.' But despite being an unfalsifiable (and thus non-empirical) theory, Popper indeed thought that psychoanalysis could be used in a somewhat unsystematic fashion in medical and clinical practice – the fields where the theory originally emerged in the first place. As we have seen, Carnap, Reichenbach, and others also saw some kind of merit in the practical application of the theory, but they certainly had reservations on its systematic ordering. But contrary to Popper, Carnap and Reichenbach might say that psychoanalysis has given us empirical, workable facts about our psyche (meaning it would rank higher on empirical knowledge), yet without any detailed theoretical integration into the fabric of unified science (resulting in a lower level of theoretical understanding).

Parapsychology also exhibits this duality. Hahn and von Mises certainly thought that there were important empirical facts to uncover, and that it was our scholarly duty to double-check the investigations that provided those facts (Carnap would have agreed with this). Whether these facts can be integrated into a comprehensive theoretical scheme is a different question, and both thought that a lot of work would have to be done to make any allegedly supernatural phenomena consistent with a naturalistic understanding of the world. For them, parapsychology had a higher empirical content (or at least the possibility of one), and a lower level of theoretical understanding. After all, the very same considerations applied to extrasensory perception, with alleged empirical facts and knowledge that needed to be double-checked, while the theoretical underpinnings would have to be addressed at a later point.

At one point, Neurath (1930/1983, 36) emphasized that it is often possible to draw true conclusions from false premises: 'If it were impossible to obtain something correct from wrong premises with the help of correct ways of conclusion, mankind would have perished long ago.'[19] Magical thinking could lead to important empirical discoveries and thus the recognition of new facts, but this would not make it true entirely. Empirical knowledge does not go hand in hand with theoretical understanding. Consequently, empirical progress on certain matters does not make a certain theory or

[19] This means that even the false pseudosciences would have some value; see Tuboly (ms.).

idea scientific, despite recent 'attempts at a "scientific" astrology, palmistry and the like; spiritualist "theory" can also be added here' (ibid.).

There is a curious and special relationship between the supernatural and the scientific: If scientific investigations were to justify, verify, or confirm the phenomena in question, then they would not be supernatural after all, but become firmly anchored in the natural setting of the world. If, for example, the parapsychologists are right about the basic elements of reality, then our scientific world conception has to be rewritten. As Carnap, Neurath, and Hahn (1929/2012, 81) wrote in their famous 1929 manifesto, 'in science there are no "depths"; there is surface everywhere.' That surface is constantly changing and thus revisable on all accounts, since 'all experience forms a complex network, which cannot always be surveyed in its totality and can often be grasped only in parts' (ibid.). As new insights emerge, they may necessitate radical change in every corner and in all the gray or fringe areas of the sciences.

But in the case of metaphysics, the situation is significantly different. Although metaphysical statements are literally meaningless from a cognitive point of view, their acceptance or practical admissibility entirely depends on one's values, political stances, and previous personal and subjective experience, that is, on one's *Lebensgefühl* (see Carnap 1932/1959a). The empirical, physical, fact-of-the-matter world has nothing to do with it.

In the case of pseudoscience, the empirical world mattered either against them or in their favor. Of course, most logical empiricists accepted the underdetermination of theories, which also applied to pseudoscientific theories. That is, the empirical world alone will not determine whether paranormal activities or extrasensory perceptional skills are to be admitted to the furniture of the world; further value-related dimensions (like simplicity, economics of thought, fruitfulness, etc.) must be considered. That is why Harry Collins and Trevor Pinch (1982) were able to discuss and cautiously investigate the parapsychological community of the 1970s – because a scientific revolution was on the horizon at the time, prompted by the anomalies surrounding quantum mechanics. Although the revolution failed, it was at least partially decided on empirical grounds – something that could never be said about metaphysical debates.[20]

Consequently, we cannot say that the Vienna Circle and logical positivism were the cradle of the fight against pseudoscience. Instead, theirs was a more sophisticated point of view that left some room for research on the edges of science. And what's more, they were much more accepting of as yet scientifically unsupported and uncertain ideas, provided that they saw a sufficient practical benefit or a kernel of truth

[20] There is only one paper about demarcation from within the Vienna Circle: George Reisch (1998) published an article about why the pluralism of John Dupré and Philip Kitcher cannot handle pseudosciences like creationism. He argued that although Kitcher and Dupré advanced a certain form of cluster-concept approach to science (admitted also by Pigliucci 2013, 21), their pluralism actually went for 'disunity' and thus could not exclude creation science. Reisch suggested that Neurath's original unified science conception was also build on pluralism, interconnectedness, a sort of cluster-idea, but Neurath advocated unity and stopped short of admitting pseudoscience. While one could agree with Reisch's criticism, Pigliucci's new coordinate demarcation is more sophisticated and thus gets around this problem. It may be less surprising then that there is a foundational similarity between Pigliucci's coordinate system and Neurath's own reading of the history and nature of the sciences, as I have argued in this paper.

in them. Thus, another myth of the received view crumbles: The history of scientific philosophy is not the history of the demarcation problem per se.[21]

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