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Citizen Karl Drais - What We Don't Know

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At the 1989 conference in Glasgow my presentation was entitled Karl Von Drais' Two Wheeler: What We Know [1], and subsequently I published a 528-page biography [2] on Drais in 2003. Meanwhile, it appears rather appropriate to present what we don't know, although in general the data are not as scarce as on the life of British carriage builder Denis Johnson who made Hobby Horses based on the principles of the Draisine beginning in 1819.[3]

Figure 2a. Garden Phaeton.

Karl Drais - the Man

His pedigree shows that Karl Drais, then still a baron, was born into a family of civil servants of lower nobility without land property. He was one of the last two males before the family name died out. His father married twice, the second marriage was childless, and the inventor and his four sisters all remained unmarried throughout their lifetimes. Presumably this was due to the epilepsy of the father, which was regarded as an impediment to marriage - in Sweden this had even been the law since 1760.

His uncle had a private forestry institute where Karl von Drais became a pupil and, having studied at Heidelberg University, an assistant teacher. After university, being overqualified for work as a forester, he tried his hand at inventing, made possible by his leave of absence at full pay. This was enabled by his godfather, the reigning Grand Duke himself. The invention of the two-wheeler (i.e. the Laufmachine that was later called the Draisine) made him famous and the darling of the media. An indication of this is the life mask [**Figure 1]** made by the brain research doctor Gall in Paris of Drais for his collection of celebrity's life masks, with poet Wolfgang von Goethe being the only other German in this collection.

Disaster struck when a political murderer, student Karl Sand, was beheaded, after Drais' father, the highest judge of Baden, had voted against a plea of clemency made to the Grand Duke's successor. The irate partisans of Sand mobbed the son Karl Von Drais nationwide, who then had to go into exile in Brazil for five years. Back home, and after his father's death, he expressed democratic ideas in public and thereby also became an enemy of the state. During the revolution of 1849, he abandoned his nobility titles via a newspaper ad. No wonder that he died penniless, after his pension had been seized by the Prussians to pay for the cost of revolution.

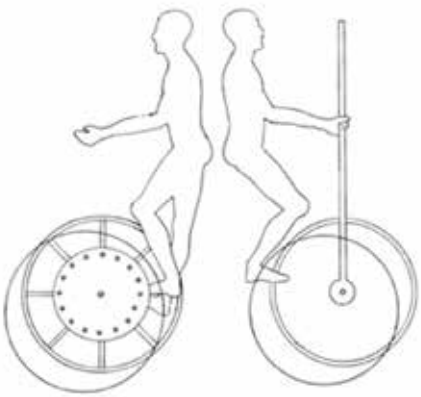

Figure 2b. Drawing by Ginzrot of a mechanism for propelling a garden Phaeton.[3]

Editor's Note: *This paper is all about the reasons for the invention of the Laufmachine, or Draisine, by Karl Von Drais in 1817 in Karlsruhe, Germany.*

Figure 1. Live mask circa 1818, Musée de l'Homme Paris.

Four Wheels instead of Four Hooves

It is presumed that Drais's earliest occupation with land transport occurred in 1803 when studying in Heidelberg and visiting his uncle residing in the nearby castle garden of Schwetzingen. Chances are that he saw or even rode the garden phaeton **[Figure 2a]** that had been bought for the earlier ruler, Palatian Elector Carl Theodor from London, in 1775: this phaeton is extant at the Deutsches Museums in Munich. Moreover, this phaeton was so sensational that Ginzrot [3] devoted a full page of drawings of it in his book on carriages.[4] Certainly, it was noticed by the technologists of nearby Heidelberg University and incorporated into their lectures . The idea behind this 4-wheel, human powered, phaeton was to avoid horse droppings on the clean garden paths. A servant treaded the pedal levers that unrolled bands attached to drums that incorporated freewheels, thus moving the carriage. The Elector sitting in front merely had to steer this garden phaeton **[Figure 2b]**.

The climate and a first crop failure[5] in 1803 enters our story here with a consequent rising price for oats nine years later in the autumn of 1812. Drais built his four-wheeled Fahrmaschine I (literally: travel machine) that carries 2-4 passengers, with a minimum of two that are needed to operate the machine **[Figure 2c]**. By placing a treadmill with steps or rungs directly between the rear wheels he radically reduced the complexity of the mechanism to a minimum. The first newspaper report covers his demonstration before Russian czar Alexander on a

visit in Karlsruhe in December 1813. He stated "C'est bien ingénieux!" and suggested that he present it before the upcoming Congress of Vienna. Drais' application for a grand-ducal privilege and for financial support was, however, denied. Nevertheless, Drais altered his Human Powered Vehicle (HPV) incorporating a crankshaft between the rear wheels, so that the "stoker" could also look forward. No images are extant, but the reinvention by Ernest Michaux (French Brevet No. 83350 of 1868) may have looked similar to this Fahrmaschine II. Drais presumably travelled about 1,000 km along the Danube to Vienna, but the assembled princes haggled over Napoleon's inheritance and didn't care about the price of oats - a personal and financial disaster for Drais. Frustrated, he left working on land transport altogether and turned his attention to inventions for towing barges upstream paternoster-like, for land surveying, and for theater-goers.

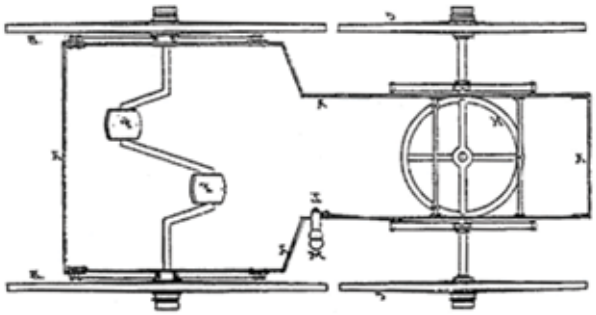

Figure 2c. Drais's four-wheeled Fahrmaschine.

Obviously Drais took on the challenge of the rising price of oats and thought to replace the draught-horse by human power, taking the garden phaeton as a model. There were references in newspapers of the time which mentioned the Drais invention.[6,7] For example, in 1817 it was reported, "*Since my latest invention, I have obtained a simple runner without a horse, or a carriage, on foot.*" [8]

We also have his testimonial in his article of 1814 (written in 1813)[9]: *"In times of war, where the horses and their feed are often seldom recruited, a small borrowing of such vehicles might be important in every army, especially for shorter periods of time and for the sick. Whether the strong running power of the machine could be applied artfully to any other wartime use, the inventor would leave to those with more military insights."*

An example of one of the German newspapers which referenced Drais' invention is shown in **Figure 3**. In those pre-industrial times, German inventors weren't accustomed to formulating elaborate priority claims such as patent attorneys began to do decades later. Rather, this idea appears in his list of possible uses of the four-wheeled Fahrmaschine.[10] However, there can be no doubt that this idea of his actually describes his motivation, and it fits well into the common scheme in the history of technology that invention answers a need. After all he was on paid leave of absence and thus - similar to most of today's engineers – he must have been under pressure to find useful solutions for a problem.


Badisches Magazin.

№ 294. Mittwoch, den 22. December 1813.

Figure 3. Drais put forth some possible uses of his 4-wheeled Fahrmachine that includes: "In war times, when horses and their fodder turn rare, ... such wagons ..... could be important." (Badefess Magazine, 05/01/1814, not extant but quoted by A. Kistner, MhGbil, 1933, S. 169-181).

The post-Tambora Catastrophe

Whereas we know that Drais' father kept a diary throughout his professional life (unfortunately missing), nothing is known about whether the inventor kept a diary. Thus, we have to rely on contemporary sources for information that would explain Drais' actions, and indeed, finding such information has been difficult. However, pertinent information is being found. For instance, John D. Post in his 1977 monograph observed that the French press didn't report the hunger riots and spread *"unrealistic optimism concerning the possibility of an immediate end of the [food shortage] crisis."* [11] In a recent book, Wolfgang Behringer, a German historian of climate, confirms this for the German speaking countries pointing to the stricter censorship on hunger news to the extent that gazettes or books didn't comment on the crisis at all! [12] Anglophile readers, whose press was already free by the early 19th Century, can hardly imagine the rigid censorship in Germany **[Figure 4]**. For newspapers or books which were censored, the whole print run was confiscated by the censor if there was a violation of the censor laws of the day - a severe financial loss for the newspaper editor or printer of books. Lack of quotable sources was indeed one of the


Kölnische Zeitung

Figure 4. Censorship on news of hunger riots in 1816/1817 in Germany was very strict. Thus, the hunger catastrophe was not commented on at all by German newspapers under threat of having all papers with such news confiscated and destroyed. Shown here is a news page from a Cologne newspaper that was left blank in protest to the censorship.

reasons why the hunger catastrophe was forgotten so soon. On the other hand, with some gazettes spreading optimistic news, one can find confirmative and contradictive quotations at the same time. Essentially, the most reliable information comes from hand-written sources during the catastrophe of 1816/17. The food and fodder shortage was felt already at the end of 1816, but reached its maximum in the summer of 1817 **[Figure 5]**.

Quotations of the ensuing horse mor-

Year	Horses	Cattle	Pigs	Sheep	Goats
1800	2700	10150	3800	16190	340
1816	2346	9619	3330	15725	559
1833	2664	11318	4425	20842	809
1853	2735	13376	5297	25117	1437
1861	3194	14999	6463	28017	1818
1873	3552	15777	7124	24999	2320

Table 1: Die Entwicklung der Tierbestände von 1800 bis 1873 (1000 Stück) nach Bittermann (Changes in the animal population from 1800 to 1873 (x 1000) according to Bittermann).[15]

tality were few, and the most dramatic that I used decades ago can't be used any longer because of a realization that its meaning is ambiguous since it may mean either "completely disrupted transport relations" or "completely disrupted business relations".[13] However, this doesn't invalidate the other proofs already presented in my biography of 2003[2] (and as was reviewed in 2005[14]):

• Drais' own testimonial in 1814 (see above).

• A report in a Dresden newspaper of November 1817: *"…. draisines replace saddle-horses raising hopes that the price of oats will fall."*

• Comte de Ségur confirms in April 1818: *"…. draisines are meant to abolish the luxury of horses and to lower the price of oats and hay."*

• Synchronization (delayed) of the two inventions with the first (1812) and the worst (1816) crop failure, that is - one year delayed for achieving the prototype **[Table 1]**.

• Proof of horse mortality can be found in Germany and France. The report of the Deputy Chamber to the King of France [Figure 6] reads:: *"….. towards the end of this same year, 1816, and in the last months usually the most favorable to manufacture and sale, were survived, for the Saltworks of the Meurthe, the most unfortunate and unprecedented events; such as the inclement weather of a rainy season, the total degradation of roads has been neglected for three years, the lack of the quality of fodder, the mortality of horses, etc.: considerable sacrifices have been made to repair these disasters."* [16]

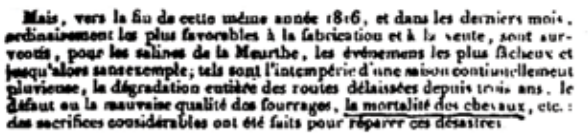
Mais, vers la fin de cette même année 1816, et dans les derniers mois, ordinairement les plus favorables à la fabrication et à la vente, sont survenus, pour les salines de la Meurthe, les événemens les plus fâcheux et jusqu'alors sans exemple; tels sont l'intempérie d'une saison continuellement pluvieuse, la dégradation entière des routes délaissées depuis trois ans, le défaut ou la mauvaise qualité des fourrages, la mortalité des chevaux, etc.: des sacrifices considérables ont été faits pour réparer ces désastres

Figure 6. A report from the French Deputy Chamber to the King on horse mortality in 1816. (Journal du Commerce, December 23 1817).

• While wide-spaced statistics showing reduction of horses by 13% from 1800 to 1816 could perhaps be explained by the Napoleonic Wars alone, the statement of the French chamber of deputies on horse mortality in 1816/17 cannot be ignored **[Figure 6]**. Hand-written and post-crisis sources retrospectively also confirm horse mortality in Germany.[17]

Two Wheels replace Four Hooves

Coming to the question of why the two-wheel machine was invented; the title of this presentation appears finally justified: With a diary lacking we really don't know the answer to this question. Drais himself says in his first ad in the *Spa Weekly* of Baden-Baden: *"The idea has been taken from ice-skating."* **[Figure 7]** Ice-skating became fashionable in Germany at the end of the 18th century, and Drais was an ice-skater himself. Indeed, balancing on only one skate was the closest analog known at that time to single-track balancing on land.[18]

The detailed steps of the invention are open to speculation. Some claim that Drais just split a four-wheeled cart in half, others say that he fitted two wheelbarrows together. Claude Reynaud proposes that Drais systematically omitted one wheel and then the other from his four-wheeled Fahrmaschine, and he sensed less rolling resistance with the removal of each wheel.[19] More doubtful is that the idea came to Drais when driving the Fahrmaschine on a rapid downhill spin, and he took a curve by lifting the wheels on the outter side as trick drivers of automobiles do today: however, this seems doubtful because it assumes that Drais had skills (especially that ability to balance on two in-line wheels) that he would not develop until he was using his Laufmaschine.

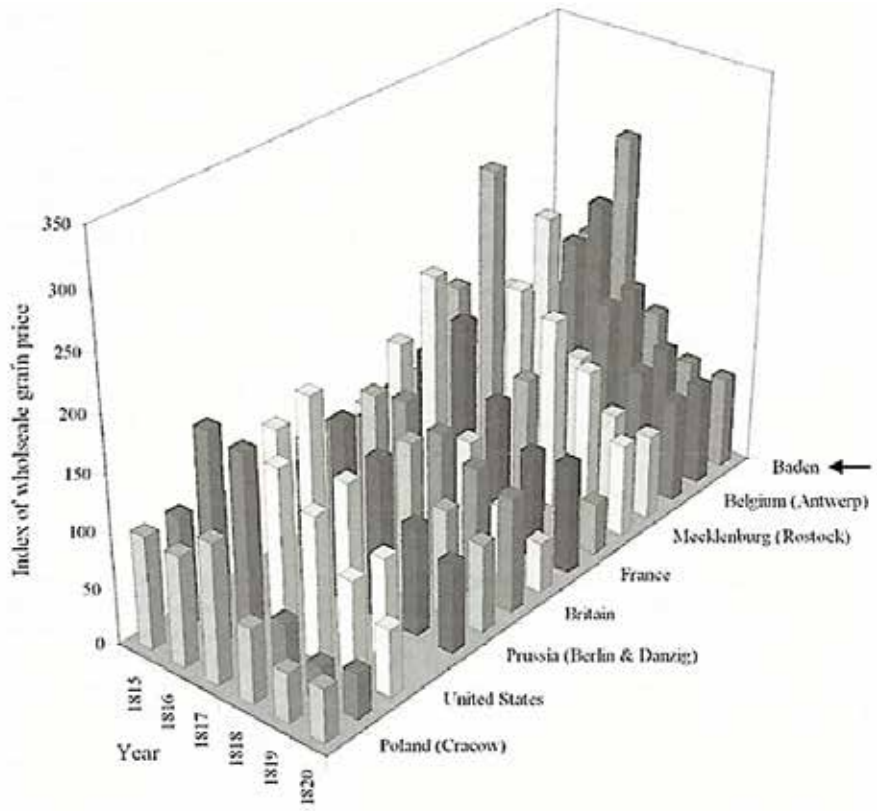

Figure 5. Rye prices of grand-dukedom Baden (C.Oppenheimer 2003).

Summary

From the above discussion of the known facts, we can deduce that the suc-

Figure 7. Reverend Walker skating on one skate (Henry Raeburn 1784).

cession of events that led to the invention of the Draisine were as shown in **Figure 8**. Drais interest in human-powered mobility began at age 18 when studying in Heidelberg. Freed from forest service and after his first inventions, he reacted to the first crop failure of a series that began in 1812 by inventing a four-wheeled carriage driven by a treadmill at age 28. He offered it to the authorities as a horse replacement when fodder and horses were lacking in war times. He failed at Vienna to generate interest by these authorities in his invention, so he turned his attention to other inventions beginning in the Spring of 1815. In June 1816, it became clear that the continuous rain and thunderstorms would spoil the harvest dramatically. Since farmers no longer had stocks of oats and hay, this meant that horses would be endangered severely - high time for Drais to return to work on developing human powered machines. One year later in June 1817 at age 32, he came out with his two-wheeled Laufmaschine: Coincidentally, at this time the price of oats was at its maximum although the prospects for the 1817 harvest were good. The counter-thesis that Drais wanted to develop an HPV merely as a sports vehicle at this time is absurd, for those were non-sporting times in Germany, and the hereditary Prince Leopold would not have praised this machine as serving the public good.

Presumably, strict censorship that stopped hunger news began in June 1816. So even if Drais wanted to print the relationship between his invention and the scarcity of fodder and horses at this time, neither editors nor printers would let him do so lest the whole print run be confiscated by the censor. Even the emotionless confirmations by contemporaries would have been tweaked to avoid alerting the censor. Yet Louis-Philippe de Ségur (1753-1830) **[Figure 9]**, councilor of state and a historian, regarded Drais' article to be so important that he included it in his collection of essays of 1818.[20] His son, Napoleon's adjutant, had described in his book the Russian strategy when the French invaded Russia in 1812 of using horse mortality by forcing the French back the same way they had come causing the French to find that all stocks of fodder at the farms on the way home had already been depleted so the horses went hungry.[21] ●

Figure 9. Louis-Philippe de Ségur (1753-1830).

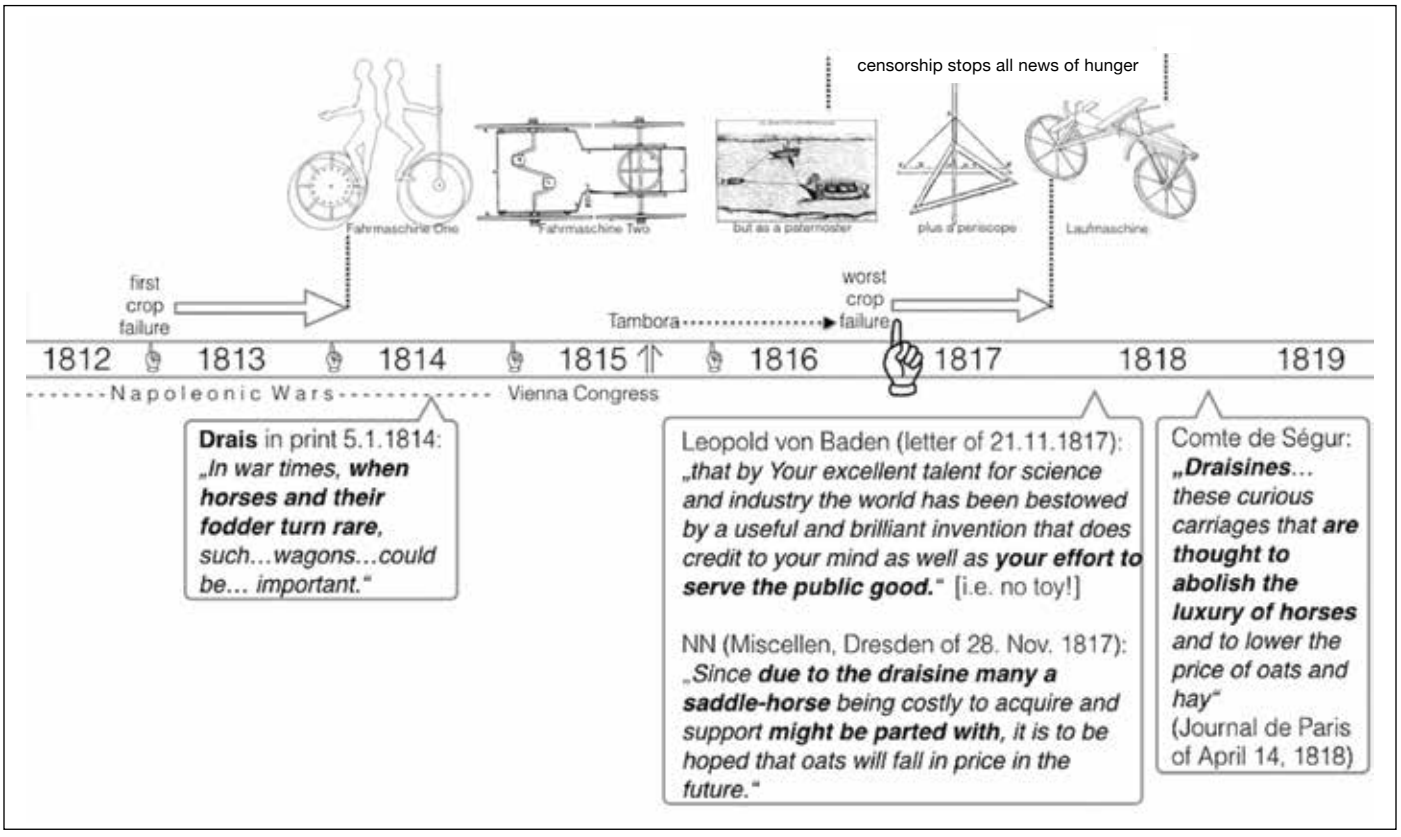

Figure 8. Timeline of Drais inventions.

Endnotes

[1] Hans-Erhard Lessing, Karl Von Drais' Two Wheeler: What We Know, *Cycle History 1: Proceedings of the 1st International Cycling History Conference*, Glasgow 1989, San Francisco: Bicycle Books, Inc., 1990, pp. 4-23.

[2] Hans-Erhard Lessing, *Automobilitaet – Karl Drais und die unglaublichen Anfaenge (Automobility - Karl Drais and the Incredible Beginnings)*, 527pp., Leipzig: Maxime-Verlag, 2003.

[3] Johann Christian Ginzrot, *Die Wagen und Fuhrwerke de Griechen und Romer und anderer alten Volker (The Wagons of the Greeks and Other Ancient People)*, Munich: 1830, reprinted by Olms Presse 1979.

[4] Roger Street, *Dashing Dandies – The English Hobby-Horse Craze of 1819*, 220 pp., Christchurch: Artesius, 2011.

[5] Wilhelm Abel, *Agrarkrisen und Agrarkonjunktur (Agriculture and Agricultural Crops)* 3rd edition, Hamburg: Pauly Parey, 1978.

[6] *Badisches Magazin*, Volume 3, Mannheim, Germany, 22 Dec. 1813., Google Books, Digitized Oct. 4, 2010, Accessed Sept. 15, 2017, https://books.google.com/books/about/Badisches_Magazin.html?id=FGxEAAAAcAAJ&hl=en

[7] *Neues Magazin aller neuen Erfindungen, Entdeckungen und Verbesserungen für Fabrikanten, Manufakturisten, Künstler, Handwerker und Oekonomen (News Magazine All New Inventions, Discoveries and Improvements), Leipzig, 1814, Bayerische StaatsBibliothek D*igital, Accessed Sept. 15, 2017, http://reader.digitale-sammlungen.de/en/fs1/object/display/bsb10230525_00007.htm

[8] *Kunst, Fabriken und Fabriken. Die Produktionsmaschine des Barons Karl von Drais* (Arts, manufactures and factories. The production machine of the Baron Karl von Drais), Allgemeiner Anzeiger der Deutschen, October 17, 1817.

[9] Karl von Drais, *Neues Magazin*, Vol. 3, No. 3, Leipzig: *Ein Wagen, der ohne Pferde lauft, erfunden von dem Freihern von Drais in Mannheim* (A Carriage Running Without Horses is Invented by von Drais in Mannheim), 1814.

[10] Hans-Erhard Lessing and Scotford Lawrence (translator), A Carriage That Goes Without Horses - Early Writings on the *Laufmaschine von Karl von Drais*, London: Veteran Cycling Club Cycling History #8, 2017.

[11] John D. Post, *The Last Great Subsistence Crisis in the Western World*, Baltimore: The Johns Hopkins University Press, 1977.

[12] Wolfgang Behringer, *Tambora und das Jahr ohne Sommer (Tambora and the Year Without Summer)*, Munich, C. H. Beck, 2016. He writes: "In centers of the Tambora crisis the invention of a riding machine made sense, simply because lack of horses existed" without quoting my published work.

[13] Jost Pietsch, *A Fairy Tale on Two Wheels*, and Hans-Erhard Lessing, Response, The Boneshaker #198, 2015. In this article, Pietsch tried to disprove the horse-mortality connection to Drais' invention of the Laufmachine.

[14] Mick Hamer, *Brimstone and Bicycles* in the *New Scientist* of 29 January 2005, p. 48-49.

[15] Eberhard Schulze, *Deutsche Agrargeschichte: 7500 Jahre Landwirtschaft in Deutschland* (Germany Agricultural History: 7500 Years of Agriculture in Germany), Aachen, 2014

[16] *Journal du Commerce* (France) of December 23, 1817

[17] Georg Friederich Tscheulin, *Beschreibung und Heilung des Nervenfiebers welches im Fruehjahr und Sommer 1817 unter den Pferden hier und in der Gegend geherrscht hat*, (Description and healing of the nervous fever which has raged among the horses in Spring and Summer 1817 here and in this region), Karlsruhe: 1819, pp. 9 & 16. He writes on the first page "there are very few towns, where horses have not been ill or died" and mentions Bretten, where 38 horses died. Pietsch selects a seemingly contradictory quotation from Tscheulin.

[18] Again, roller skating ended 50 years of balancing "angst" encouraging people to take their feet off the ground permanently, see Hans-Erhard Lessing, *Cycling or Roller Skating - The Irresistible Rise of Personal Mobility, Cycle History 5: Proceedings of the 5th International Cycling History Conference*, Cambridge, 1994, San Francisco: Bicycle Books, Inc., 1995, pp. 129-132.

[19] Claude Reynaud, *L'Ère de la Draisienne en France 1818-1870 (The Age of the Draisine in France 1818-1870)*, Domazan: Chateau de Bosc, 2015.

[20] Louis-Philippe comte de Ségur, *Galerie Morale et Politique (Morale and Political Gallery)*, Paris: 1824.

[21] Phillipe-Paul de Ségur, *Napoleon's Russian Campaign 1812*, Paris: 1824, Translated by J. David Townsend, London, 1959.

Conference Extra

JOHN KRALIK

An original 1817 Draisine (originally named "Laufmachine" by its inventor Karl von Drais), an example of the world's first bicycle, that was on display at the entrance to an exhibition "The 200th Anniversary of the Invention of the Bicycle" at the TECHNOSEUM in Mannheim, Germany, November 11, 2016 - June 25, 2017.