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Tying the knot: skill, judgement and authority in the 1870s Leipzig spiritistic experiments

KLAUS B. STAUBERMANN*

Abstract. Recent studies in nineteenth-century spiritualism have illuminated the social practice of the occult in various cultural contexts. Richard Noakes in his latest study on telegraphy and the occult in Victorian England, for instance, shows how the world of spiritualism and the world of technology were welded together by Victorian engineering schemes and money.¹ This paper looks at another culture of occult practice which has often been neglected by historians of science: the role of spiritism in the making of German experimental psychology. Based on a debate focusing on the German astrophysicist Karl Friedrich Zöllner and the American medium Henry Slade, I will show how spiritistic experiments were situated in the emerging contexts of scientific practice, laboratories and disciplines.² This study will also take a close look at the perception of spiritistic mediums as instruments by experimenters such as Zöllner.³

Things were in control and then they were not and then they were.

Sally Bushell, *Under the Breadfruit Tree*⁴

The beginnings of German experimental psychology of vision were marked by investigating delusions in the act of creating such delusions. Experimenters like astronomers and psychophysicists developed skills, and a consciousness of their skills, in experimenting with their own and others' vision and judgement. One of them was Karl Friedrich Zöllner (1834–82) at Leipzig University, who became the first German professor for astrophysics in 1865, mainly because of the success of the instruments he designed. He became a public figure in the 1870s through his attacks on various scientific authorities at that time, including Hermann Helmholtz. As a consequence of his polemical behaviour he was asked to resign from his position as a professor, but died shortly before his resignation under uncertain circumstances.⁵

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1 R. Noakes, 'Telegraphy is an occult art: Cromwell Fleetwood Varley and the diffusion of electricity to the other world', *BJHS* (1999), 32, 421–59.

2 For a more external approach on Zöllner see C. Meinel, *Karl Friedrich Zöllner und die Wissenschaftskultur der Gründerzeit*, Berlin, 1991. 'Spiritismus' in German and 'spiritualism' in English refer to the study of ghosts. 'Spiritualismus' in German refers to the metaphysical and theological dimension of the spiritual.

3 This perception dates back to the 18th century. S. Schaffer, 'Deus et Machina', *La Lettre de la Maison française* (1997), 9, 30–58. On the perception of experimental subjects as machines in Victorian culture see A. Winter, *Mesmerized*, Chicago, 1998, Chapter 3.

4 S. Bushell, *Under the Breadfruit Tree*, Cambridge, 1997, 22.

5 For more biographical information on Zöllner see D. B. Herrmann, *Karl Friedrich Zöllner*, Leipzig, 1982.

It is worth taking a closer look at Zöllner's early career. Zöllner was born the son of a pattern painter and calico printer in Berlin on 8 November 1834. Little is known about his childhood but it is reported that he was the oldest of twelve brothers and sisters and had shown early interest in technical construction and experiment. It is also known that he used to entertain his family on Sunday nights with technical demonstrations which he had prepared on the morning of the same day, most probably having been assisted by his artisan father. In his teenage years many friends of the family joined the Sunday evening entertainment given by the young Zöllner. Though it is not known what kind of technical entertainment and demonstration Zöllner performed, it is reported that his audience saw in him a 'talented demonstrator'.⁶ After leaving secondary school and the *Gymnasium*, Zöllner began studies at the Königliches Gewerbeinstitut in Berlin and at Berlin University. This was not surprising in the 1850s when Berlin University could not provide enough laboratory places for its students, so that some of them, like Zöllner, trained in the better-equipped *Gewerbeschulen*. Zöllner soon focused his studies on subjects related to the field of physics, neurophysiology and psychology, with his main interests in colour, light and optical illusions.⁷

For his doctoral research in 1858 Zöllner had chosen the laboratory of the physicist Gustav Wiedemann at Basel University. Wiedemann, not much older than Zöllner, was a friend of the Zöllner family in Berlin and had just equipped his laboratory in Basel. Wiedemann suggested that Zöllner investigate the relation between light emission of glowing wires and current intensity. However, the phenomenon was too complex and Zöllner had to conclude in his thesis that no clear relation could be found.⁸ All of Zöllner's inventions up till then had failed. Apart from trying to introduce a standardized light source and a colorimeter he had also worked on a barometer and an electro-magnetic power engine. Zöllner's engine had already been superseded by Werner Siemens's engine when he published his article about it, and the barometer, meant to work without mercury, was never actually produced. Moreover, the principle of polarization for his photometrical work had been criticized by his teachers Heinrich Wilhelm Dove and Gustav Magnus – although Dove had stimulated Zöllner's work. Starting from his first interest in colour and patterns, the experimentation with light sources and projectors and his studies with crystals and polarization, his ability in creating and controlling images grew. His approach was a qualitative rather than a quantitative one, and statistical evaluations of his observations were exceptional. Zöllner tried to create the visual effects needed for comparison and judgement.

When Zöllner's father bought a steam-powered printing machine in the 1830s, printing patterns became more simple and standardized than the skilfully hand-printed ones. However, printing these patterns on a large scale showed effects which had been unknown before. During the two years between his Ph.D. in Basel and his position as a lecturer

6 F. Koerber, *Karl Friedrich Zöllner*, Berlin, 1899.

7 D. B. Herrmann, *Ein eigenhändiger Lebenslauf von Karl Friedrich Zöllner aus dem Jahre 1864*, Berlin, 1974, 3.

8 K. F. Zöllner, *Photometrische Untersuchungen insbesondere über die Lichtentwicklung galvanisch glühender Platindrähte*, inaugural dissertation, Basel, 1859.

(*privat Dozent*) in Leipzig Zöllner both carried out his photometrical observations and studied delusions of colours and patterns at his late father's factory in Schönweide. During this time Zöllner also published four articles on different psychological and physical subjects related to brightness, colour and spatial perception and perception of movement.⁹

Zöllner carried out most of his quantitative investigations of vision at his late father's factory in Schönweide near Berlin. He was mainly investigating what had already been the topic of his first article written in Schönweide and what is still known in cognitive psychology as the 'Zöllner delusion': two parallel lines, each crossed by several lines at angles other than at right angles, do not appear parallel.¹⁰ Indeed, Zöllner even claims to have seen this effect on a pattern in his father's calico printing factory. In his last Schönweide paper Zöllner measured the angle of the crossing lines at which this effect becomes most visible. The set-up was a light source projecting the shadow of a brass frame on a white screen. By means of the brass frame the angle of all crossing lines could be changed in a measurable way. Zöllner found that the maximum effect was indeed dependent on the angle, but also on the observer, and again on the colour of illumination.¹¹

Though Zöllner in his early work, in the 1850s and 1860s, was mainly interested in projection apparatus and optical illusions, his three most successful instruments were for astronomical purposes. All of them incorporated several skills for comparing judgements. Each instrument was designed in such a way that it could enhance the contrast of the incorporated skill in order to distinguish it from the phenomena being observed and thereby shape the observer's attention and support him in his judgement. The first instrument was an astro-photometer – on which his later reputation in astrophysics was based. The other two were a protuberance device and a reversion spectroscope.¹² The reversion spectroscope was designed so that two spectra, the second one inverted, were compared rather than one spectrum being observed in comparison to a fixed scale. This emphasized the relative position of spectral lines when, for example, observing the Doppler shift. The protuberance device was designed so that it not only covered the image of the sun but enhanced the contrast of the observed protuberances.

That Zöllner was interested in the technical rather than in the philosophical aspect of human vision is evident from the letters he wrote to Helmholtz in 1862 while he was working on his experiments. At that time he was working on after-images caused by looking at light sources through coloured filter glass with one eye while the other eye was looking at the source without the glass. Zöllner reported that if the image was watched for

9 K. F. Zöllner, 'Ueber eine neue Art von Pseudoskopie und ihre Beziehungen zu den von Oppel und Plateau beschriebenen Bewegungsphänomenen', *Poggendorff'sche Annalen der Physik und Chemie* (1860), 110, 500–23; 'Beiträge zur Kenntniß der chromatischen und monochromatischen Abweichung des menschlichen Auges', *Poggendorff'sche Annalen der Physik und Chemie* (1860), 111, 329–36; 'Ueber eine neue Beziehung der Retina zu den Bewegungen der Iris', *Poggendorff'sche Annalen der Physik und Chemie* (1860), 111, 481–99, 660–6.

10 M. Luckiesh, *Visual Illusions*, New York, 1965, 76.

11 K. F. Zöllner, 'Ueber die Abhängigkeit der pseudoskopischen Ablenkung paralleler Linien von dem Neigungswinkel der sie durchschneidenden Querlinien', *Poggendorff'sche Annalen der Physik und Chemie* (1861), 114, 587–91.

12 Zöllner's spectroscope is still built and used by astronomers. See E. Geyer, 'Zöllner's Reversion-Spectroscope', in *Karl Friedrich Zöllner and the Historic Dimension of Astro-Photometry* (ed. C. Sterken and K. Staubermann), Brussels, 2000, 39–44.

only a short time and then both eyes were turned towards a white screen, the eye which had not been exposed to the coloured light would see its complementary colour. When Zöllner talked to the psychophysicist Theodor Fechner in Leipzig about it, Fechner pointed out that similar experiments carried out by him with longer exposure times showed the complementary colour only on the eye exposed to the filtered light, but not on the other eye, making the phenomenon a retinal rather than a mental one.¹³

The step from self-consciousness to self-conceit in such experiments could be a very small one, considering the experimenter's influence on the spectator and therefore his power over the outcome of the experiment. But for Zöllner, seeing through illusions and being able to control them did not just mean creating and controlling images. In 1875 he turned to other phenomena. These were the phenomena which could not be explained and so were often placed in a religious context as 'miracles'. Although interest in spiritism was not uncommon for scientists in the late nineteenth century, most scientists would be careful about expressing their interest in public.¹⁴ Not so Zöllner: he did not hesitate to make these phenomena the subject of scientific and experimental interest, and he introduced the term 'transcendental physics' for this new discipline.¹⁵

Zöllner argued that in transcendental physics, as in all phenomena in experimental science, human agency is needed. This human agency, the intelligent act of invention and experimentation, is a necessity for the creation and control of these phenomena. The intelligent act of inventing instruments and apparatus for Zöllner was only partly a conscious one. Since the act of inventing experiments is also connected to the unconscious activity of the inventor, it might be the case that our senses are not only limited to what we are aware of. According to Zöllner there might be people who – like the unconscious working inventor or experimenter – have a sensibility beyond their consciousness which gives them access to otherwise hidden phenomena. People with this ability were called 'mediums' and the process of accessing these phenomena Zöllner called 'inspiration'.¹⁶

For Zöllner, the question of authority was at the very centre of his involvement in spiritism. Due to his previous failures in scientific experimentation Zöllner wanted to show that after all he was a successful experimenter. The transcendental physical experiment is much more individual than the physical experiment, because of the subjective intelligence of the medium. In the physical experiment the experimenter has control – he is the authority in charge of his experiment. In transcendental physics the medium is both experimenter and experiment. However, according to Zöllner, somebody who himself had experience in controlling psychological experiments could, by direct observation, judge the authority of the medium. It was Zöllner's authority in controlling his own experiments which gave him the self-confidence for this argument. Though he did not claim to have the

13 K. F. Zöllner, Letters to H. Helmholtz, Leipzig, 7 July 1862, 21 October 1862, 20 December 1862, Berlin-Brandenburgische Akademie der Wissenschaften, Akademiearchiv, NL Helmholtz, Brief 1–3.

14 For both continuities and discontinuities of spiritism in German nineteenth-century science see A. Hessenbruch, 'Science as public sphere: x-rays between spiritualism and physics 1896', in *Wissenschaft und Öffentlichkeit in Berlin 1900* (ed. C. Goschler), Wiesbaden, forthcoming.

15 K. F. Zöllner, *Naturwissenschaft und Christliche Offenbarung*, Leipzig, 1881, p. xvi; for an English translation of Zöllner's first essay on this topic in his *Wissenschaftliche Abhandlungen*, Volume 3, Leipzig, 1879, see J. C. F. Zöllner, *Transcendental Physics*, London, 1880.

16 K. F. Zöllner, *Wissenschaftliche Abhandlungen*, Volume 3, Leipzig, 1879, p. xix.

sensibility of a medium, Zöllner considered himself able to judge a medium's authority. Essential for judging the credibility of such transcendental physical mediums was participation in the experiment.

Observation for Zöllner came before scientific theory. In his popular essay on the theory of the fourth dimension in 1876 Zöllner explained how he imagined the 'transcendental' perception of hidden phenomena. In nature a three-dimensional object is projected on the retina as a two-dimensional object. Following the need for orientation, the mind transforms the two-dimensional images into a three-dimensional concept by applying geometrical laws to the perceived images. In the same way one could conceptualize a four-dimensional object by deducing its existence from a three-dimensional perception. As with a balloon, visible only at the start and end of its flight, which one may conclude still exists all the time in between, even when it is not visible because hidden by the clouds.¹⁷

Zöllner's interest in four-dimensional mathematics can be traced to the publication of Bernhard Riemann's collected works by Zöllner's friend Heinrich Weber in 1876.¹⁸ Riemann's essays on philosophical issues, especially his outline on particles moving between a physical and a spiritual world, caught Zöllner's immediate attention. In 1878 Zöllner had already translated Riemann's work in an essay of his own, 'Zur Metaphysik des Raumes'.¹⁹ In this essay, Zöllner also gave a detailed description of one of his first experiments with his medium Henry Slade:

Two strips cut from soft leather of a length of forty-four centimetres and a width of five to ten millimetres are tied together and sealed. These two closed strips of leather were put separately on the gambling table at which we sat. Then, I put the two strips at the same place and covered them with my hands. Slade, who sat on my left, temporarily put his right hand quietly on my hands, while I was still able to feel the strips under mine. Slade claimed to see streaming lights and to feel a cool wind over my hands. The latter I could feel too, but could not observe any lights. While I felt the cool wind again, and Slade's hands did not touch mine but were about two to three decimetres away, I felt a clear movement of the two strips under my hands. Immediately after, it knocked on the table three times and when I removed my hands, the two previously separate strips were tied together. The time during which the strips remained under my hands did not exceed three minutes.²⁰

According to Zöllner, one conceives the third dimension by trying to match the two-dimensional perception with three-dimensional experience from a moving, and therefore changing, perspective. When a three-dimensional object has an appearance that can only be explained by a higher dimension, that would be an empirical proof of Zöllner's theory. For Zöllner this included, for instance, crystals, like the circular polarizing rock crystal he used in his astro-photometer, an asymmetrical object with a distinctive and unchangeable orientation in three-dimensional space. The three-dimensional world would then be the projection of a four-dimensional world, where three-dimensional orientation becomes manifested.

Zöllner referred to Plato's metaphor of the cave, concluding that the known material world might only be a projection phenomenon of a yet unknown world.²¹ This view was

17 Zöllner, op. cit. (16), 72.

18 B. Riemann, *Gesammelte Mathematische Werke*, 2nd edn. (ed. H. Weber), New York, 1953.

19 K. F. Zöllner, 'Zur Metaphysik des Raumes', *Wissenschaftliche Abhandlungen* (1878), 2, 893–938.

20 Zöllner, op. cit. (19), 912. My translation.

21 Zöllner, op. cit. (16), 84.

not uncommon among German philosophers following the renaissance of Arthur Schopenhauer in the second half of the nineteenth century. However, Zöllner was the only scientist who combined his spiritistic experience with Riemannian mathematics and (post-) Kantian philosophy, and also made this part of his lectures. At a time when new specialist disciplines were being created Zöllner was one of the last remaining ‘*Universalgelehrte*’. Unity of all spirit, body and universe was an ideal Zöllner was striving for, partly because he had never experienced it when growing up in an already industrialized Berlin.²² This will become clear when we look at his attempts to link experimental laboratory science and spiritism.

For Zöllner, the early projectionist, inventor and experimenter, the essential question was how to access this unknown world experimentally. The easiest way, Zöllner pointed out, would be to have the same power in controlling the appearance of four-dimensional objects as he had in controlling that of two- or three-dimensional objects. Like a child learning to conceive three dimensions from two-dimensional perception, one has to learn to conceive four-dimensional experience from three-dimensional perception. This separation of the four- and three-dimensional, according to Zöllner, is possible only by being able to detect ‘accidents’ – when four-dimensional phenomena are wrongly displayed in the three-dimensional world – finding out about their cause, and by doing so separating them from what can be explained by causes already known. What is not explainable is either a four-dimensional phenomenon or – due to the individualistic nature of the experience – hallucination. Here Zöllner began wondering if such transcendental experiments could be carried out by spiritual mediums, who were then common in the German countries.²³

However, in 1877 Zöllner was still reserved towards spiritism, advising other spiritists rather to ‘knock (blow) the dust off the masterpieces of literature in the libraries rather than let ghosts knock on tables and walls’.²⁴ Zöllner’s first experiments investigating the existence of the manifestations of a fourth dimension were purely instrumental. The first instrument used by Zöllner was again a photometer, this time a radio photometer. Zöllner found the idea and design in 1875 when, together with the German instrument-maker Repsold, he was visiting the English chemist William Crookes in London, following a meeting of the *Astronomische Gesellschaft* in Leiden. Unfortunately, nothing is known about Zöllner’s meeting with Crookes. But Zöllner was impressed by the sensitivity of Crookes’ radiometer, and when he returned to Germany he requested a similar instrument from the instrument-maker Geissler in Bonn, calling it a ‘*Skalen-Photometer*’.²⁵

Like Zöllner, Crookes was a talented and skilled experimenter and inventor who had developed exceptional skills both in spectroscopy and in measuring delicate radiation forces. Unlike Zöllner, Crookes had been reluctant to employ his instruments for the

22 Christoph Meinel has made this a topic of his work on Zöllner. C. Meinel, op. cit. (2).

23 For an introduction into spiritism in nineteenth-century Germany see U. Linse, *Geisterseher und Wunderwirker – Heilssuche im Industriezeitalter*, Frankfurt a. M., 1996.

24 Zöllner, op. cit. (16), 102.

25 K. F. Zöllner, *Das Skalen-Photometer*, Leipzig, 1879, 8.

investigation of the occult. Rather, Crookes used his radiation apparatus for gauging psychic forces.²⁶ Crookes's interest in his radiometer originated from his experiments with a vacuum balance when trying to determine the absolute weight of thallium. Crookes noticed that heat had an effect on the measurement, affecting the movement of the balance. His trials of different designs resulted in the 'radiometer' or 'light mill' for the measurement of radiation.²⁷

Both Crookes and Zöllner had hoped that the radiometer would reveal something about the radiation of comets or the sun. Zöllner had explained his theory of comets as early as 1872. According to Zöllner, the comet tail was caused by gas particles originating from the sun.²⁸ This theory was not new among astronomers, but Zöllner could show by means of laboratory experiments how heat radiation both affects the movement of an artificial comet's body and the shape of the artificial comet's tail. This effect, the influence of 'repulsive forces', had been studied by astronomers before. In 1874 Zöllner's laboratory experiments were confirmed by the appearance of comet Coggia, which for weeks showed that the tail was pointing away from the sun.²⁹ Although controversial, Zöllner's theory was accepted by most astronomers. The year before, James Clerk Maxwell, in his *Treatise on Electricity and Magnetism*, had already calculated the repulsive force of sunlight on a surface, a work cited by Zöllner and used in his support of his theory.³⁰

The numerous subsequent experiments by English and German scientists with the radiometer were repeated and reported by Zöllner. He argued that if the *Skalen-Photometer* could detect electromagnetic forces, then the human body should be similarly affected by those forces. Zöllner saw a strict analogy between the photometer and the human body. For him the human body could respond to natural forces like an instrument. Though various 'biomagnetic' forces had been studied by German and English scientists, and were already widely discussed in the context of hypnosis, Zöllner's use of Crooke's radiometer was unique. All that had to be done for Zöllner now was to find a person, a medium, who was sensitive enough to respond to such forces as his photometer could.³¹

It was at this time that Zöllner learned about the medium Henry Slade, who was performing in Berlin at that time. Slade was an American who had come to England in 1876, giving performances to respectable English society. He was unmasked soon after as a result of an investigation into his trickery, and then arrested. Slade was convicted and sentenced to three months' hard labour which he could only escape by fleeing to France. However, the French press found out about the English court proceedings before Slade

26 R. K. De Kosky, 'William Crookes and the fourth state of matter', *Isis* (1976), 67, 36–60. R. Noakes, "'Cranks and visionaries": science, spiritualism and transgression in Victorian Britain', Ph.D. thesis, University of Cambridge, 1998.

27 A. Woodruff, 'William Crookes and the radiometer', *Isis* (1966), 57, 188.

28 K. F. Zöllner, *Über die Natur der Cometen*, Leipzig, 1872.

29 S. Brush and C. Everitt, 'Maxwell, Osborne Reynolds, and the Radiometer', *Historical Studies in the Physical Sciences* (1969), 1, 110.

30 S. Brush, C. Everitt and E. Garber, *Maxwell on Heat and Statistical Mechanics*, Cranbury, 1995, 68.

31 Zöllner, op. cit. (16).

could give any performances in France. From France Slade travelled to Germany where he met Zöllner in 1877.³²

Slade claimed to be a person sensitive enough to be affected by ‘powers’ and who, apart from other skills, possessed the power of ‘tying knots’. This attracted Zöllner’s immediate attention since he had already contemplated the act of turning a rope as a three-dimensional operation which changes the appearance of a two-dimensional object.³³ Turning a rope is a three-dimensional operation which can be projected in two dimensions – but can only be understood when one is aware of the three-dimensional nature of the operation. A knot, Zöllner argued, can only be projected in three dimensions but perhaps – similar to the rope – can be tied in a higher dimension. These ‘*Knotenexperimente*’ were the first ones carried out by Zöllner and his medium Slade. Later experiments were made on the fourth dimension, including moving tables, ringing bells and handwriting on hidden slate boards. In all of these experiments Slade claimed to have been able to move objects without any visible action by means of forces or powers in the fourth dimension.

When the experiment is no longer in the hands of the experimenter the question arises as to how the experimenter can distinguish between ‘real’ four-dimensional phenomena and deception. In a field where the authority of an experienced practitioner was already needed to operate three-dimensional phenomena, if this authority were to be transferred to the medium the experiment itself would become a matter of fragile credibility. When Zöllner admitted that he had neither the power nor the sensitivity to create and control these phenomena he reduced himself from being the experimenter to a mere spectator. Still considering himself an authority through his former experiments, he now had to rely on a judgement which was purely based on belief or disbelief.

The local culture and tacit presuppositions involved in nineteenth-century spiritistic seances are, perhaps, hard to understand or share in the early twenty-first century. Spiritual seances were mostly held in darkened rooms and participants were supposed to stay in the same place throughout. These facts were, and are, obvious sources of objection for sceptics.³⁴ It was often the medium, not the experimenter, who was in effective control of the experiments. The ability to reduce the experimenter to a passive spectator, yet still appear to maintain the experimenter’s apparent authority, was one of the psychological skills of a medium.

After their seances in Leipzig, Zöllner and Slade travelled to Russia, where Slade performed in the astronomical community of Pulkovo Observatory. It is not clear, though, if Zöllner arranged this visit or if they were invited by Otto Struve, the famous director of the observatory. But it was surely Zöllner’s reputation as an astrophysicist and experimenter which allowed him to turn a place of astronomical labour into a space of spiritistic practice. However, not all performances at Pulkovo were successful. Of Slade’s performances it is reported that in one case he tried to ‘untie’ a knot by using scissors. On

32 However, there was no consensus over Slade’s guilt. Zöllner mentioned numerous sources which support his claim that Slade could be regarded as reliable. Zöllner, *op. cit.* (16), 197, and elsewhere.

33 Zöllner, *op. cit.* (16), 97.

34 J. Oppenheim, *The Other World*, Cambridge, 1985, 24; A. Owen, *The Darkened Room*, London, 1989, 69.

another occasion, Zöllner and Slade tried to lift up the director's wife on a chair. When the chair broke, Mrs Struve, instead of moving upwards, moved downwards.³⁵ Newspapers were keen to report spiritism and often commented on it in a polemical manner.³⁶

The debate about spiritism in Leipzig in the 1870s was first of all a matter of scientific authority. Whereas the public debate was rather superficial, a small group of scientists discussed the experiments and their implications seriously. In Leipzig these people included, apart from Zöllner, Th. Fechner, the psychophysicist, Wilhelm Wundt, the philosopher and psychologist, and W. Weber, the physicist, all of whom had participated in at least one spiritistic session with Slade. Others, like the philosopher and publisher H. Ulrici, took part in the debate but do not seem to have attended any seances.

Ulrici supported the results of Zöllner's experiments, but had to admit that he could 'not claim to have found any explanation in the ordinary sense'.³⁷ Attendance at such a session became a crucial question in the further debate. Fechner and Wundt were both critical of the experiment and its outcome, but for different reasons. Weber did not want to be pulled into this debate and did not participate in it.

Whereas many scientists considered spiritual phenomena as deceptions, some considered them real. Fechner supported Zöllner, though he could not claim to have the 'authority of an observer' which Zöllner possessed. However, he criticized the fact that the method of scientific experiment was turned on its head by the criticism of the anti-spiritists: according to Fechner, conclusions were usually derived from the successful experiments, whereas the unsuccessful ones were rejected. The anti-spiritists acted contrary to this principle; they claimed successful experiments were manipulated. Furthermore, he argued that whereas normally, in the case of a successful experiment, the conditions of its success were studied, in the case of Zöllner's experiments the critics demanded the environment be investigated and ordered beforehand. Fechner concluded that Zöllner could not convince his critics as long as they kept on turning all arguments against him. Fechner concluded that 'where one usually looks at what the finger is pointing to, here one simply cuts off the hand and claims not to have seen anything'.³⁸

Wundt argued that the medium, Slade, was the experimenter, not Zöllner. In an open letter to Ulrici (who had mentioned Wundt in the context of Zöllner's sessions with Slade), Wundt went further by focusing not only on the question of experimental method but also on the question of authority. Authority for Wundt could only be attributed to a scientist who had experience in the field he was working in. He widened this rather narrow definition by also conceding authority to experts of technical, though not scientific,

35 H. Romberg, letter to C. Bruns, Pulkowa, 29 March 1878, Bruns-Nachlaß, Leipziger Universitätsarchiv. The places where Slade performed were not only astronomical but also parts of the experiments themselves. The philosopher H. Ulrici writes that on one occasion Zöllner asked Slade to write 'Littrow, astronomer' on a slate board. H. Ulrici, 'Der sogenannte Spiritismus eine wissenschaftliche Frage', *Zeitschrift für Philosophie und Philosophische Kritik* (1879), 74, 245. On another occasion Slade apparently changed the polarization of Nicol prisms. Zöllner himself describes the Nicol experiments in his *Wissenschaftliche Abhandlungen* (1878), 2, 342.

36 See, for example, 'Vermischtes', *Leipziger Tageblatt und Anzeiger*, Leipzig, 4 April 1880.

37 Ulrici, *op. cit.* (35), 74 and 261.

38 Th. Fechner, *Die Tagesansicht gegenüber der Nachtansicht*, Leipzig, 1904 (first edn. 1879), 271. My translation.

experience, like professional magicians. However, according to Wundt, such an authority became still more trustworthy by holding an academic degree even if in a field unrelated to the matter of enquiry. Furthermore, for the acceptance of an observation two criteria had to be met: that the person having made the observation was an authority and that the observation did not contradict former established observations.

Wundt developed this argument further by requesting that the former observations had also to be made by an authority. He also demanded that authority must include all ‘historical authority’, meaning that an observation should not contradict any past and now known natural laws – including causality. The experimenter carrying out the experiment had to have free access to all means required to perform it and full control over his senses.³⁹ However, like Fechner, Wundt had to admit that he also was not experienced in this matter and therefore not an authority himself. In the end Wundt could only rely on his personal impression that he did not ‘trust’ the observations he made while attending his seances with Slade.⁴⁰

Zöllner replied to Wundt’s letter immediately. Drawing a line between ‘real’ and ‘so-called’ philosophers, Zöllner accused Wundt of belonging to the latter. A real philosopher, according to Zöllner, knows about the ‘fact of observation’. Zöllner had hoped that Wundt, as a former assistant of Helmholtz, would value actual observations more highly than their ‘mental’ implications. This was, Zöllner wrote, why he had arranged for Wundt to be called to Leipzig as a professor of philosophy in 1875.⁴¹ Zöllner argued that Wundt could hardly deny that Fechner, Weber and he himself were ‘scientific authorities’ in the field of observation. Moreover, the fact that Wundt argued that Weber was not an authority on magnetic experiments would simply be a ‘personal insult’. To Wundt’s criticism that Slade was not ‘trustworthy’, Zöllner replied that he had hosted this ‘personally agreeable and socially well-mannered man’ himself, with a friend, for eight days.⁴²

Wundt had also criticized the fact that the circumstances of the experiment were not mentioned in Ulrici’s letter, which he said would have changed the judgement on the experiment significantly.⁴³ Zöllner replied that he would have been willing to explain the circumstances to anybody had he been asked to do so. This argument, Zöllner wrote ironically, was meant by Wundt to make the public suspicious of the experiment because ‘the light conditions for reading the magnetic needle had not been measured with a photometer’.⁴⁴

We do not know much about how exactly Slade performed his seances. One person who investigated Slade’s spiritistic practice was Carl Willmann, a magician and merchant of German origin.⁴⁵ Willmann showed that the few scientists who were seriously concerned

39 Wundt argues here similarly for the experimenter and the observer.

40 W. Wundt, *Der Spiritismus – Eine sogenannte Wissenschaftliche Frage*, Leipzig, 1879, 6.

41 K. F. Zöllner, ‘Die Transcendentale Physik’, *Wissenschaftliche Abhandlungen* (1879), 3, 21; see also W. Wundt, *Erlebtes und Erkanntes*, Leipzig, 1920, 287.

42 Zöllner, op. cit. (41), 41, 63.

43 Wundt, op. cit. (40), 19.

44 Zöllner, op. cit. (41), 64.

45 C. Willmann, *Moderne Wunder*, third edn., Leipzig, 1897.

with investigating spiritistic practice lacked not only practical qualifications but also objective judgement; moreover, like most participants in spiritistic seances, they often had a personal interest in the success of the spirits' appearances.⁴⁶ Magicians like Willmann were also aware of the techniques both mediums and magicians employed to control their environment to their own advantage. This included controlling and focusing the spectators' gaze by means of light, movements and words.⁴⁷

Following the proceedings of the English court against Slade an independent commission, the Seybert Commission, which consisted of both magicians and scientists, had been set up in New York to investigate Slade's practice, including the experiments he had carried out with Zöllner. The Commission came to the conclusion that no 'spirits' were present or involved in Slade's performances, and that every illusion or trick could be carried out by anyone with sufficient skill and practice. For the table rapping, for instance, Slade could simply slip his foot out of his shoe, which remained in contact with the spectators' shoes, thus enabling him, the medium, to push or kick the table. A similar trick could be done putting the hands of the spectators in contact with one another, and leaving them in the belief that they were holding the medium's hands. This could easily be done in the dark or by distracting the spectators' attention by words or unexpected actions. Slade's magnetic experiments would include well-hidden metal items, which, for example, could be glued under the table or chair while the medium was being body-searched.⁴⁸

The Leipzig debate on Slade's seances ended with Zöllner's sudden death in 1882. By that time Zöllner had been widely regarded as mentally unsound, and his death was met with relief by most of his friends and opponents. However, the debate on spiritism had lasting consequences for disciplined research at Leipzig. Until Zöllner's death he was the most popular lecturer on 'sensory deceptions', 'optical illusion' and 'scientific authority' at Leipzig. More than fifty students attended each of his lectures, the one on 'authority' being attended by seventy-one students in 1880, the year after Wundt's open letter attacking Zöllner's spirit experiments.⁴⁹ At that time Wundt's and Zöllner's lecture rooms were close to each other and, since both were lecturing on philosophy, students could easily attend both their lectures. However, space was limited. In 1879 Wundt had only one classroom available for the practical demonstrations accompanying his lectures on psychology. An attempt to extend his 'laboratory' in early 1882 was only partly successful.⁵⁰ Matters changed for Wundt when Zöllner died in April 1882. Having qualified as an opponent and suffered Zöllner's attacks, Wundt was appointed head of the commission for the

46 Janet Oppenheim calls this 'the will to believe'. Oppenheim op. cit. (34), 202.

47 This knowledge was not new. The enlightened eighteenth-century scholar H. Brämer wrote, 'Machine technology means to cheat someone by words.' H. Brämer, *Ausführliche Beschreibung der Sprachmaschinen*, Nürnberg, 1798, 21. For the role of light and darkness in performances, see W. K. King, 'The portrayal of darkness and sixth sense on the English stage', *Theatre Survey* (1993), 34, 39.

48 Most magicians considered Zöllner wilfully naive and an unfortunate victim of Slade.

49 J. Hamel, 'Karl Friedrich Zöllner's Tätigkeit als Hochschullehrer an der Universität Leipzig', *NTM, Schriftenreihe für Geschichte der Naturwissenschaften, Technik und Medizin* (1983), 20, 38. Though Zöllner did not supervise work on optical illusion he was advising colleagues who were doing so. See, for example, Zöllner's letter to W. Förster, Leipzig, 4 March 1863, Universitätsarchiv Leipzig, U. 246 2.1.7.2.

50 W. G. Bringmann and R. D. Tweney, 'The establishment of Wundt's laboratory', in *Wundt Studies* (ed. W. G. Bringmann and R. D. Tweney), Toronto, 1980, 123.

nomination of a successor of the professorship in astrophysics. Though the astronomers of Leipzig Observatory recommended an astrophysicist from Pulkovo Observatory, Wundt suggested not appointing any successor.⁵¹ For Wundt this led to a major change: the budget of Zöllner's astrophysical seminar was given to Wundt to furnish an 'Institute for Experimental Psychology'.⁵²

Wundt legitimated this move by linking his work on 'apperception time' to meridian astronomy.⁵³ Measurement of the reaction time of different observers became the focus of Wundt's institutionalization of experimental psychology.⁵⁴ Part of this approach was to use the most accurate measurement devices – clocks – for his quantitative research. Based on meridian observations, Wundt set up a programme for his laboratory research, introducing methods to measure observers' perception and reaction time.⁵⁵ Though Wundt did not have an explicit programme for research in his laboratory the work followed certain rules. These rules can be seen as a response to his experience with Zöllner's spiritistic experiments. Wundt, having been criticized for his lack of technical education, soon hired craftsmen who built machines for his personal use. If he complained about the lack of apparent causality in Zöllner's experiments, his own experiments followed strict action and reaction schemes. Wundt had also argued against the medium being prepared for the experiment, whereby the medium would know of the purpose of the experiment beforehand. Wundt, in his own laboratory, made it the rule that the subject was not informed about the purpose of the task he had to perform. Having stated that the medium could not be trusted, Wundt tried to employ experimental subjects known to him: co-workers, students or friends. Subjects could make observations authoritative, but the authority over the interpretation of the experiment was with the experimenter.⁵⁶

The experiment was known to the experimenter in its technical details and its purpose and he could create and control all effects – exactly what Wundt thought Zöllner had lacked when doing his spiritistic experiments. Whereas Wundt noted the lack of 'exact observation' in Zöllner's experiments he took care that measurements in his laboratory could be quantified. The interference of the subject in the programme of the experiment led Wundt to a strict separation of experimenter and subject. The experimenter knows the experimental set-up, can create and control the effects that the subject perceives and to which the subject responds, and records the subject's response. The experimenter is responsible for the fact that an effect occurs, for when it occurs and for how the attention of the subject is directed. Only by strictly separating the subject and the experimenter was the experimenter able to control the experiment. Controlling and creating effects was

51 *Protocolle der philosophischen Facultät der Universität Leipzig 1866–1885*, Volume 2, Acte, Professur für Astrophysik. Phil. Fak. Vol. 2/2005, 1882, Universitätsarchiv Leipzig.

52 *Acta die Rechnungen über die astrophysikalische Sammlung betr.* Universitäts-Rentamt zu Leipzig, No. 848, Universitätsarchiv Leipzig; see also Bringmann and Tweney, *op. cit.* (50), 149.

53 S. Schaffer, 'Astronomers mark time', *Science in Context* (1988), 2, 115.

54 W. Wundt, *Essays*, Leipzig, 1885, 163.

55 W. Wundt, 'Ueber psychologische Methoden', *Philosophische Studien* (1883), 1, 33.

56 For a detailed account of Wundt's distinction between the experimenter and the subject, see K. Danziger, *Constructing the Subject*, Cambridge, 1990.

limited to a strictly causal scheme which could only be controlled by the experimenter, and which guaranteed the autonomy of the observer.⁵⁷

The Leipzig debate might not have enlightened spiritistic practice, neither had it provided substantial insights into experimenters' skills, judgement and authority. But it certainly had contributed to the establishment of a new discipline, experimental psychology.

⁵⁷ Wundt, *op. cit.* (40), 14; and H. Hiebsch, 'Wilhelm Wundt und die Anfänge der Experimentellen Psychologie', *Sitzungsberichte der Sächsischen Akademie der Wissenschaften zu Leipzig, Philologisch-historische Klasse* (1977), 118, 318. Wundt's interest in securing the autonomy of the observer originated from his experience with hypnotic experimentation. See M. Kusch, 'Recluse, interlocutor, interrogator', *Isis* (1995), 86, 419–39.