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HISTORICAL ARTICLE

Priority Disputes in the History of Psychology with Special Attention to the Franz–Kalischer Dispute About Who First Combined Animal Training with Brain Extirpation to Investigate Brain Functions

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Abstract Shepherd Ivory Franz (American) and Otto Kalischer (German) each claimed to have been the first to combine animal training and brain extirpation to study brain function, a methodological approach that historians assert fundamentally changed subsequent neuropsychological research. Each defended his claim in 1907 in back-to-back commentaries in the journal *Zentralblatt für Physiologie*. Before considering details of the Franz versus Kalischer dispute, it was deemed useful to consider priority disputes in general and to revisit the priority claims for who discovered the "conditioned reflex" and whether Pierre Flourens was the "father" of brain extirpation as examples of this type of research. Consideration of the Franz–Kalischer dispute began with a brief history of the study of brain function to provide background and context for the Franz–Kalischer dispute. For additional context, biographic sketches of Franz and Kalischer are presented. Then, details of the dispute are presented and discussed followed by conclusions that include that Franz (*The American Journal of Physiology, 8*, 1–22, 1902) preceded Kalischer (1907a) and that it is highly unlikely that anyone before Franz had used his combination of innovative methods. Finally, the perceived importance of being first to combine animal training with brain extirpation is represented by quotations from several authors of history or psychology textbooks and one author of a history of neuroscience textbook.

Keywords Animal training · Animal learning · Brain ablation · Brain extirpation · Brain lesion · History brain research · Learning · Memory · Priority in psychology · Priority in science

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People in general and scholars in particular bestow considerable esteem upon those whose discoveries, inventions, theories, or methods fundamentally change scholarship, research, or the world in which we live. Thus, it is very important that priority be rightfully attributed to those who deserve it. Most priority claims do not involve a direct confrontation in the literature between or among opposing rivals, as was the case for Franz and Kalischer. Usually, priority disputes originate with other scholars, as shown in examples below.

In the case of Franz and Kalischer, the claim in question was an important methodological one. Based on research published in 1902, Franz (1902) asserted that he was the first to combine animal training and brain extirpation to study brain functions; in his effort to be clearer, sometimes Franz would say "special animal training." Kalischer (1907a), who might not have known about Franz's work, made a highly similar claim in February 1907 that was soon made known to Franz. Later in 1907, each presented and defended his claim in back-to-back commentaries in the journal, *Zentralblatt für Physiologie*.[1] Franz's (1907a) commentary preceded Kalischer's (1907b).

Before describing and assessing the Franz–Kalischer dispute, it will be useful first to consider some general issues associated with priority claims as well as to revisit two

[1] The translations of Franz (1907a) and Kalischer (1907b) used here were done by George Windholz (1932–2002) at my request in 1995, when I was doing general biographical research about Franz. Windholz was a highly regarded Pavlovian scholar (Furedy, 2004) whose research relied heavily upon his ability to translate Russian and German into English (e.g., Windholz, 1997). Copies of Franz (1907a) and Kalischer (1907b) and Windholz's translations of them from German to English will be provided upon request. Quotations in English used in this article from these translations cannot be assigned precise page numbers because Windholz's translations did not include the page numbers. However, as may be seen in the References, Franz's (1907a) article appeared on pages 583–584 and Kalischer's (1907b) appeared on pages 585–586, so the precise locations of quotations could be found easily by those who can read both languages.

previously considered priority disputes as examples of this type of research, namely who discovered the "conditional reflex" and who was first to use brain extirpation to study brain functions.

Priority Claims in General

In the context of a decades-long, highly contentious dispute over priority for the first use of ether for surgical anesthesia, Wolfe (2001, p. 504) wrote the following:

> Proving priorities is tantamount to playing Russian roulette, even when the game is entered into by experienced and knowledgeable players, who have a good idea in which chambers the bullets are loaded, for there is always the danger that some fact or prior deed, lurking in the literature, unseen, or unrecognized, or forgotten, will be discovered to ultimately shoot one dead.

In an interesting article about priority in science, Windholz and Lamal (1993, p. 339) observed:

> There is a strong motivation for the establishment of priority; it is considered as rewarding to the scientist(s) credited with it because discovery is crucial to science. Indeed, priority has been called the "central focus of science." (Brannigan, 1981) [For the reader's con venience, Brannigan's book is listed among the References here.]

Windholz and Jamal also questioned a priority claim by Kalischer that was only indirectly related to the Franz–Kalischer dispute. They did not mention Franz, and the Kalischer claim that Windholz and Lamal refuted will not be discussed here.

Revisiting Two Disputed Priority Claims

Discovery of the "Conditioned Reflex"

Rosenzweig (1959) quoted reports as early as 1555 and including several prominent physiologists of the 18th and 19th centuries to show that they had observed the salivary conditioning phenomenon, but they did not pursue it as a subject for scientific investigation. Dallenbach (1959), whose article immediately followed Rosensweig's in the same issue of the *American Journal of Psychology*, noted that Edwin B. Twitmyer's discovery of the conditioned reflex was first reported in his doctoral dissertation approved in 1902. In an article well-known among historians of psychology, Coon (1982, p. 255) wrote:

> Edwin B. Twitmyer independently discovered the conditioned reflex at approximately the same time [as Pavlov] and reported his finding in 1904 at the meeting of the American Psychological Association.

Dallenbach's emphasis was on factors contributing to Twitmyer's obscurity as was Coon's. However, Coon delved deeper into that subject than did Dallenbach.

It may be of interest to some that a footnote in Rosenweig (1959, p. 629) referred briefly to the early mistranslation of the Russian word (Anglicized as *ouslovny*) for *conditional* as *conditioned*, which means that "conditioned reflex," one of the best known terms in psychology, was a translation mistake. Rosenweig cited Brazier (see Yakolev, 1959), but he did not mention that the translation mistake was reported by W. Horsley Gantt in the postpresentation discussion of Yakolev's (1959) chapter, "Bechterev." Gantt was an American who studied with Pavlov and who translated into English two books of Pavlov's lectures (Gantt, 1928a, 1928b). Gantt made it clear that Pavlov intended that the adjective *conditional* be used in reference to the learned reflex, not *conditioned*. However, Gantt explained that he perpetuated "conditioned" in his translations of Pavlov's lectures, as by then the term was too well known.

Complicating matters for Dallenbach (1959) and Coon (1982), Windholz and Lamal (1993, p. 344) reported that Pavlov's doctoral student, S. G. Vul'fson, reported *his discovery of the conditioned reflex* in his dissertation in 1898. Coon (1982, p. 259) mentioned "S.G. Wolfson" (likely the same person) as being among those who "enthusiastically embraced his [Pavlov's] discovery." Dallenbach (1959) and Coon (1982) cited Rosenzwieg (1959) and discounted Pavlov's predecessors on the ground that it was Pavlov who showed that the unconditioned salivary response could be elicited by non-food stimuli (Dallenbach, p. 634; Coon, p. 261). Dallenbach added that Pavlov's predecessors failed to see its significance or follow it up. Windholz and Lamal (1993) did not cite Rosenzweig (1959), but they cited both Dallenbach and Coon and, presumably, agreed with them.

Was Flourens, the "Father" of the Extirpation Method?

This is a highly pertinent priority controversy, because reports of Franz's priority in combining animal training and brain extirpation are often mentioned in the context of Franz's method replacing Flourens's "observation method." Flourens did not use behavioral experiments but only observed and reported changes from normal behavior that were seen following brain extirpations (Thomas, 2012). Boring (1929, p. 61; 1950, p. 64) described Flourens as the "father" of the

extirpation method. As will be shown in the following section, this was not correct.

None of the authors of recent history of psychology textbooks that I have examined committed Boring's error. For example, Thorne and Henley (2005, p. 158) referred to Boring (1950) as having described Flourens as the "father" of the ablation method, but they did so only to add that Flourens "used" the method but did not "invent" it. (For the list of 21 recent histories of psychology textbooks audited on this point, please see Section A of the References.) Only a few referred to Flourens. In the following section, extirpation, ablation, and lesion tend to be used synonymously.

Who Was the "Father" of the Brain Extirpation/Ablation/Lesion Method?

Finger (1994, p. 36) wrote:

> Flourens was not the first to use the lesion ("experimental") method. For example, in 1673 Joseph DuVerney (1648–1730) made brain lesions in pigeons . . . . In addition, Luigi Rolando (1773–1831) used the ablation method at least as early as 1809. . . . Flourens, however, had considerably more influence.

Although Finger (1994) did not mention François Pourfour du Petit (1664–1741) in this context, he did refer to animal brain lesion experiments by Pourfour du Petit. More recently, Kruger's and Swanson's (2007, p. 99) chapter begins as follows:

> The beginnings of an experimental approach to brain function derived from the study of brain lesions can be traced to antiquity, but the emergence of a reasoned systematic methodology was surprisingly slow to mature.

Kruger and Swanson (2007, p. 99) then concluded that "Petit established the impact of ablation as an experimental tool for *functional* neuroanatomy from which he drew remarkably astute interpretations." In case it may be unclear, Pourfour du Petit and Petit was the same person. Kruger and Swanson noted that Petit's contributions had been well reported in Neuberger's (1981) book, first published in 1897. The book's title is worth noting, namely, *The Historical Development of Experimental and Spinal Cord Physiology Before Flourens* (translated, edited, and supplemented by Clarke).

Conclusions

First, as has been shown, Wolfe's game-of-Russian-roulette analogy applies both to the Twitmyer–Pavlov priority conflict and to Flourens being the "father" of the experimental brain extirpation method. One might reasonably expect that with both examples the game may not be over yet. Second, history appears to assign greater recognition to those who are perceived to have done the most to develop a new discovery, invention, method, or theory. On that basis, Pavlov deserves priority recognition for the "conditioned reflex," although it remains to be seen who will prevail in that regard between Flourens and Petit. The Franz–Kalischer dispute is considered in the following section. To start, some background history and context is provided.

The Franz–Kalischer Dispute

A Brief History of the Study of Brain Functions

According to Misiak (1961), prior to the 19th century, some philosophers argued that the brain and mind were identical (e.g., Thomas Hobbe's materialistic monism whereby only the brain exists and George Berkeley's *idea*listic [note emphasis] monism whereby all that we perceive to exist is only an idea in the mind). Other philosophers argued that the brain and mind were independent entities, a general position known as *dualism*. Two basic forms of dualism were presented (a) by René Descartes, who argued that the brain and mind were independent but that they interacted, and (b) by G. W. Leibnitz, who argued that brain and mind were independent and that they functioned in perfect parallel.

Descartes added neuroanatomy and physiology to his brain–mind interaction view by proposing that they interacted via the pineal gland, a brain structure that he chose primarily because it was approximately at the center of the brain and because it was a singular structure whereas most brain structures are bilaterally represented in the brain (Thomas, 2007). Early physician-scholars before and after the beginning of the Christian epoch attempted to investigate brain functions, but scientific investigations of the brain functions did not emerge strongly until the 19th century (Thomas, in press-a).

Franz Joseph Gall (circa 1810), a highly competent neuroanatomist, asserted that bumps and depressions on the skull reflected the underlying development or lack thereof of brain matter. Bumps on the skull indicated the superior development of a particular faculty (i.e., brain function), while depressions on the skull reflected deficiency or absence of a faculty. Gall was careless about experimental control when seeking correlational evidence for faculties in relation to his human subjects' cranial bumps and depressions, and the "science" that soon became known as "phrenology" (a term Gall eschewed while favoring terms such as "craniology" or "organology") was soon denounced (Krech, 1964).

Phrenology's strongest early critic was Pierre Flourens, who in the early 1820s experimentally ablated or extirpated

parts of the brains of frogs, rabbits, and pigeons and observed changes in their behavior (Thomas, 2012). Flourens concluded that different parts of the brain might have special functions (*action propre*) but that the overriding principle was that the different parts of the brain acted in unity (*action commune*). Flourens's antilocalization view of brain function prevailed until 1860, when Bouillaud, Aubertin, and Broca discovered that a specific area of the cerebral cortex controlled human speech (Thomas, 2007). In 1870, Fritsch and Hitzig using electrical stimulation of the cerebral cortex determined that a specific area of the dog's cerebral cortex controlled motor movements (Finger, 1994).

Subsequently, research-based mapping of the functions of the cerebral cortex using brain extirpation in nonhuman animals, clinical brain damage or extirpation in humans, and electrical stimulation in human and nonhuman animals identified distinct sensory and motor areas in the cerebral cortex. For human and nonhuman primates, it appeared that after mapping the sensory and motor areas, large cortical areas were unassigned. "Associationism," a largely British philosophy about how knowledge is acquired, was prevalent in the late 1800s, and soon the viewpoint emerged that the unassigned cortical areas comprised "association" cortex. Association areas were said to integrate activities in sensory cortex and motor cortex, enabling higher order brain activities such as learning and memory. After discovery of the speech center, the view that functions were localized in the brain prevailed until the early decades of the 20th century (Thomas, in press-a).

With respect to learning and memory, the antilocalization view reemerged strongly with research by Shepherd Ivory Franz, who designed sophisticated experiments combining animal training with brain extirpation (e.g., 1902, 1906, 1907b). Franz's presidential address for the Southern Society for Philosophy and Psychology in 1912, titled "New Phrenology," was published in *Science* (Franz, 1912a). The article was directed primarily at those who had mapped the cerebral cortex using histological methods to identify cortical areas with similar cytoarchitecture and who had then asserted that cortical areas that differed anatomically also differed functionally. While there was some correlation between previously identified sensory and motor areas, the cytoarchitecturists conducted little, if any, brain function research.

Franz's protégé, Karl Lashley (e.g., 1929), became such a scholarly force that he established the antilocalization view regarding learning and memory for decades. Following Lashley's death (1958), some of his data were questioned (e.g., Thomas, 1970), and numerous laboratory experiments were done that showed significant roles for specific brain areas in memory (e.g., McGaugh, 2000). However, localization of higher order brain functions based on brain imaging methods was often taken to such extremes that William Uttal (2003) challenged such interpretations in his book *The New Phrenology*: *The Limits of Localizing Cognitive Processes in the Brain.*

Meanwhile, neuroanatomical views regarding sensory and motor areas of the cerebral cortex were changing. Brodal (1981, p. 227) reported that

> the precentral "motor cortex" received sensory information, and motor effects can be obtained on stimulation of the "sensory," postcentral gyrus. Accordingly, one can speak of a *sensorimotor cortex.*

Neuroanatomical views were also changing regarding "association cortex." After years of research, Diamond and colleagues concluded there was no association cortex and that the cortex is best mapped only as sensory areas. Furthermore, Diamond (1979, p. 35) concluded that "every area of the cortex could be viewed as a motor area, or layer V itself could be termed the 'motor cortex.'" Most of the cerebral cortex has six layers, with layer I closest to the surface and layer VI closest to the white matter below the cerebral cortex. Some, perhaps many, researchers agree with Diamond that the brain is a sensory-motor processing system to which memory processing should be added and that as the brain evolves it becomes increasingly capable of highly complex behavioral functions that are explainable in terms of sensory-motor-memory processing (Thomas, in press-a).

The Franz–Kalischer Dispute Begins

While describing his early neuropsychological research in his autobiographic chapter, Franz (1932) insisted that he was the first to use "the combination of animal training and [brain] extirpation as a method" in research. Implicitly, he was referring to Franz (1902). After reporting that he had received early compliments for his new method from two eminent neurophysiologists, Sir Edward A. Sharpey-Schäfer and Sir Charles Sherrington, Franz (1932, p. 96) wrote:

> A further and much later commendation came in a less pleasant fashion. This was the appearance of an article by Kalischer in which he appropriated the training-extirpation method as his own. Of his publication I was informed at the Heidelberg Physiological Congress in 1907. To this I protested[20] [Franz's Footnote 20 referred to Franz, 1907a.] because I could see no reason why the method, if of any worth, should be labeled "made in Berlin." Kalischer's article was, however, as complimentary as is all plagiarism.

Who Was Shepherd Ivory Franz?

Most information here is from Thomas (1999, 2000, in press-b)[2]. Franz was born (1874) in the United States of America, and he died (1933) soon after the onset of amyotrophic lateral sclerosis while serving as professor and department head of psychology at the University of California, Los Angeles (UCLA). He also chaired the committee that developed programs for graduate studies at UCLA (Hamilton & Jackson, 1969).

Franz earned the PhD degree (1899) at Columbia University under the supervision of James McKeen Cattell, and Franz's first five publications did not reflect an interest in brain function (Murchison, 1929). His interest in the study of brain function developed apparently as a result of his early teaching positions in physiology, first at the Harvard and then at the Dartmouth Medical Schools. Beginning about 1901, Franz's interests shifted predominantly toward both (a) basic brain research using animals and (b) clinical neuropsychology; he retained these interacting interests throughout his career. In 1902, Franz published his first study using the combination of animal training and brain extirpation.

In 1904, Franz began working at the McLean Hospital, an important teaching facility associated with the Harvard Medical School. In 1904 at McLean and at the suggestion of Superintendent Edward Cowles, Franz organized *the first psychological laboratory in a hospital*. In 1907, Franz accepted a similar position at the Government Hospital for the Insane (GHI), also known informally as "St. Elizabeth's Hospital." Beginning in 1917, the acronym and its expansion were no longer used, and St. Elizabeth's Hospital became the formal name. St. Elizabeth's referred to the tract of land purchased for the GHI and not to any theological connection.

Also In 1907, Franz established *the first program of routine psychological testing of all patients in a hospital*. In 1912, Franz (1912b) published his *Handbook of Mental Examination Methods.* Given its emphasis on neurological disorders in conjunction with mental illness, this book was likely the *first book written for clinical neuropsychology.* These and other contributions suggest strongly that *Franz was the first clinical neuropsychologist* in the United States of America, if not also internationally.

For much of Franz's tenure at St. Elizabeth's, he enjoyed the support of Superintendent William A. White, a psychiatrist, including that Franz was promoted from his initial position as psychologist (1907) to science director (1909), and, later, to director of laboratories (1919). The latter gave Franz administrative responsibility for eight departments and several buildings. However, their relationship diminished over time. Franz did not mention White by name in his autobiographical chapter, but he wrote the following (Franz, 1932, pp. 109–110):

> During the last fifteen years of my St. Elizabeth's service there was a volcanic rise of psychoanalytic belief. Tedious laboratory studies were looked upon as unfruitful, if not entirely useless. . . . Diverse activities . . . kept me away from the main volcanic outpourings, and I did not become submerged by them. Nor did I attempt to stem or direct the flow. I was an onlooker.

Franz's resignation from St. Elizabeth's resulted from his administrative responsibility for a building known as the "Rest," which was used as the mortuary. On March 28, 1924, Henry Morosse, the captain of the watch, sent Franz a letter informing him that he had informed Monie Sanger, administrative assistant to Superintendent White, of the following[3]:

> The outside door of the rest was found unlocked on February 12 and 26th at 8:00 P.M. The medicine door was found unlocked almost every night, the last time being on March 27. Then gas burner [one used for a hot air sterilizer] in the basement of the rest was found burning on March 16th and 17th.

Franz asked Harold Palmer, a bacteriologist, to investigate. Palmer reported in writing to Franz on March 29, 1924. Franz wrote to Sanger on March 31:

> Orders have been posted in the Rest for several years regarding the leaving of gas burners turned on, whether lighted or unlighted, and also regarding the locking of the front door. The last one to leave the laboratory, whether at the end of the day or at noon time is supposed to see that the front door is locked and that no patients are in the building.

[2] . Because there is uncertainty when the volume in which Thomas (in press-b) will be published, readers are invited to download the manuscript version: https:faculty.franklin.uga.edu/rkthomas/. Permission to download the manuscript was given by the editor, James L. Pate. The uncertainty exists because this monumental project initiated by Pate has been ongoing since at least 2000. Pate invited the Franz manuscript, and he accepted it for publication in the early 2000's. With Pate's permission, in 2003 the manuscript was copyrighted and placed in an electronic archive, *Eprint Archive: History and Theory of Psychology*, which is now defunct.

[3] The author possesses photocopies of extensive correspondence and other documents pertaining to Franz's St. Elizabeth's years, including all correspondence cited here in conjunction with Franz's demotion and resignation. The photocopies were obtained either from the National Archives of the United States or from the U.S. Office of Personnel Management. I plan to donate all Franz-related materials in my possession to the Center for the History of Psychology at the University of Akron, Akron, OH.

Franz concluded by noting that had he been informed of the infractions sooner, it might have been possible to have taken corrective actions.

Franz did not mention, as Palmer had done in his report, that the chemical stock room (referred to as the "medicine room" in Morosse's report) contained nothing that required that it be locked. Franz also did not mention, as Palmer had done, that the front door lock was faulty and that upon leaving one might have thought that it had locked when it had not. Whether these omissions would have made a difference is unknown. On April 15, 1924, and citing only the "unsatisfactory condition of the laboratory," White approved the "transfer" of Franz's position from director of laboratories to psychologist at a salary of $3,500.00 per annum, which was a significant salary reduction. Other written exchanges between White and Franz over the years (Thomas, in press-b) reveal White's pettiness,[4] and it is not unreasonable to think that White may have been looking for an excuse to demote Franz. On May 5, and in a tersely worded one-sentence letter, Franz tendered his resignation to take effect June 1. By Fall 1924, Franz was professor of psychology and department head at UCLA, where he remained until his untimely death in 1933.

Franz received much recognition during his lifetime, such as, but not limited to, the presidencies of the American Psychological Association (1920), the Southern Society for Philosophy and Psychology (1912), and the Western Psychological Association (1927–1928) as well as editorships of the *Psychological Bulletin* (1912–1924) and *Psychological Monographs* (1924–1927). He was elected to fellowships in the American Association for the Advancement of Science and in the American Medical Association (dates undetermined), and he received many honorary awards (see Murchison, 1929). Franz has not received sufficient recognition for being the first clinical neuropsychologist despite efforts by Thomas (1999, 2000, in press-b) and Colotla and Bach-y-Rita (2002). For example, none of the 21 recent histories of psychology textbooks in Section A of the References emphasized Franz's work in clinical neuropsychology. He also has not received due recognition for originating the view that "higher order" brain functions are not localized in the brain, a view that is largely memorialized by contemporary historians as having originated with Franz's protégé, Karl Lashley (Thomas, 2011).

[4] To exemplify White's pettiness, on May 10, 2017, White sent Franz a memorandum seeking "possibilities for economy" and questioning why Franz's children were being fed from the "Detached kitchen" rather than the staff dining room and why they were receiving "special diets." On May 11, 1917, Franz reminded White he had earlier said that "small children, until the age of ten or thereabouts, were best kept away from a public or general dining room, because of their probable annoyance to others than their parents." Franz told White that his children were ages 1 and 6, and Franz wrote at length to explain that his children did not receive special diets.

Who Was Otto Kalischer?

I am unable to add details of Kalischer's life that were not provided by Windholz and Lamal (1993, pp. 340–341).[5] They are quoted fully here regarding who Kalischer was.

> Not much is known about the life and work of Kalischer. [Here, Windholz and Lamal cited three personal communications] What there is shows that Kalischer received the M.D. degree at the University of Freiburg in 1891. In 1905, Kalischer published a monograph about the cerebral cortex of parrots. Kalischer's affiliation is not given on the title page of this monograph, suggesting that he may have been a *Privatgelehrter,* that is, a scholar not permanently associated with an academic or scientific institution. However, in his initial description of his work on discrimination [sensory discrimination in animals], Kalischer (1907) acknowledged having received support from the Royal Prussian Academy of Science in Berlin. A subsequent paper states that Kalischer experimented in the Physiology Section of the Physiology Institute of Berlin.

Description and Assessment of the Franz–Kalischer Priority Dispute

In 1907, in back-to-back articles in the journal *Zentralblatt für Physiologie*, Franz (1907a) wrote first to assert his claim that he was the first to combine animal training with brain extirpation to investigate brain functions. In reply, Kalischer's (1907b) cited no references but referred to studies by Munk in 1878 and Gaule in 1890 before stating that "Even if [Franz's] method is an improvement over the others, it is not of fundamentally decisive difference." According to Kalischer, Munk's study involved the effect of temporal lobe extirpations on its learned responses to four calls "pst, komm, hoch, schon." Kalischer did not say whether the temporal lobe lesions affected the dog's response to the calls. According to Kalischer, Gaule's study involved the effect of brain extirpation on a dog that had to use its foreleg to lift a lid to a box that contained pieces of meat. Presumably, the dog had been trained to make the response, but Kalischer did not state that. In any case, these studies might be cited also against Kalischer's claim for priority, but he based his claim on the fact that his sensory discrimination training had been more sophisticated than Munk's.

[5] With the appropriate caveat, "admittedly not the most scholarly source," an anonymous reviewer brought to my attention a biographical article about Kalischer on the Wikipedia website that provides details not seen in Windholz's and Lamal's biographical sketch. The Wikipedia article indicates good scholarly work, and I recommend that interested readers consider it. It does not refer to the Franz–Kalischer dispute.

Franz did not offer further response to Kalischer regarding the studies by Munk and Gaule . However, in his 1902 article, Franz had cited three previous experimental investigations involving brain extirpation and memory. Franz discussed these in some detail (pp. 3–5) and summarized his stance as (Franz, 1902, p. 5):

> The important and significant fact that the reader should bear in mind is that in these . . . cases . . . we have a very definite mental state, in each animal a particular association which in two cases was lost and in the other was retained after removal of the frontal lobes. It will be well to note that in none of the cases have we information how long before the operation the associations were formed. The lack of this detail, I believe it will be shown later, makes the experiments comparable to only a slight extent. In a subsequent portion of this article it will be noted that the duration of an association should perhaps be considered of prime importance.

In spite of referring to the previous research as being "comparable to some extent," Franz perceived there to be a distinct difference. He iterated this point in his assertion against Kalischer (Franz, 1907a) by referring to some of the same studies he had reviewed in 1902 as well as a few additional studies before writing that in their cases:

> Training was not a *special method* . . . . [Paragraph break.] I am, I believe, the first person who used together training and extirpation as a *special method*. [Emphasis added.]

Franz's experiments with cats (1902) and monkeys (1906, 1907b[6]) were unprecedented in their sophistication and experimental control: (a) he used multiple learning tasks, so that lesion effects would not be task dependent; (b) he carefully described his extirpation procedures to facilitate replication; (c) he presented brain diagrams for each cat and monkey to illustrate the location and surface extent of the extirpations; (d) he extirpated different brain areas to determine which areas affected learning or memory; (e) some animals were extirpated before training to assess extirpation effects on learning, and other animals were extirpated after training to assess effects on memory; (f) he showed that only bilateral lesions were effective; (g) he showed that a well-learned means of escape from a box to gain access to freedom and food might be forgotten after partial frontal extirpation, that the cat could relearn the task, that a second extirpation again disrupted memory resulting from relearning, and that the cat could relearn the task; and (h) in 1912 he advanced a strong antilocalization view with respect to higher order brain functions, such as learning and memory.

[6] The most detailed account of Franz's early research, including brain diagrams of individual animals, was Franz 's (1907b) monograph. The monograph included portions of Franz (1902) and Franz (1906). In the Preface to the monograph, Franz thanked the editor of the *American Journal of Physiology* for permission to publish part of the 1902 article, and in a footnote to Franz (1906), he described the article as "a preliminary communication."

Conclusions

There is no doubt that Franz (1902) preceded Kalischer (1907a) in advocating the combination of animal training and brain extirpation to study brain function. Given the sophistication of Franz's research summarized in the preceding paragraph, it seems highly unlikely that Franz will become a victim of Wolfe's priority game of Russian roulette. Another important conclusion emerging from the Franz–Kalischer dispute, one that likely applies to most priority disputes worthy of examination, including Flourens as the "father" of ablation and the Pavlov–Twitmyer dispute, is that priority claims must be described precisely before they can be fully assessed.

The Importance of Combining Animal Training and Brain Extirpation

Following is how some authors of history of psychology textbooks and one psychologist who specialized in and wrote a history of neuroscience (Finger, 1994) perceived the importance of combining animal training with brain extirpation. They all attributed the new method to Franz, and none of them mentioned Kalischer.

Boring (1929, p. 559) wrote:

> One very important development in animal psychology was the bringing together of the method of investigating discrimination and learning in animals and the method of extirpation in the study of the different areas of the cerebrum. To *Shepherd Ivory Franz* (1874–) belongs the credit for this new and fruitful type of study.

Boring (1950, p. 684) was less explicit in the second edition, but he still gave Franz credit for "new technics [sic]" for the study of brain function.

Lachman (1963, pp. 22–23) wrote:

> An experimental psychophysiology of learning in animals was begun by SHEPHERD IVORY FRANZ

(1874–1933) who developed new techniques for assessing the role of brain structures in learning.

Krech (1964, p. 54) wrote:

From now on [referring to Franz, 1902] learning and problem-solving behavior was to be the concern of many of the brain localization studies–rather than the traditional simple sensory reactions or motor reflexes.

Finger (1994, p. 342) wrote:

Shepherd Ivory Franz was the first to use the new behavioral methods from experimental psychology to assess the effects of brain lesions on learning and memory functions.

Thorne and Henley, in their glossary, wrote (2005, p. G-8; the Glossary begins following p. 551):

Franz, Shepherd Ivory (1874–1933). The first person to combine the ablation method of the physiologist with the training methods of the psychologist to study the function of the frontal lobes in cats.

The final example is one that is the most succinctly informative. Fancher and Rutherford (2012, p. 118) wrote:

In 1902, a young American psychologist named Shepherd Ivory Franz (1874–1933) published a study of the effects of cortical ablations on cats that had been trained to escape from a "puzzle box."[12] [Fancher's and Rutherford's Footnote 12 referred to Franz, 1902.] Such a study, of course, was much in the tradition of Flourens—except that instead of looking at the generalized effects of ablation as Flourens had, Franz was interested in the effects on a specific, learned response. His innovation was to combine ablation with animal training.

Thus, the importance of combining animal training with brain extirpation has been well recognized in American historical literature at least since 1929 and at least as recently as 2012, and without exception, priority for combining animal training with brain extirpation has been attributed to Shepherd Ivory Franz.

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References

Section A: Recent (1991–2012) History of Psychology Textbooks Examined

Benjafield, J. G. (2005). *A history of psychology* (2nd ed.). Ontario, Canada: Oxford University Press.

Benjamin, L. T., Jr. (1997). *A history of psychology: Original sources and contemporary research*. New York, NY: McGraw-Hill.

Benjamin, L. T., Jr. (2007). *A history of modern psychology.* Malden, MA: Blackwell.

Bolles, R. C. (1993). *The story of psychology: A thematic history.* Pacific Grove, CA: Brooks/Cole.

Brennan, J. F. (2003). *History and systems of psychology* (6th ed.). Englewood Cliffs, NJ: Prentice Hall.

Fancher, R. E. (1996). *Pioneers of psychology* (3rd ed.). New York, NY: W. W. Norton.

Fancher, R. E., & Rutherford, A. (2012). *Pioneers of psychology* (4th ed.). New York, NY: W. W. Norton.

Goodwin, C. J. (2008). *A history of modern psychology* (3rd ed.). New York. NY: John Wiley & Sons.

Hergenhahn, B. R. (2009). *An introduction to the history of psychology* (6th ed.). Pacific Grove, CA: Thomson/Wadsworth.

Hothersall, D. (2004). *History of psychology* (4th ed.). New York, NY: McGraw-Hill.

Hunt, M. (1993). *The story of psychology.* New York, NY: Doubleday.

Krapp, K. (Ed.). (2005). *Psychologists and their theories for students. Volume 1: A-K, Volume 2: L.-Z.* Detroit, MI: Thomson-Gale.

Leahey, T. H. (2001). *A history of modern psychology* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.

Leahey, T. H. (2004). *A history of psychology: Main currents in psychological thought* (6th ed.). Upper Saddle River, NJ: Prentice Hall.

O'Boyle, C. G. (2006). *History of psychology: A cultural perspective*. Mahwah, NJ: Erlbaum.

Schultz, D. P., & Schultz, S. E. (2004). *A history of modern psychology* (8th ed.). Belmont, CA: Thomson/Wadsworth.

Smith, R. (1997). *The Norton history of the human sciences*. London, England: W. W. Norton.

Thorne, B. M., & Henley, T. B. (2005). *Connections in the history and systems of psychology* (3rd ed.). Boston, MA: Houghton Mifflin.

Viney, W., & King, D. B. (2003). *A history of psychology: Ideas and context* (3rd ed.). Boston, MA: Allyn & Bacon.

Watson, R. I., & Evans, R. B. (1991). *The great psychologists: A history of psychological thought* (5th ed.). New York, NY: HarperCollins.

Wertheimer, M. (2000). *A brief history of psychology* (4th ed.). Belmont, CA: Thomson/Wadsworth.

Section B: General References

Boring, E. G. (1929). *A history of experimental psychology.* New York, NY: D. Appleton-Century-Crofts.

Boring, E. G. (1950). *A history of experimental psychology* (2nd ed.). New York, NY: Appleton-Century-Crofts.

Brannigan, A. (1981). *The social basis of scientific discoveries*. Cambridge, England: Cambridge University Press.

Brodal, A. (1981). *Neurological anatomy in relation to clinical medicine* (3rd ed.). New York, NY: Oxford University Press.

Colotla, V. A., & Bach-y-Rita, P. (2002). Shepherd Ivory Franz: His contributions to neuropsychology and rehabilitation. *Cognitive, Affective, & Behavioral Neuroscience, 2*, 141–148.

Coon, D. J. (1982). Eponymy, obscurity, Twitmyer, and Pavlov. *Journal of the History of the Behavioral Sciences, 18*, 255–262.

Dallenbach, K. M. (1959). Twitmyer and the conditioned reflex. *American Journal of Psychology, 72*, 633–638.

Diamond, I. T. (1979). The subdivisions of neocortex: A proposal to revise the traditional view of sensory, motor, and association areas. *Progress in Psychobiology and Physiological Psychology, 8*, 1–43.

Finger, S. (1994). *Origins of neuroscience: A history of explorations into brain function*. New York, NY: Oxford University Press.

Franz, S. I. (1902). On the functions of the cerebrum: I. The frontal lobes in relation to the production and retention of simple sensory-motor habits. *The American Journal of Physiology, 8*, 1–22.

Franz, S. I. (1906). Observations of the functions of the association areas (cerebrum) in monkeys. *Journal of the American Medical Association, 47*, 1464–1467.

Franz, S. I. (1907a). Über die sogenannte Dressurmethode für Zentralnervensystems-untersuchungen. [About the so-called training method for the study of the central nervous system.] *Zentralblatt für Physiologie, XXL*, 583–584.

Franz, S. I. (1907b). On the functions of the cerebrum: The frontal lobes. In R. S. Woodworth (Ed.), *Archives of psychology* (pp. 1–64). New York, NY: The Science Press.

Franz, S. I. (1912a). New phrenology. *Science, 35*, 321–328.

Franz, S. I. (1912b). *Handbook of mental examination methods*. New York, NY: The Journal of Nervous and Mental Disease Publishing.

Franz, S. I. (1932). Shepherd Ivory Franz. In C. Murchison (Ed.), *A history of psychology in autobiography* (Vol. 2, pp. 89–113). Worcester, MA: Clark University Press.

Furedy, J. J. (2004). Pavlovian George Windholz (1931–2002): An exemplar of scholarly "observation and observation" and a critical contributor to psychology, and hence to behavioral neuroscience. *Integrative Physiological and Behavioral Science, 39*, 139–147.

Gantt, W. H. (1928a). *Lectures on conditioned reflex*es (Vol. 1: Ivan Petrovitch Pavlov). New York, NY: International Publishers.

Gantt, W. H. (1928b). *Lectures on conditioned reflexes* (Vol. 2, Conditioned reflexes and psychiatry, Ivan Petrovitch Pavlov). New York, NY: International Publishers.

Hamilton, A., & Jackson, J. B. (1969). *UCLA on the move, during fifty golden years, 1919–1969*. Los Angeles, CA: Ward Ritchie Press.

Kalischer, O. (1907a). Zur Funktion des Schläfenluppens des Grosshims. Eine nue Hörprüfungsmethod bei Hunden; zugleich ein Beitrag zur Dressur als physiologischer Untersuchungsmethode. [Toward the function of the temporal lobes of the cerebral cortex. A new auditory-test-method in dogs as well as a contribution of training as a physiological method.] *Sitzungsberichte der phys-math, Klasse, Bericte der Königlichen reussischen Akademie der Wissenschaften, Berlin*, 204–217. [This reference was copied *verbatim* from Windholz and Lamal, 1993, p. 349.]

Kalischer, O. (1907b). Einige bemerkungen über meine dressurmethode. [Some comments about my training method.] *Zentralblatt für Physiologie, XXL*, 585–586.

Krech, D. (1964). Cortical localization of function. In L. Postman (Ed.), *Psychology in the making: Histories of selected research problems* (pp. 31–72). New York, NY: Alfred A. Knopf.

Kruger, L., & Swanson, L. W. (2007). 1710: The introduction of experimental nervous system physiology and anatomy by Fransçois Pourfour du Petit. In H. Whitaker, C. U. M. Smith, & S. Finger (Eds.), *Brain, mind and medicine: Essays in eighteenth century neuroscience* (pp. 99–113). New York, NY: Springer.

Lachman, S. J. (1963). *History and methods of physiological psychology*. Detroit, MI: The Hamilton Press.

Lashley, K. S. (1929). *Brain mechanisms and intelligence*. Chicago, IL: University of Chicago Press.

McGaugh, J. J. (2000). Memory—A century of consolidation. *Science, 287*, 248–251.

Misiak, H. (1961). *The philosophical roots of scientific psychology*. New York, NY: Fordham University Press.

Murchison, C. (1929). *The psychological register*. Worcester, MA: Clark University Press.

Neuberger, M. (1981). *The historical development of experimental and spinal cord physiology before Flourens*. (E. Clarke, Trans., Ed., Supplemented). Baltimore: The Johns Hopkins University Press.

Rosenzweig, M. R. (1959). Salivary conditioning before Pavlov. *American Journal of Psychology, 72*, 628–633.

Thomas, R. K. (1970). Mass function and equipotentiality: A reanalysis of Lashley's retention data. *Psychological Reports, 27*, 899–902.

Thomas, R. K. (1999). Franz, Shepherd Ivory. In J. A. Garraty & M. C. Carnes (Eds.), *American national biography* (Vol. 8, pp. 405–406). New York, NY: Oxford University Press.

Thomas, R. K. (2000). Franz, Shepherd Ivory. In A. E. Kazdin (Ed.), *Encyclopedia of psychology* (Vol. 3, pp. 396–398). New York, NY: Oxford University Press.

Thomas, R. K. (2007). Recurring errors among recent history of psychology textbooks. *American Journal of Psychology, 120*, 477–495.

Thomas, R. K. (2011, October). *Shepherd I. Franz (1874-1933) and Karl S. Lashley (1890-1958): An example of unfair historical recognition?* Invited presentation at the Center for History of Psychology, University of Akron, Akron, OH.

Thomas, R. K. (2012). Flourens, Pierre. In R. W. Rieber (Ed.), *Encyclopedia of the history of psychological theories (Part 6)* (pp. 442–443). New York, NY: Springer-Verlag.

Thomas, R. K. (in press-a). Brain and intelligence. In H. L. Miller (Ed.). *Encyclopedia of theory in psychology*. Thousand Oaks, CA: SAGE.

Thomas, R. K. (in press-b). Shepherd Ivory Franz (1874–1933). In J. L. Pate (Ed.), *Southern society for philosophy and psychology presidents and presidential addresses*. Amsterdam, The Netherlands: Rodopi Press.

Uttal, W. R. (2003). *The new phrenology: The limits of localizing cognitive processes in the brain*. Cambridge, MA: MIT Press.

Windholz, G. (1997). Ivan P. Pavlov: An overview of his life and psychological work *American Psychologist* (Special issue, "Commemorating Pavlov's Work"), *52*, 941–946.

Windholz, G., & Lamal, P. A. (1993). Vagaries of science: Priority, independent discovery, and the quest for recognition. *The Psychological Record, 43*, 339–350.

Wolfe, R. J. (2001). *Tarnished idol: William Thomas Green Morton and the introduction of surgical anesthesia, a chronicle of the ether controversy*. San Anselmo, CA: Norman Publishing.

Yakolev, P. I. (1959). Bechterev. In M. A. B. Brazier (Ed.), *The central nervous system and behavior: Transaction of the first conference, February 23, 24, 25, and 26, 1958* (pp. 187–210). Madison NJ: Madison Printing.