



Clever Hans and his effects: Karl Krall and the origins of experimental parapsychology in Germany



Fabio De Sio^{a,*}, Chantal Marazia^b

^a Institut für Geschichte der Medizin, Heinrich Heine Universität, Düsseldorf, Germany

^b Département d'histoire des sciences de la vie et de la santé, Université de Strasbourg, France

ARTICLE INFO

Article history:

Available online 28 August 2014

Keywords:

Karl Krall
Experimental parapsychology
Clever Hans
Elberfeld Horses
Psychic research
Anpsi

ABSTRACT

Shortly before the outbreak of World War I, the so-called Elberfeld horses, the counting and speaking animals, were among the most debated subjects of the newborn comparative psychology. Yet, they have left little trace in the historiography of this discipline, mostly as an appendix of the more famous Clever Hans. Their story is generally told as the prelude to the triumph of reductionistic experimental psychology. By paying a more scrupulous attention than has so far been done to the second life of Hans, and to the endeavours of his second master, Karl Krall, this article explores the story of the Elberfeld horses as an important, if so far neglected, chapter in the history of experimental parapsychology.

© 2014 Elsevier Ltd. All rights reserved.

When citing this paper, please use the full journal title *Studies in History and Philosophy of Biological and Biomedical Sciences*

In Germany ‘thinking animals’ play the same part in the social economy that ‘spirits’ do in the Anglo-Saxon world. That is, their alleged performances serve as a challenge and intense irritant to scientific orthodoxy.

F. C. S. Schiller (1923)

1. Introduction

At the dawn of the twentieth Century, the new-born science of comparative psychology was confronted with its first maturity test: the “wonder animals” (Lachapelle & Healey, 2010). Sure, counting pigs, reading dogs and intelligent horses had been around for centuries (Jay 1987), but the virtues of these exceptional beasts had now risen beyond the simple curiosity to veritable scientific affairs. The counting ability and capacity for abstract thought they seemed to possess flew in the face of evolutionary gradualism, psychological parsimony, Christian belief and materialistic philosophies. Some of these cases had grown so popular as to call for a final verdict from the impassionate tribunal of science. And the verdict

had come—fraud, or self-deception—restoring at the once scientific truth and the natural hierarchy of beings (Candland, 1995, chap. 8; Crist, 1997, pp. 4–5; Kressley-Mba, 2006).

The case of Clever Hans, the computing horse of the retired schoolteacher Wilhelm von Osten, admirably summarizes all the major features of these stories: wonder, sensation, interest elicited by the exceptional animal that counts just like us; intervention of authoritative men of science for personal interest or as part of commissions pro veritate, appointed in order to judge of the veracity of the phenomenon; debunking of the thinking horse and affirmation of a sober, critical approach; consignment to history of a name that will be forever identified with a capital experimental sin—the Clever Hans Phenomenon.

The “Clever Hans Phenomenon”, or “Clever Hans Effect” has over time grown into a methodological caveat (thou shalt not interfere!), the moral of a scientific parable (Griffin, 1976; Rosenthal, 1966. See also Sebeok & Rosenthal (Eds), 1981). As in all parables, the story has by necessity been limited to the essential: the problem posed by Hans’ exceptional capacities and the final solution, provided by Oskar Pfungst, a scrupulous experimenter who put everything back into question, starting from his very self, and so realized that the clever animal was not guided by thoughts from the inside, as it was by signs from the outside (Pfungst, 1907; Watson, 1914, pp. 297–303).

* Corresponding author.

E-mail addresses: Fabio.Sio@uni-duesseldorf.de, fabiodesio@gmail.com (F. De Sio).

Pfungst's (1907) *Das Pferd des Herrn von Osten* is usually received as the last word on the case, and therefore, the end of this story. The history of animal psychology continues its course, away from animal minds and towards its reductionistic future, while exceptional animal capacities fall back in the limbo of contingencies (Boakes, 1984, pp. 78–83; Prinz, 2006). Despite the objections raised against Pfungst's sign hypothesis (especially its almost universal applicability: see Candland, 1995; Crist, 1997; Despret, 2004a) "no scientists made the effort of reopening the dossier. Better so, at least for Hans: at the end of the story, it is surely better for him to remain the one about whom people were wrong" (Despret, 2004b, p. 134).

2. Clever Hans and the Elberfeld Horses

What the end of the story is, one could object, depends on the story. Histories of psychology rarely mention that Pfungst's theory actually did not go unchallenged, that Clever Hans was given a second chance, and that celebrity learning animals actually increased in number after 1907 and continued to command attention and ignite disputes for decades to follow (Mann Borgese, 1968, pp. 7–11).

After the death of Herr von Osten, both Hans and the mission to rebut Pfungst's argument were inherited by a Westphalian gentleman, Herr Karl Krall from Elberfeld (on Krall, see Werner, 1960). Krall had followed Clever Hans in the press since 1904, when the first assessment of the case was published by Pfungst's supervisor and director of the Psychological Institute of Berlin Carl Stumpf (Stumpf, 1904). Having witnessed Hans' performances in 1905, he became a frequent and welcome visitor of von Osten's and, after his death in 1909, Hans' new master. In order to further the education of the horse, Krall established in the centre of Elberfeld a "research stable" (Versuchsstall), which grew progressively into a little experimental zoo. By 1914 he had ten horses (Hans, Muhamed, Zarif, Harun, Amasis, Berto, Jona, the mare Edda and two others) a Pony, Hänschen, two donkeys, and the Elephant Kama. All of them were educated, with varying success, along Hans' model (see von den Berg, 2008; Mackenzie, 1914).

The official story of these experiments, as told by Krall himself (Krall, 1912), is that of a systematic reassessment of Pfungst's sign hypothesis, pursued through refinement of von Osten's method (especially as regarded the horses' system of communication), but especially through an obsessive complication of the experimental protocol "without knowledge", the cornerstone of Pfungst's argument (Pfungst, 1911, chap. II, esp. pp. 31–32; Krall, 1912, pp. 160–172). The experiences with Hans and his most talented companions, Muhamed and Zarif—aka "the Elberfeld Horses"—were published in 1911,¹ in the ponderous *Denkende Tiere: Beiträge zur Tierseelenkunde auf Grund eigener Versuche* [Thinking animals: experimental contributions to the knowledge of the animal mind]. This was to Krall the final, experimental vindication of the selbständige Denktätigkeit [autonomous thinking activity] of animals, against Pfungst's sign hypothesis, which he perceived as an erroneous and unjust reduction of the animal from a purposeful individual to a reacting mechanism (Krall, 1912, pp. 5–6).

The appearance of *Denkende Tiere* revamped the somewhat dawning interest in thinking animals: the Elberfeld Horses rapidly grew into a pet story for the scientific press, and even more so for the popular one, rivalling in fame with Hans' previous solo career.²

One year after the appearance of Krall's book, a sceptical Henry Piéron assembled a bibliography of around 50 titles in his review of the case for the *Année Psychologique* (Piéron, 1913). In 1914, William MacKenzie counted 84 scientific works on Hans & Co. (Mackenzie, 1914). Nevertheless, the Elberfeld Horses have left but little trace in the historiography, mostly as a detail within, or an appendix of, the "large" picture of comparative psychology (Dewsbury, 1984, p. 261; Kressley-Mba, 2006; Lachapelle & Healey, 2010; Thomas, 2005), or a variation on the Hans theme (von den Berg, 2008; Davis & Memmott, 1982; Vezzani, 2013), a fruitless attempt by another dilettante to revive the myth of clever animals (notable exceptions are Candland, 1995, chap. 5–6; Moynahan, 1999; Pogliano, 1987).

In revisiting here the significance and meaning of *Denkende Tiere*, we do not wish to retouch the standard account of the history of comparative psychology, but rather to reinstate Hans and the Elberfeld Horses to their proper place in the history of parapsychology. We will therefore focus on the negative of the Elberfeld affair: not much what Krall claimed he was doing, but what he omitted from his reports; not his official science, but his occult science.

3. Clever Hans or Psychic Hans?

Hans' debut places him squarely within the domain of parapsychology. The first to examine the horse (in 1903, one year before Stumpf) had in fact been the "critical occultist" Albert Moll (Wolffram, 2009, p. 233. On Moll, see also Sommer, 2012; Wolffram, 2012). Moll wasn't particularly impressed by what he saw, and only the following year—after Hans had hit the news—did he respond to the "insistent requests" from the Berlin *Psychologische Gesellschaft* to lecture on the case (Moll, 1904a, p. 368. On the origins and nature of the *Gesellschaft* see Sommer, 2013).

On that occasion, Moll recalled having filed his notes on Hans under the heading "Occultism", instead than "animal psychology" (Moll, 1904a, p. 369), for he had immediately recognized in the horse's performances instances not of independent thought, but of mind-reading, if of a wholly mundane kind. Moll's long-standing, critical interest in the supernatural made him aware of the role of imperceptible involuntary bodily movements in guiding human mind-readers, a phenomenon well known under the name of "muscle-reading" or "Cumberlandism" (see Cumberland, 1888, pp. 223–226). "As we know it", Moll cautioned, "this source of error must be neutralized for 'Clever Hans' as well" (Moll, 1904a, p. 369).³ Moll's detailed account of the case was ignored by Stumpf as well as by the scrupulous Pfungst, who, while expanding at some length on tongue-in-cheek comparisons between clever animals and human mediums in his 1907 work, never even cited him (Moll, 1904b; Gundlach, 2006). This lack of recognition outraged Moll, who did not let go, and took the chance to set the matter straight for the historical record, reclaiming to himself the paternity of the sign hypothesis a few years later. In his 1913 work on hypnotism and occultism, he claimed that Stumpf only "relinquished his erroneous views" on the sources of influence over Hans "after [Moll] had given him the correct explanation, privately and publicly", but never acknowledged the reason for his change of mind (Moll, 1913, p. 458). "Stumpf", Moll bitterly commented, "ought from the very first to have made use of that critical system of research that alone has been employed for the last twenty years by persons making experiments in connection with telepathy, clairvoyance and the action of drugs at a distance" (Moll, 1913, p. 457). Karl Krall was one such person, if not exactly one of Moll's persuasion.

¹ We have referred to the expanded 1912 edition (Krall, 1912).

² At the end of 1914, Franz Kafka jotted the story of a young student, fascinated by the Elberfeld experiments, who planned to abandon his studies and commit himself to the resolution of this controversy (Kafka, 1993).

³ The practice of secretly guiding trained animals by means of bodily signs was known since antiquity (see Klinkowstrem, 1928). On involuntary cues, see also Moll (1892).

Contemporaries portrayed Krall as an earnest amateur scientist, perhaps a trifle prone to enthusiasm but “of unquestioned good faith”, endowed with a rich library “especially strong in psychology” (Sanford, 1914, pp. 18–19; Mackenzie, 1914, pp. 8–10). What his critics would (apparently) not suspect, and Krall would (apparently) not tell, was that his scientific library went beyond psychology, well into more obscure realms, and that the unpublished “psychophysical researches” he had so far conducted into his “considerable physical laboratory” (Mackenzie, 1914, p. 9) were of a special kind, and on a special subject.

To Krall, as he himself made clear towards the end of his life, Clever Hans had been more than a psychological curiosity: he was the end of a long quest. Like many middle-class Europeans of his generation, Krall had in fact developed an early interest for psychic phenomena, in particular telepathy. Like the few experimentally minded *séance*-goers of the time, moreover, he sought not much to chat with the souls of the dead, but rather to scientifically investigate the principles and laws of bona fide natural phenomena. In this connection, he soon came to recognize in the reliability of the mediums the greatest obstacle to a serious exploration of psychic events (see Wolfram, 2009, p. 147). He spared no effort in the search for a trustworthy medium, and in 1901 he thought he had found the right subject in the Brazilian mind-reader Georges Ninoff (Krall, 1926, pp. 584–586). The two teamed up, and Krall built the parapsychological laboratory at his home in Elberfeld, where they planned to study the physical basis of thought-transference.

It is in the context of Krall’s collaboration with Ninoff that he first envisaged the possibility of testing interspecies telepathy, but the project presented insurmountable difficulties. Even with such a gifted and emphatic subject as Ninoff, the inability of the animal to make itself intelligible to the observer stood in the way of a proper experimental assay. An unequivocal system of communication was necessary to evaluate the results of the experiments beyond any possible misunderstanding. The absence of any such device reduced the possibilities of observation to the cases in which the animal was sender and the medium receiver, and complicated the design of the experiments enormously. The animal had to be stimulated to form a clear and distinct mental image, which then was up to the medium to catch and interpret correctly. One of the tests Krall had conceived, for instance, consisted in presenting a hungry animal with an object—a carrot, a loaf of bread, or white sugar—and then verifying whether it had transferred the corresponding mental image to the mind reader. This design required that the experimenter be unaware of what object the animal was to see, to prevent contamination of the thought transfer. Moreover, the sender was inevitably unreliable, in terms of both availability to communication and ability to produce readable thoughts.

It is in the midst of these disquiets that, in 1904, Krall first came across clever Hans. “Here”, he said to himself, “is an animal that can make itself understood! Instead of relying on the cumbersome and difficult proof ‘from animal to man’, now the other way is accessible: from man to animal! Here we have the experimental object we need: one we can actually question” (Krall, 1927a, p. 63).

Krall’s “other way” was not new to Hans. Von Osten had already tried with him what he called “silent speaking” (*stilles Sprechen*—see Krall, 1927b, p. 150), i.e. the wholly mental transmission of simple orders, like “move your head” or “lift your leg”. Some such experiments had even been attended by the first commission of experts appointed by Stumpf in 1904 to investigate Hans’ intelligence. Apparently, they hadn’t failed to “baffle and bewilder” some of the experts. As one of them later commented, “one could be persuaded that it was enough to just intensely think of a number

[...]: the animal would tap it correct” (L. Heck, quoted in Krall, 1927b, p. 152). Silent commands were also put to the test by Pfungst, who disposed of them as yet another instance of unintentional cueing (Pfungst, 1907, pp. 78ff).

Krall started exploring the potentialities of silent speaking from 1907. He had Mr von Osten think of a colour and then transmit the information to Hans, who could in turn communicate unambiguously which colour he had received. In another protocol, he asked two observers to think of a number and independently transfer it telepathically to Hans, who had to make the sum (Krall, 1927b, pp. 157–161). This last experiment was especially important to Krall, in that it proved both the salient capacities of the animal—counting and mind reading—while at the same time confirming their independence: Hans was a proficient mathematician and a gifted medium.

Krall was pleased with the results of the telepathic experiments: Hans learned fast and scored above chance level (Krall, 1927a). Despite the logistic difficulties (life and work in Elberfeld, the horse in Berlin), in 1908 he had gathered enough material for a whole chapter on the “silent speech” experiments in the book he was writing on Hans. The manuscript, *Beiträge zur ehrfurchungsmässigen Seelenkunde* [Contributions to experimental animal psychology], was planned in eight parts, the first two of which were devoted to a minute history of Clever Hans, from von Osten to the latest experiments. The other chapters covered: Hans’ means of expression; Krall’s own learning and telepathic experiments; critical discussion of the different hypotheses on Clever Hans; “The cultural value of von Osten’s work and its meaning for animal protection”; and two series of annexes.⁴

The bounded draft, dated 1908 and bearing the name of a fictional publisher, Stumpf–Pfungst Verlag, was never published in its original outline.⁵ Heavily reshuffled, it came to constitute the bulk of *Denkende Tiere*. The final version of the book, however, differed from the 1908 draft in one important detail: no trace was left of silent speech. In the draft, Krall reported “present silent speech experiments” to some detail in the June 1907 entry of the chronology, and in October 1907 referred to a “large series of experiments” he had performed in his laboratory.⁶ The detailed journal of the research with Hans, transcribed almost verbatim in the Annex I to *Denkende Tiere* (Krall, 1912, pp. 275–353), was purged of these entries.

Interspecies telepathy was preserved in the published version only as a purely theoretical option. In the introduction, the “wholly unknown connection between animal and man [...] or the so called *Gedankenübertragung*” was presented as the only plausible alternative to autonomous thinking (Krall, 1912, p. 8). Throughout the rest of the essay, though, the telepathic hypothesis was not only expressly refuted, together with Pfungst’s sign hypothesis, as an “assumption of last resort” [*Verlegenheitsunterstellung*] (Krall, 1912, p. 170), but even reduced to a “senseless [*nicht recht einleuchtend*] explanation” like pure chance, electrical conduction or “the unmatched sensation of heath without direct contact” (Krall, 1912, p. 76). Krall’s final word on the unknown connection was anyhow unequivocal: “All the attempts so far made at attributing Hans’ accomplishments to signs or a ‘connection’ are incorrect” (Krall, 1912, p. 344). One is left wondering if it is entirely a coincidence, that such a sharp judgement was put in the stead of

⁴ Ludwig-Maximilians-Universität München, Nachlass Karl Krall (54.13), Der kluge Hans I–III. Typescript, 1908.

⁵ The manuscript is incomplete, lacking a substantial part of section IV (including the chapter on silent speech) and sections V–VIII.

⁶ Ludwig-Maximilians-Universität München, Nachlass Karl Krall (54.13), Der kluge Hans I–III. Typescript, 1908, pp. 34–35.

the June 1907 entry. As for the original October 1907 entry, it was substituted with a generic reference to “New experiments with Hans” (Krall, 1912, p. 346).

It is plausible that Krall's self-censorship served a tactical purpose. Whatever the issue (animal mind or animal telepathy), the stumbling stone was the sign hypothesis. As long as that objection stood, no progress was possible along any of the two lines. Animal psychology was obviously a safer ground for proving the independence of Hans' performances from external guidance. It was therefore useless to divert attention from the preliminary issue at stake, and to open additional fronts of controversy by suggesting hypotheses that only explained *obscura per obscuriora*.

Within Krall's long-term strategy, *Denkende Tiere* served a double purpose. It was certainly conceived as a final statement on the plausibility of a clever Hans, but to the cognoscenti it was also the necessary methodological prolegomenon to a properly scientific animal parapsychology: responding to Pfungst implied responding to Moll. Once the signs had been eliminated, the file on telepathy could be (re)opened. Krall in fact did not refrain, in a short concluding paragraph on the "Implications of [his] work" from hinting at some unspecified "results that form the basis of [his] further experiments", that he wished to record in order to "protect [his] authorship", if in a cryptographic form: "aaaaaaaaaaaaaaaa bbbbbb cccc dddddddddddddddd eeeeeeeeeeeeeeeeeeeeeeeeeeee eeeeeeeeeeeeeeeeeeee ffff gggggggggggggggg hhhhhhhh iiiiiiiiiiiiiii kkkkk ll mmm nnn o pp rrrrrrrrrrrrrr sssssssssssss tttttttttttt uuuuuuuuuuuuuu vv ww zz" (Krall, 1912, p. 522). What these results were, it is not possible to know with certainty. What we do know, however, is that immediately after the completion of *Denkende Tiere* (and, tellingly, on the verso of its draft), Krall had started working on the next stage: a book on *Tierokkultismus*.⁷ This "new science of the future" was a complement of his earlier work, in that it was conceived as "the combination of the speaking animal, educated according to the new method, with occultism. An intersection of occultism and animal thinking ability".⁸

4. If psychology does not go to Muhamed...

Krall's emphatic denial of the “unknown connection” [unbekannten Konnex] did not discourage parapsychological readings of *Denkende Tiere* (see [Harter, 1914](#); [Kotik, 1913](#); [Siciliano, 1914](#); [Stefani, 1913](#)). The Elberfeld Horses featured prominently in the *Annales de Sciences Psychiques* ([Ferrari, 1912](#); [de Vesme, 1912, 1914](#)), and a debate on the learning animals opened the first meeting of the *Société Universelle d'Etudes Psychiques* in 1913 ([Lachapelle & Healey, 2010](#)). In the same year the *Society for Psychical Research* encouraged its psychological members to arrange independent experiments on Krall's horses, in light of the interesting analogy they seemed to provide with human “muscle-reading” (“[Private Meeting for Members and Associates](#),” 1913; “[Report of the Council for the year 1912](#),” 1913). Experts and sympathizers of parapsychology mingled from early on with psychologists and zoologists on their way to Krall's estate. Maurice Maeterlinck, Nobel laureate for literature in 1911 and committed spiritualist, made his “pilgrimage to Elberfeld” in September 1913 and, after a few days of experiments, was convinced that the “transmission of thought from

one subconsciousness to the other”, was the only acceptable explanation for the spectacular performances of the horses, “however strange it might be in this new region” ([Maeterlinck, 1914](#), p. 238).⁹ Academic psychologists (Edouard Claparède, G. C. Ferrari, Roberto Assagioli) and biologists (William Mackenzie), supporters of the autonomous thinking hypothesis, did nevertheless consider telepathic and mediumistic interpretations worthy of discussion in their writings on the thinking horses (see [Claparède, 1913](#); [Kindermann, 1923](#), pp. 157–188; [Pogliano, 1987](#)).

Even though a few parapsychological interpretations had been advanced in connection with von Osten's experiments, too, never before had the thinking animal issue been so popular among psychic researchers, nor the psychic option so widely discussed within academic circles. Edmund C. Sanford of Clark University reviewed Krall's experiments in a long piece for the *American Journal of Psychology*, bearing the explicit title "Psychic research in the animal field". While thoroughly critical of Krall as an animal psychologist, Sanford approvingly observed that "the chief interest of [Krall's] studies [...] lies in the closeness with which they correspond in their general features to the human experiences dealt with by the Society for Psychical Research". "Perhaps the delicate responsiveness of horses", he concluded, "offers us a means of bringing some of the mediumistic phenomena into the laboratory in manageable fashion" (Sanford, 1914, pp. 30–31).

Despite the encouraging turn taken by the early debate on *Denkende Tiere*, showing a certain openness on the part of (some) experimental psychologists to ruthless new hypotheses, Krall preferred to keep his occult science occult. He rejected insistent requests from the *Institut Metapsychique International* for the appointment of a commission (Lachapelle & Healey, 2010), and even played the fool with Maeterlinck, assuring him that he had “never made any effort to transmit this and that” to the horses (Maeterlinck, 1914, p. 271).

Krall had of course tried to transmit this and that, but had interrupted any systematic experiment by the beginning of 1909. He kept practicing discontinuously with Hans, but chose to preserve Muhamed and Zarif. Their telepathic capacities he had tested, and with encouraging results, but he resolved not pursue this line any further, for fear that his best performing subjects may get too used to telepathic guidance to the detriment of an adequate cultivation of their autonomous thinking (Krall, 1927b, pp. 162–163). Both epistemologically and methodologically, the psychological question had priority over the parapsychological one: the animals' mind had to be proven beyond doubt and adequately defined, before serious psychic research could even be conceived. From 1909, Krall concentrated all his efforts into building consensus around the autonomous thinking theory.

Denkende Tiere was the main pillar of this strategy, but it was still the work of an amateur. Krall wanted his research invested with academic authority, and furthered as a collective endeavour. The founding of the *Gesellschaft für Tierpsychologie*, in 1912, was an attempt to meet these needs. If Krall was the inspirer and secretary of the society, its first president and director of its journal (the *Mitteilungen der Gesellschaft für Tierpsychologie*) was the distinguished zoologist Heinrich Ernst Ziegler, professor at the *Technische*

⁷ Ludwig-Maximilians-Universität München, *Nachlass Karl Krall* (54.10: Tierokkultismus Mss + Notizen, file Mss 1919–1924). Schlusswort. Das Verhältnis des Menschen zum Tiere im Laufe der Zeiten. Typescript, 1911.

⁸ Ludwig-Maximilians-Universität München, Nachlass Karl Krall (54.10: Tierokkultismus Mss + Notizen, file Mss 1919–1924). Tierokkultismus 13.12.24. Typescript, 1924, p. 1.

⁹ In the Spring of 1912, Sándor Ferenczi proposed to Freud a review for the *Schriften zur angewandten Seelenkunde* on what he called the phenomena of “induction” that may be involved in the case of the Elberfeld horses. He intended to take an eight day trip to Elberfeld, in order to observe the animals in person. Freud accepted the offer immediately and wholeheartedly, inviting his friend to take even two weeks and “study everything [he needed]”. He also proposed the title “The unconscious and thought-transference”, as he feared that the term “induction” may sound obscure to the public (Brabant et al., 1908–1914, pp. 379–381). No trace has been found of Ferenczi’s equine essay.

Hochschule in Stuttgart. Among its founding members were several respected scholars (Edouard Claparède, Ludwig Edinger, Ernst Haeckel, Enrico Morselli, Sante de Sanctis, Paul Sarasin, Julius Schaxel) from all over Europe and one (Robert Yerkes) from the USA (Yerkes, 1913).

The Elberfeld Horses were the absolute protagonists of the early activity of the society, and were presented as the point of origin of a new animal psychology (Krall, 1913). The greatest share of the first two volumes of the *Mitteilungen* featured Hans & Co, but the associates were also encouraged to publish on their experiments in other scientific journals, while Krall himself occasionally sponsored the publication of sympathetic pamphlets by non-members (see de Vesme, 1913). The organization of the Elberfeld research stable had to be strengthened to respond to the worldwide fame of the horses. Krall had to delegate his commercial activity to his son and hire new assistants, including two typists for the “equine correspondence” (Mackenzie, 1914, pp. iv and 9).

The resonance of his work had made Krall hopeful that animal psychology could really be reformed along the lines he had envisaged, and that a consistent scientific movement could be catalysed to provide a final, collective response to Pfungst’s sign hypothesis. He had provided the method, the animals, the organization, and a lot of money out of his own pocket. He did not get much in return, apart from a snowfall of popular press articles, a few favourable scientific pronouncements and a handful of reviews in scientific journals. Still, the sign hypothesis remained the canonical explanation within the official animal psychology and Krall’s work was referred to, if at all, as a minor heresy, when not made target of outright derision (see Piéron, 1920; Washburn, 1917, pp. 307–309).

The thinking animals were still in want of an authoritative patron, someone whose voice would not be easily ignored by the academic establishment. The opportunity presented itself again in the guise of a scientific commission. On the occasion of its annual meeting, in April, 1914, the *Deutsche Gesellschaft für Experimentelle Psychologie* invited Prof. Robert Sommer of Gießen to convene a group of scholars to close the Elberfeld case (see R. Sommer, 1925, pp. 97–99).

The involvement of Sommer promised to be decisive: not only was he an established academic, he was also directly connected to the sign hypothesis, as the inventor of the device for measuring the involuntary movements of the hands later adapted to head movements by Pfungst (Pfungst, 1911, p. 116; R. Sommer, 1898).

Krall, who had always been firm in protecting his animals and reputation from excessively critical scrutiny (Sanford, 1914, p. 136; Vezzani, 2010, pp. 88–90) adducing the excuse that the animals were sensitive to an unsympathetic attitude, this time was glad to collaborate. Organizational problems impeded the official appointment of a full commission, and on May 30th, 1914, Sommer resolved to undertake the assessment privately, with the help of two other scholars. They could not devote much time to the horses, but left Elberfeld with a strengthened faith in their capacities, in Krall’s competence and in his method (R. Sommer, 1925, pp. 112–114). Unfortunately, Sommer’s report remained unpublished for more than ten years (R. Sommer, 1925, p. 115), depriving Krall of his last opportunity for a high profile academic endorsement.

To add insult to injury, Krall and the *Gesellschaft für Tierpsychologie* were targeted by animal protection movements, venting the suspicion that the training methods employed at Elberfeld may lead to torture and vivisection (von den Berg, 2008, pp. 99–101). The outbreak of World War I did the rest. In one of the last entries of his diary (August 15th, 1914), Krall recorded the official end of his didactic work with horses, and his firm intention not to resume it in the future. The cost of keeping the research stable had in the long

run proven too high, and so, in the absence of any external help, Krall found himself forced to renounce to his beloved pupils.¹⁰

Krall’s farewell to animal psychology was bitter. Despite all the effort and resources poured in the endeavour, the sign hypothesis had stood the challenge and, as *Tierokkultismus* was nothing short of the “intersection of occultism and animal thinking capacity”,¹¹ this meant a standstill for the whole project. If the attempt at sowing the seed of autonomous thinking in the field of animal psychology had substantially failed, however, still he could try to implant the sprout of *Tierokkultismus* on a smaller but potentially more fertile ground: that of the *Gesellschaft für Tierpsychologie*. After all, the Society had gathered around the very issue of animal consciousness, Krall’s authority and primacy in the field were recognized, and some of the members were not at all prejudiced against scientific occultism. In particular, Krall found a kindred spirit in Karl Gruber, professor of Zoology at the *Polytechnikum* in Munich. Gruber had converted to parapsychology in the Summer of 1913, after having personally observed the Elberfeld horses (U. Gruber, 2008). He had been among the first to consider telepathic explanations of their performances and in 1920 he published a detailed review on the matter in the *Mitteilungen der Gesellschaft für Tierpsychologie* (K. Gruber, 1920). In 1922, Krall and Gruber penned an open letter to the *Mitteilungen*, pleading for the inclusion of “the field of Occultism, in particular Animal Occultism” among the topics covered by the journal (Ziegler, 1922, p. 65). H. E. Ziegler, president of the Society and editor of the *Mitteilungen*, accepted to publish the plea, but threatened to resign in case of so radical a revision of the Society’s scientific programme. Himself by no means unsympathetic with the thought-transference hypothesis, Ziegler nevertheless did not wish to have the *Gesellschaft* associated with any brand of occultism. Moreover, the society simply could not afford, in so troubled times, to have its expensive journal trashed with “sterile polemics” no one would want to read (Ziegler, 1922, p. 66).

The *Kulturkampf* within the society did not discourage Krall, it only commanded a reconsideration of the strategy: instead of implanting occultism into animal psychology, he would import animals into occultism.

5. ...Muhammed will go to the parapsychologists

Ziegler’s blow had not come unexpected. An esteemed professor and renown popularizer of science, he had surely helped to secure public attention to the Elberfeld horses, and to promote the cause of autonomous thinking. As for his collaboration in the “second phase of the work—demonstrating the feasibility of thought transfer between animal and man” Krall’s hopes had always been “rather modest”.¹² Anticipating Ziegler’s resistance, Krall had tried to address a different audience. Introduced by Gruber, in the Fall of 1921 he had delivered two lectures to the *Psychologische Gesellschaft* of Munich, the cradle of German psychic research (K. Gruber, 1922; Sommer, 2013). The first conference (October 24th) was on the thinking animals and his teaching methods. The second (November 8th) was devoted to the 1907 silent speech experiments with Hans, which were made public for the first time in this occasion and enjoyed a flattering reception. The master of the *Psychologische Gesellschaft*, the *Geisterbaron* Albert von Schrenck-

¹⁰ Ludwig-Maximilians-Universität München, Nachlass Karl Krall (51/1-18: Tagebücher 1908–1914). Tagebuch 18. Manuscript.

¹¹ Ludwig-Maximilians-Universität München, Nachlass Karl Krall (54.10: Tierokkultismus Mss + Notizen, file Mss 1919–1924). Tierokkultismus 13.12.24. Typescript, 1924, p. 2.

¹² Ludwig-Maximilians-Universität München, Nachlass Karl Krall (51/1-18: Tagebücher 1908–1914). Tagebuch 18, entry 07.10.1915. Manuscript.

Notzing, became Krall's Pygmalion in Munich, invited him at some séances with the medium Willi Schneider (A. v. Schrenck-Notzing, 1924) and introduced him to the vibrant local psychic scene (Sünner, 1929, p. 169).

In Munich, Krall's public persona progressively emancipated from the Elberfeld Horses, as it grew in prominence within the community of parapsychologists. In a 1924 essay in the *Neue Rundschau*, Thomas Mann, a neighbour of Gruber's and occasional attendant to Schrenck-Notzing's séances, portrayed him as "a man, whose trade and activities hover on the borders of the occult" (Mann, 1932, p. 221). Encouraged by Schrenck-Notzing, by 1925 Krall had moved to Munich permanently, in an imposing villa on the Isar in the suburb of Harlaching.¹³ The whole ground floor of the building was turned into a large parapsychological laboratory, consisting of two rooms for experiments, a workshop, an archive and a darkroom. The first floor accommodated the 7000 volumes of the library.

The technology for physical and parapsychological research was state-of-the-art. Galvanometers, thermopiles, electrometers, bridgemeters, telegraphons were combined in complicated networks, in order to record the slightest noises and to detect the cold breath of the medium. A sophisticated photographic and cinematographic equipment allowed the documentation of materializations or ectoplasms even in the dark. Special lights illuminated the séances, while the loudspeaker directly connected to the Münchner Staatsoper provided background music. The pride of the laboratory was the electrical apparatus for medium control, invented by Krall himself and perfected by Schrenck-Notzing. It consisted of an electrical circuit, whose nodes were the limbs of the medium and of the controls. Any undue movement would therefore interrupt the circuit and activate a warning light. This simple instrument, greeted by Schrenck-Notzing as a "Columbus egg" for psychic research, mechanized part of the standard control procedures and should have prevented allegations of fraud by guaranteeing a constant monitoring of the medium (Krall, 1927c, pp. 90–91; A. v. Schrenck-Notzing, 1926).¹⁴

The Harlaching laboratory was not simply an updated, high-tech version of Schrenck-Notzing's cabinet (on which see Wolfram, 2009, 131–189). It had been conceived and designed as a new sort of research infrastructure, the core of a model institute for *Tierokkultismus*. In order to fulfil this mission, it was not enough to have human and animal parapsychology carried out under the same roof. Tierokkultismus was more than the brute sum of animals and occultism, as was made explicit by the very name of the institute: *Krallsche Institut für Tierseelenkunde und Parapsychische Forschungen* (Krall's Institute for Animal Psychology and Parapsychological Research). Animal psychology and parapsychological research were recognized as the two equally important pillars of the new science, while the explicit mention of Krall's name derived from a precise choice to highlight the centrality of von Osten's and Krall's method (Krall, 1927c). Krall's ambition, in fact, was again not just to continue his own programme in the best possible

environment, as to build a vast research community committed to the renovation of psychology, and for this reason he had fashioned his institute "on the model of Adolf Dorn's [sic] Naples Aquarium", where individual scientists could conduct their special studies in complete independence, with the help of the best available technologies and the rich library (Krall, 1927c, p. 89).

Like its Neapolitan model, the *Krallsche Institut* was conceived as an international hub, the major task of which would have been to foster autonomous research by taking care of the most expensive and time consuming organizational issues, starting from the selection and education of adequate subjects, both animal and human. Spaces equipped for the training of the animals were provided in the veranda and park of the villa, with the plan of systematically resuming the propaedeutic education on a variety of species: parrots, cats, horses, elephants, rats, mice, all the way down to insects. As for the humans, it would have been the task of the *Tierpsychologische Gesellschaft München* (Gruber's society) to select and train motivated researchers.¹⁵

The founding of the institute was the culmination of a twenty-year-long struggle for the establishment of a new scientific discipline. Krall had every reason to rejoice: his plans were finally materializing, with the support and consideration he had not found among the animal psychologists. Not least, the *Krallsche Institut* represented the vindication of von Osten in the face of his academic critics. "The seed sown 25 years ago by the old and unrecognized master", he wrote, "one of the greatest discoverers of all time, has [...] become a tree, which will bear – I hope! – its fruits also to the following generations. As long as there are thinking humans, there will be thinking animals. The idea is not dead – the work LIVES!" (Krall, 1927c, p. 582).

6. Tierokkultismus revealed

The move to Munich and the establishment of the laboratory had taken their toll on Krall's own experiments. He had had no time to devote to the elaborate preparation of animal-occultistic experiments, except occasional measurements of "thought radiations" between a man and a dog with the new instrumentation (Krall, 1927c), and also the writing of the book was lagging behind. Nevertheless, in the Fall of 1926 he started the publication of a ponderous essay on interspecies telepathy (*Denkübertragung bei Mensch und Tier. Experimentalstudien*) in the first volume of the *Zeitschrift für Parapsychologie* (Krall, 1926).¹⁶ An introductory note, signed by the editors but actually drafted by Krall, announced that "after twenty years, the time [had] finally come to stop waiting for the consensus of a backward, if official, 'scientific animal psychology', and to make the world finally acquainted with the second, occult side of this multifaceted complex – the question of animal mind" (Krall, 1926, p. 578).

Time had come, indeed. In the previous few years, a series of conditions had materialized that prompted Krall to go public with his pre-war psychic experiments on Hans. For one thing, experimental animal parapsychology fitted the new agenda of German

¹³ Sünner (1929, p. 169). There is some uncertainty as to the timing of this move. Zöllner (Zöllner, 1929, p. 164) anticipates it to 1921, while the *Wupperthaler Biographien* (Werner, 1960) indicate 1925. It is most likely that Krall's relocation was a slow process, and that he progressively intensified his presence in Munich during the first half of the 1920s. According to Amereller, for instance, in 1924 the laboratory was already under construction, which would imply that the villa was purchased either in early 1924 or before (Amereller, 1929).

¹⁴ Krall's apparatus was bound to become a major piece of parapsychological technology. Schrenck-Notzing had one built in his laboratory, too, and when, in 1929, the medium Willi Schneider relocated in London, at the court of Harry Price, he brought with him Karl Amereller, the engineer who had worked with Krall, and who installed an improved version of the electrical medium control at the National Laboratory of Psychical Research (A. Schrenck-Notzing, 2013, p. 228).

¹⁵ Ludwig-Maximilians-Universität München, Nachlass Karl Krall (54.10: Tierokkultismus Mss + Notizen, file Mss 1925–). Das Tier und der Okkultismus. Vergangene und zukünftige Versuche. 27.01.25. Typescript, 1925, p. 4.

¹⁶ It was planned as a four-part essay, covering the phenomenon of thought transference: 1. between man and man; 2. between man and animal; 3. between animal and animal, incorporating evidence from past research as well as his own results. The fourth chapter should have been devoted to an account of Krall's own experience in parapsychological research. Unfortunately, the essay was interrupted at the end of section 2. The ambitions of the project were clear from the exergue, the same quote from Seneca as in F. A. Messmer's last book: "Veniet tempus, quo ista, quae nunc latent, in lucem dies extrahat" (Krall, 1926, p. 577).

psychic research, as expressed in the policy of the *Zeitschrift* of “exploring the border areas [of parapsychology] with other sciences” like physics, psychiatry, psychology and biology (“*Zur Umgestaltung der ‘Psychischen Studien’ in eine ‘Zeitschrift für Parapsychologie’*”, 1926. See also Wolffram, 2009, pp. 165–169, on Schrenck-Notzing’s influence on the new course of the journal). Encouraging developments had occurred in the academic sciences, too: if, in 1907, Stumpf could ridicule the hypothesis of interspecies telepathy, grouping it with fancy theories like the mysterious N-rays, “magical” or “magnetic influence” (Pfungst, 1911, p. 28), now an authoritative physiologist had come to its rescue—twist of fate, in Moll’s journal.

In 1924, Wladimir Bekhterev had published on the *Zeitschrift für Psychotherapie und medizinische Psychologie* an article on some experiments performed with the circus tamer Wladimir Leonidovich Durow (Bechterew, 1924).¹⁷ Bekhterev reported of his success in inducing two of Durow’s dogs to perform various tasks by “mental suggestion”, and claimed equally impressive results with his own, untrained companion animal.

Bekhterev’s experimental setting and method were quite far from Krall’s, and in a sense less revolutionary. His theoretical framework was what came to be known as “biological radio-communication” (Kazhinskiy, 1963), in which the human side was the only source psychic communication, and the animal a simple receiver. The only thing that mattered, anyway, was that the reality of interspecies telepathy had been experimentally established in a satisfactory way and, most importantly, that it could be “adjusted to the conditions of a physiological laboratory experiment” (Bechterew, 1924, p. 299).

Krall had long waited for this breakthrough: “for the first time”, he commented, “my 1907 discovery of the possibility of interspecies telepathic communication has been fundamentally confirmed” (Krall, 1926, p. 579). Bekhterev’s name was to the scientific community a guarantee against all mystifications: he was a prominent and reliable physiologist, accustomed to the design of complex experiments and to the rules of scientific reporting. Not least, he was well above all suspicion of intelligence with the parapsychologists (Zimmer, 1925, p. 245). Once the ice had been broken, however, it was critical that the whole extension and import of the revolution be made clear. The task of *Tierokkultismus* was not simply to affirm the existence of supernormal faculties in animals (as had been done before, see Bohn, 1895; Bozzano, 1905, 1926). It was also, and mostly, to advance psychic research as a whole to a mature experimental stage, and frame it in a renewed, non-materialistic “science of the future”.¹⁸

To Krall, the stalemate of psychic research was largely due to the lack of “an instrument, a reliable device that, like in physical laboratories, be always at hand” (Krall, 1926, p. 581). Animals were that missing instrument: they were available in greater quantity than genuine human mediums were, easier to train and much easier to manage (as Zimmer put it in a review of Bekhterev: “We don’t need to ask animals, whether they want or have time”, Zimmer, 1925). But the most important feature of animal subjects, to Krall’s eyes, was their “natural” reliability: their inherent honesty, immune to any temptation to please their masters, was in itself a guarantee against cheating, which allowed to dispense

with all the control devices indispensable to the traditional, medium-centred psychic research. Moreover, animals could be expected to provide access to psychic phenomena in a purer form, in that their soul “draws immediately from the eternal springs of nature” and, free from cultural burdens and “excessive mental labours, [...] is more receptive to some kind occult influences, especially — as demonstrated by experiments — in the field of telepathy” (Krall, 1928, p. 255). Finally, the mediumistic faculties of animals appeared to be more malleable than those of humans, were easier to cultivate and refine in laboratory conditions, and could be put to practical tasks, like “recovery of lost valuables, solution of apparently unsolvable enigmas, crime detection, treatment of diseases, prediction of telluric, perhaps even of cosmic events”.¹⁹

But the importance of the animal to parapsychology transcended its practical advantages. Krall, like Bekhterev, did appreciate the pragmatic value of animal experimentation, especially in its connection with the issue of reproducibility. Nevertheless, while Bekhterev had sought to contribute to parapsychological research from the point of view of experimental physiology, introducing the animal as a mechanical model to reproduce a function, a void receiver, Krall had never approached his horses as simple objects, or instruments. The true revolution of *Tierokkultismus* lied in the system of communication between researcher and animal allowing the latter to directly contribute to the experiment.

Krall took great care to separate the issue of animal thinking capacity from that of their telepathic or mediumistic powers. Both were to him independently proven by observation and experiment, and could stand on their own (Krall, 1926, p. 579). The connection between the two was nonetheless crucial, not only to the explanation of the phenomena, but also, and especially, to the quality of the research being conducted. The possibility of unambiguous communication between two mentally independent subjects turned the animal from an experimental object, reacting to a stimulus, to an experimental subject, responding to the actual questioning of the human partner in a shared code. The knocking method made it possible for the animal to (literally) bare its soul, providing the humans with insight towards an adequate cultivation of its skills. Krall thought it possible “that the unconscious of the animal manifest itself physically thorough leg tapping, like the turning table, so to speak, makes use of its legs, driven by the unconscious of the table turners”.²⁰

Krall’s concept of the animal as an experimental subject (as opposed to a mere experimental object) marked the greatest distance between his approach and that of Bekhterev. While the latter had only added animals to occultism, Krall had sought to merge, and therefore overturn, two sciences. To his mind, *Tierokkultismus* was the trigger of “an unprecedented spiritual revolution, which will shake the whole building of normal psychology, and with it the decaying relic of ‘scientific animal psychology’, insofar as it rests on the shaky ground of a nothing-else-than-instinct-and-reflex theory” (Krall, 1926, p. 578). Animals, possibly all of them, possessed individual minds; these minds were variably susceptible of education and training, in both sensory and telepathic communication. A direct channel was opened, through which the animal mind could be made directly visible to the human, thus inevitably affecting its

¹⁷ The experiments were started before the war, and resumed from 1918. An article had been published in Russian, in 1920 (see Ryzl, 1961). In 1919, Durow had become head of the Zoopsychological Institute of Moscow, and by December 1921 had performed more than one thousand “experiments in mental suggestion (to dogs)” (Kazhinskiy, 1963, p. 45).

¹⁸ Ludwig-Maximilians-Universität München, Nachlass Karl Krall (54.10: Tierokkultismus Mss + Notizen, file Mss 1919–1924). Tierokkultismus 13.12.24. Type-script, 1924, p. 1.

¹⁹ Ludwig-Maximilians-Universität München, Nachlass Karl Krall (54.10: Tierokkultismus Mss + Notizen, file Mss 1919–1924). Tierokkultismus 31.12.24. Type-script, 1924, p. 2.

²⁰ Ludwig-Maximilians-Universität München, Nachlass Karl Krall (54.10: Tierokkultismus Mss + Notizen, file Mss 1919–1924). Tierokkultismus 31.12.24. Type-script, 1924, p. 1.

self-representation. The coupling of thinking animals and occultism broke the Faustian taboo so far cast over the whole of science:

“Mysterious, even in broad daylight, /Nature won’t let her veil be raised:/What your spirit can’t bring to sight, /Won’t by screws and levers be displayed” (Krall, 1926, p. 582).

This revolution Krall had prepared for most of his life. The first part of his work, *Denkende Tiere*, had sparked some controversy, moved a few souls, but not subverted the order of mechanistic psychology. Now, finally, a deeper layer of the problem was being exposed, the second half of the work was being made public, and would show how it was possible to extort answers from nature experimentally, provided that the right lever was employed. He planned to resume animal education on an unprecedented scale as soon as possible, and expected researchers from all over the world to pool around his pioneering enterprise in the superb facility he had provided for them.

Now “the lever is set, things were started, when will our successors come?” (Krall, 1926, p. 582).

7. Conclusion

The successors did not come. Karl Krall died of pneumonia in 1929, and his most plausible heir, Karl Gruber, had prematurely passed away in 1927. Schrenck-Notzing, who had inherited the direction of the laboratory, survived Krall by a few weeks, only. As Harry Price recalled in his memories “the deaths of the two principal German psychists” caused a shock from which “German psychical research [...] never recovered” (Price, 1975).

The standing of Krall at the time of his death makes his absence from the historiography of parapsychology quite conspicuous. Even a rich and articulated scholarly account as Heather Wolfram’s contains but one passing mention of the Munich laboratory, and none to the man and his work (Wolfram, 2009, p. 138). The only references we found to Krall’s involvement with parapsychological research are in the context of histories of animal psychology (von den Berg, 2008; Vezzani, 2010), where it appears as an extemporaneous and late conversion.

As we have shown, Krall’s Munich Laboratory and the Elberfeld research stable were instead two tips of one and the same iceberg. Only a consideration of the whole trajectory, from Ninoff to Willi Schneider through Hans, allows to appreciate Krall’s meaning to the history of psychic research in full. The salient features of Krall’s endeavour (his preoccupation with the experimental control of psychic phenomena; his ambition to catalyse a research community around the Elberfeld Horses; his investment in technological advances and broad organizational vision) conjure in placing this story squarely within the framework of Wolfram’s “border science” account (A. Sommer, 2013; Wolfram, 2009), along with recognized protagonists like Schrenck Notzing.

Krall’s tactical approach to animal psychology in his Elberfeld period emerges instead as an anomaly within this account. Before the war, *larvatus prodiens*, Krall had resolutely attempted not much at negotiating and demarcating the boundaries of his own “marginal science”, as at infecting and redirecting from within a thriving, but still epistemologically underdetermined academic discipline (animal psychology), which was to serve as a stronghold for the final assault at scientific materialism. Krall deployed Hans like his more famous Trojan ancestor, as a ruse to break into the citadel of the orthodox sciences, and only the failure of this “psychological” warfare pushed him in the arms of more kindred spirits.

But the animal was to Krall more than a simple bait. Its value to experimental parapsychology laid at once in the solution it offered to the vexing questions of replicability and selection of adequate

(and honest) experimental subjects, as well as, in the direct, immediate access it provided to a biological phenomenon of evolutionary significance. There was no possible misunderstanding: through the animal spoke no spirits of the dead, nor, minds (or bodies) of the living, but nature itself.

Acknowledgements

The first version of this paper was presented at the International Conference on “Psychical research and parapsychology in the history of medicine and the sciences”, London, UCL Centre for the History of Psychological Disciplines, January 2013.

The authors wish to thank the two anonymous reviewers, Sonu Shamdasani, Andreas Sommer and Marion Thomas for their precious criticism of earlier drafts. We are also grateful to the archivists and the director of the Archives and Universitätsbibliothek of the Ludwig-Maximilians-Universität, München; the secretary and direction of the Institut Metapsychique International, Paris, and Katrin Rauhut, Universitätsbibliothek, Albert-Ludwigs-Universität, Freiburg, for their great kindness. Claudio Pogliano and Stefano Vezzani deserve thanks for their generous and prompt bibliographic help. CM acknowledges support of the Alexander von Humboldt Stiftung and of the Ville de Paris, Research in Paris Programme, for the period of this research. FDS acknowledges support of an Anschüßförderung of the Heinrich Heine Universität, Düsseldorf. The writing of this article would not have been possible without the generous and constant cooperation of Mr. Stefano Battaglin.

This paper is dedicated to Mr. Carlo De Sio, who is a good boy.

References

- Amereller, K. (1929). Das Krallsche Institut für Tierpsychologie und Parapsychologische Forschung. *Zeitschrift für Parapsychologie*, 56, 165–168.
- Bechterew, W. M. (1924). Von den Versuchen über die aus der Entfernung erfolgende “unmittelbare Einwirkung” einer Person auf das Verhalten der Tiere. *Zeitschrift für Psychotherapie und medizinische Psychologie mit Einschluß des Hypnotismus, der Suggestion und der Psychoanalyse*, 8, 280–303.
- von den Berg, B. (2008). Die “Neue Tierpsychologie” und ihre wissenschaftlichen Vertreter (von 1900 bis 1945). Hannover: Tenea.
- Boakes, R. (1984). *From Darwin to behaviourism: Psychology and the minds of animals*. CUP Archive.
- Bohn, E. (1895). Bitte an gleichgesinnte Forscher. *Psychische Studien*, 22, 524.
- Bozzano, E. (1905). Animals and psychic perceptions. *The Annals of Psychical Science*, 2, 79–120.
- Bozzano, E. (1926). *Les manifestations métapsychiques et les animaux*. Jean Meyer.
- Brabant, Eva, Falzender, Ernst, & Giampieri-Deutsch, Patrizia (1908–1914). *The correspondence of Sigmund Freud and Sándor Ferenczi* (Vol. 1). Boston: Harvard University Press.
- Candland, D. K. (1995). *Feral children and clever animals: Reflections on human nature*. Oxford University Press.
- Claparède, E. (1913). Encore les chevaux d’Elberfeld (avec une note de M. de Modzelewski). *Archives de Psychologie*, 13, 224–244.
- Crist, E. (1997). From questions to stimuli, from answers to reactions: The case of Clever Hans. *Semiotica*, 113, 1–42.
- Cumberland, S. C. (1888). *A thought-reader’s thoughts: Being the impressions and confessions of Stuart Cumberland*. London: S. Low, Marston, Searle & Rivington, Ltd.
- Davis, H., & Memmott, J. (1982). Counting behavior in animals: A critical evaluation. *Psychological Bulletin*, 92, 547–571.
- Despret, V. (2004a). The body we care for: Figures of anthro-zoo-genesis. *Body & Society*, 10, 111–134.
- Despret, V. (2004b). *Hans, le cheval qui savait compter*. Paris: Les empêcheurs de penser en rond.
- Dewsbury, D. A. (1984). *Comparative psychology in the twentieth century*. Stroudsburg (PA): Hutchinson Ross Publishing Company.
- Ferrari, G. C. (1912). Bêtes qui pensent. *Annales des Sciences Psychiques*, 12, 246–249.
- Griffin, D. R. (1976). *The question of animal awareness: Evolutionary continuity of mental experience*. Rockefeller Univ. Press.
- Gruber, K. (1920). *Tierunterricht und Unterbewusstsein*. In *Mitteilungen der Gesellschaft für Tierpsychologie* (pp. 12–18).
- Gruber, K. (1922). *Denkende Tiere*. Zwei Vorträge von Karl Krall. *Psychische Studien*, 157–165.
- Gruber, U. (2008). ‘Okkulte Erlebnisse’. Der Arzt, Zoologe, Skipionier und Bergsteiger sowie Parapsychologie Professor Dr. Karl Gruber als Nachbar Thomas Manns. In D. Heiße (Ed.), *Thomas Mann in München. IV* (Vol. IV, pp. 111–153). München.

- Gundlach, H. (2006). Carl Stumpf, Oskar Pfungst, der Kluge Hans und eine geglückte Vernebelungsaktion. *Psychologische Rundschau*, 57, 96–105.
- Harter, G. (1914). *Das Rätsel der denkenden Tiere*. Wien, Leipzig: W. Braumüller.
- Jay, R. (1987). *Learned pigs & fireproof women: Unique, eccentric and amazing entertainers*. New York: Random House.
- Kafka, F. (1993). Elberfeldheft. In M. Pasley (Ed.), *Nachgelassene Schriften und Fragmente I* (pp. 225–228). Frankfurt/Main: Fischer Verlag.
- Kazhinskiy, B. B. (1963). *Biological radio communications*. Dayton (OH): Translation Services Branch, Foreign Technology Division, WP-AFE.
- Kindermann, H. (1923). *Lola, or the thought and speech of animals. With a chapter on thinking animals by Dr. William Mackenzie*.
- Klinkowstrem, C. v (1928). Zur Geschichte der Pseudotelepathie. *Zeitschrift für Kritischen Okkultismus und Grenzfragen des Seelenlebens*, 3, 9–20.
- Kotik, N. (1913). Entgegnung. *Tierseele*, 1, 182–187.
- Krall, K. (1912). *Denkende Tiere: Beiträge zur Tierseelenkunde auf Grund eigener Versuche*. Leipzig: F. Engelmann.
- Krall, K. (1913). Aufruf zur Beteiligung an der Gesellschaft für Tierpsychologie. *Mitteilungen der Gesellschaft für Tierpsychologie*, 1, 1–2.
- Krall, K. (1926). Denkübertagung bei Mensch und Tier. *Experimentalstudien. Zeitschrift für Parapsychologie*, 53, 577–600; 641–655; 705–725.
- Krall, K. (1927a). Denkübertagung zwischen Mensch und Tier. *Mitteilungen der Gesellschaft für Tierpsychologie*, 1 (Dritte Reihe), 61–80.
- Krall, K. (1927b). Denkübertagung bei Mensch und Tier. *Experimentalstudien. Zeitschrift für Parapsychologie*, 54, 150–163.
- Krall, K. (1927c). Krallsches Institut für Tierseelenkunde und Parapsychische Forschungen. In K. Krall (Ed.), *Denkende Tiere. Denkübertagung zwischen Mensch und Tier. Vortrag gehalten auf dem III. Congrès International de Recherches Psychiques*. Stuttgart: Verlag der Gesellschaft für Tierpsychologie.
- Kressley-Mba, R. A. (2006). On the failed institutionalization of German comparative psychology prior to 1940. *History of Psychology*, 9, 55–74.
- Lachapelle, S., & Healey, J. (2010). On Hans, Zou and the others: Wonder animals and the question of animal intelligence in early twentieth-century France. *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences*, 41, 12–20.
- Mackenzie, W. (1914). *Nuove rivelazioni della psiche animale (da esperimenti dell'autore)*. Genova: A. F. Formiggini.
- Maeterlinck, M. (1914). *The unknown guest*. London: Methuen & Co.
- Mann, T. (1932). Okkulte Erlebnisse. In *Three essays* (pp. 219–261). London: Martin Secker.
- Mann Borgese, E. (1968). *The language barrier: Beasts and men*. London: Holt, Rinehart and Winston.
- Moll, A. (1892). *Der Rapport in der Hypnose: Untersuchungen ueber den thierischen Magnetismus* (Vol. 3). Leipzig: Alphonse Dürr Verlag.
- Moll, A. (1904a). Mitteilung über den "klugen Hans". *Zeitschrift für pädagogische Psychologie und Jugendkunde*, 6, 368–380.
- Moll, A. (1904b). Weitere Mitteilung über den "klugen Hans". *Zeitschrift für pädagogische Psychologie und Jugendkunde*, 6, 448–464.
- Moll, A. (1913). *Hypnotism: Including a study of the chief points of psycho-therapeutics and occultism*. London, New York: The Walter Scott Publishing.
- Moynahan, G. B. (1999). Ernst Cassirer, theoretical biology, and the Clever Hans phenomenon. *Science in Context*, 12, 549–574.
- Pfungst, O. (1907). *Das Pferd des Herrn von Osten (der kluge Hans): ein Beitrag zur experimentellen Tier- und Menschen-Psychologie*. Leipzig: Johann Ambrosius Barth.
- Pfungst, O. (1911). *Clever Hans (The horse of Mr. von Osten): A contribution to experimental animal and human psychology*. New York: Henry Holt and Company.
- Piéron, H. (1913). VI. Le problème des animaux pensants. *L'année Psychologique*, 218–228.
- Piéron, H. (1920). La psychologie zoologique, science du comportement animal. *Journal de Psychologie Normale et Pathologique*, 17, 145–167.
- Pogliano, C. (1987). Animali pensanti e uomini perpleksi. In *Scritti in onore di Eugenio Garin* (pp. 405–427). Pisa: Scuola Normale Superiore.
- Price, H. (1975). *Fifty years of psychical research: A critical survey*. Arno Press.
- Prinz, W. (2006). Messung kontra Augenschein. *Psychologische Rundschau*, 57, 106–111.
- Private Meeting for Members and Associates. (1913). *Journal of the Society for Psychical Research*, XVI, 98–102.
- Report of the Council for the year 1912. (1913). *Journal of the Society for Psychical Research*, XVI, 20–26.
- Rosenthal, R. (1966). *Experimenter effects in behavioral research*. New York: Appleton.
- Ryzl, M. (1961). Research on telepathy in Soviet Russia. *Journal of Parapsychology*, 25, 75–85.
- Sanford, E. C. (1914). Psychic research in the animal field: Der Kluge Hans and the Elberfeld horses. *The American Journal of Psychology*, 25, 1–31.
- Schiller, F. C. S. (1923). *Lola, or the thought and speech of animals*, by Henni Kindermann etc. *Mind*, New Series, 32, n. 127 (pp. 368–369).
- Schrenck-Notzing, A. (2013). *Grundfragen der Parapsychologie*. Hamburg: Severus Verlag.
- Schrenck-Notzing, A. v (1924). *Experimente der Fernbewegung*. Stuttgart: Union Deutsche Verlagsgesellschaft.
- Schrenck-Notzing, A. v (1926). Ein elektrischer Apparat für Medienkontrolle. *Zeitschrift für Parapsychologie*, 1, 513–516.
- Sebeok, T. A., & Rosenthal, R. (Eds.). (1981). The Clever Hans phenomenon: Communication with horses, whales, apes, and people. *Annals of the New York Academy of Sciences*, 364, vii–viii.
- Siciliano, L. (1914). La nona ipotesi. *Psiche*, 3, 85–86.
- Sommer, A. (2012). Policing epistemic deviance: Albert Von Schrenck-Notzing and Albert Moll. *Medical History*, 56, 255–276.
- Sommer, A. (2013). Normalizing the supernatural: The formation of the 'Gesellschaft für Psychologische Forschung' ('Society for Psychological Research'), c. 1886–1890. *Journal of the History of the Behavioral Sciences*, 49, 18–44.
- Sommer, R. (1898). Dreidimensionale Analyse von Ausdrucksbewegungen. *Zeitschrift für Psychologie und Physiologie der Sinnesorgane*, 16, 275–297.
- Sommer, R. (1925). *Tierpsychologie*. Leipzig: Quelle & Meyer.
- Stefani, S. (1913). Correnti inter cerebrali tra uomo e gli animali? *Luce e Ombra*, 13, 193–223.
- Stumpf, C. (1904). Das Pferd des Herrn von Osten. *Der Tag*, 4, 1–2.
- Sünner, P. (1929). Karl Krall als Parapsychologe. *Zeitschrift für Parapsychologie*, 4, 168–170.
- Thomas, M. (2005). Are animals just noisy machines?: Louis Boutan and the co-invention of animal and child psychology in the French Third Republic. *Journal of the History of Biology*, 38, 425–460.
- de Vesme, C. (1912). Les chevaux pensants d'Elberfeld. *Annales des sciences psychiques*, 12, 353–363.
- de Vesme, C. (1913). I Cavalli Sapienti. In *La Stampa* (p. 1). Torino.
- de Vesme, C. (1914). Les chevaux d'Elberfeld et le 'directeur de l'institut de psychologie zoologique'. *Annales des Sciences Psychiques*, 14, 127–128.
- Vezzani, S. (2010). *Animali "sapienti"*. Roma: Aracne.
- Vezzani, S. (2013). The Elberfeld Horses. *Skeptical Enquirer*, 37, 40–44.
- Washburn, M. F. (1917). *The animal mind. A textbook of comparative psychology* (2nd ed.). New York: The MacMillan Company.
- Watson, J. B. (1914). *Behavior: An introduction to comparative psychology*. New York: Holt.
- Werner, G. (1960). Karl Krall. In *Wuppertaler Biographien* (Vol. 2, pp. 85–95). Wuppertal: Born Verlag.
- Wolffram, H. (2009). *The stepchildren of science: Psychical research and parapsychology in Germany, 1870–1939* (Vol. 88). Amsterdam-New York: Rodopi.
- Wolffram, H. (2012). 'Trick', 'manipulation' and 'farce': Albert Moll's critique of occultism. *Medical History*, 56, 277–295.
- Yerkes, R. M. (1913). A society of animal psychology. *Journal of Animal Behavior*, 3, 303.
- Ziegler, H. E. (1922). An die Mitglieder der Gesellschaft für Tierpsychologie. *Mitteilungen der Gesellschaft für Tierpsychologie*, 3, 64–67.
- Zimmer, C. (1925). Telepathieversuche mit Tieren und "Denkende Tiere". *Psychische Studien*, 52, 242–254.
- Zöllner, H. (1929). Der Tierpsychologe Karl Krall. *Zeitschrift für Parapsychologie*, 4, 161–165.
- Zur Umgestaltung der "Psychischen Studien" in eine "Zeitschrift für Parapsychologie". (1926). *Zeitschrift für Parapsychologie*, 1, 1–4.