

The Safety Bicycle: An Enduring Design with Lasting Impacts

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In these present times, technologies often have short lifecycles. Such short lifecycles are the result of the processes of innovation and invention, both of which challenge engineers to create optimal solutions to problems that people face in any domain. It is often the case that the solutions to these problems last only as long as they are more effective in solving the problem than other solutions and as long as these problems remain relevant to people. Therefore, technologies often change as better solutions to problems are created or the needs of people change. With this in mind, one might be surprised at the timelessness of the design of the safety bicycle, which was invented in the late 1870's. This paper will investigate the timelessness of the safety bicycle by comparing its design with those of earlier models. Next, the paper will examine the immediate reactions to the safety, thereby illustrating its impact on other technologies and society while also illustrating what needs were satisfied by its design. Finally, the paper will demonstrate the impacts of the bicycle on health, transportation, and infrastructure as we move towards the future. In demonstrating the past, present, and future impacts of the design of the safety bicycle, the paper will also demonstrate that the design of the safety bicycle is timeless because of its versatility and inherent adaptability to meeting human transportation needs.

One of the major reasons the safety bicycle proved to be an effective and versatile means of meeting transportation needs is its superiority to the designs that preceded it. The first widely accepted contributor to the evolution of the bicycle is Baron von Drais de Sauerbrun, who invented the Draisienne between 1816 and 1818.¹ The Draisienne was a simple device consisting of two wheels, a frame to sit on, and a handlebar. Lacking pedals,

¹ Wilson, S., "BICYCLE TECHNOLOGY," *Scientific American* 228, no. 3 (March 1973): 81-91, URL: <https://www.jstor.org/stable/10.2307/24923004>.

the rider would drive it by pushing the machine forward with the rider's feet while sitting on the machine. This somewhat clumsy means of transportation was considered unique, but not a serious means of transportation.² Following the Draisienne, bicycles with driving cranks on the hub of the front wheel would appear, including the French velocipede and the high-wheeler. While the velocipede might appear more practical and familiar to the modern safety bicycle, the high-wheeler was developed in response to the low gear ratio of the velocipede. Wilson explains that the "[velocipede], sometimes called 'the bone-shaker,' had cranks fixed directly to the hub of the front wheel, like the simplest child's tricycle. As a result it suffered from the limitation of having too low a 'gear ratio,' to use the modern term. This meant that one turn of the pedals advanced the machine a distance equal to the circumference of the front wheel, perhaps only 10 feet. (In a modern bicycle one turn of the pedals, by means of a chain drive from a large sprocket to a small one, advances the machine 16 feet or more.)"³ Because of this drawback, the high-wheeler employed a large front wheel to allow the rider to advance further with a single pedal turn, while also making it difficult for the rider to mount the machine and ride safely.⁴

In the process of addressing these deficiencies, several innovations allowed for the refinement of the bicycle into the currently recognized design. These innovations culminated in the 1885 Rover safety bicycle, whose design would influence how manufacturers across the world produced bicycles.⁵ Many of these innovations are

² Wilson, S., "BICYCLE TECHNOLOGY," *Scientific American* 228, no. 3 (March 1973): 81-91, URL: <https://www.jstor.org/stable/10.2307/24923004>.

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⁴ British Pathé. "The Penny Farthing Bike Race (1928) | British Pathé," (August 27, 2014), URL: https://www.youtube.com/watch?v=8HRpVV_x3N4.

⁵ Wilson, S., "BICYCLE TECHNOLOGY," *Scientific American* 228, no. 3 (March 1973): 81-91, URL: <https://www.jstor.org/stable/10.2307/24923004>.

described in a *Scientific American* journal article on the Victor safety bicycle, a bicycle produced in Massachusetts. Features borrowed from the Rover include the wheels, which “are built with tangent spokes and are practically everlasting. . . . Dustproof ball bearings are used throughout. The machine contains the surprisingly large number of 176 balls. They are the Æolus balls, and are the best known.”⁶ Aside from the stabilizing tangent spokes and friction-reducing ball bearings, the inclusion of the tubular frame allowed for good structural stability while assisting in maintaining a relatively light weight, making the bicycle useful when travelling uphill.⁷ The final important development in outcompeting previous bicycle models was the rear wheel chain-and-sprocket drive, which, after numerous iterations, succeeded in upgrading the previously lacking gear ratio while delaying wear and tear. With this culmination of innovations in one human-powered machine, there was technically no need for major improvements in self-powered locomotion. While the design of the safety surpassed those that came before it, history would demonstrate its versatility in the progression from the gay 90’s to the current day.

The introduction of the safety bicycle caused a stir in the 1890’s that would result in noteworthy demonstrations of the perceived versatility of the bicycle. At the time, sports like baseball and football were growing in popularity in the United States, leading Protestant church leaders to question the compatibility between competition and the Protestant work ethic.⁸ While they eventually resolved the practice of sports with their

⁶ “THE VICTOR SAFETY BICYCLE,” *Scientific American* 62, no. 14 (April 1890): 212, URL: <https://www.jstor.org/stable/10.2307/26098787>.

⁷ Wilson, S., “BICYCLE TECHNOLOGY,” *Scientific American* 228, no. 3 (March 1973): 81-91, URL: <https://www.jstor.org/stable/10.2307/24923004>.

⁸ Taylor, Michael., “Rapid Transit to Salvation: American Protestants and the Bicycle in the Era of the Cycling Craze,” *The Journal of the Gilded Age and Progressive Era* 9, no. 3 (July 2010): 337-363, URL: <https://www.jstor.org/stable/20799394>.

own ideologies, they struggled to peg the place of cycling, which was used both for monitored sports events as well as unmonitored transportation and recreation purposes. Taylor explains how this more private pursuit of cycling “became a source of concern when, following the invention of the modern or ‘safety’ bicycle in 1887 and the end shortly thereafter of the era of the ‘high-wheelers’ or ‘penny farthings,’ large numbers of women began riding bicycles . . . Although the Protestant establishment had not been notably disturbed by the bicycle prior to this period, the emergence around 1890 of a sport that offered more privacy than other sports and that enjoyed widespread popularity among not only men, but also women, changed everything.”⁹ In response to the possibility of the safety being used by young parishioners to spend Sundays away from church and towards activities that were morally questionable, American Protestants began preaching to condemn the bicycle, though plenty were split as to whether the bicycle truly posed a threat to the youth. Ultimately, however, Protestant preachers were finally won over by the realization that bicycles could be used not only for amusement, but also for transportation, thereby resulting in Protestants welcoming cyclists and even employing the use of bicycles to reach out to the community to preach the gospel.¹⁰ The recognition of the versatility of the bicycle and its role in changing the minds of the bicycle’s critics reflects a paraphrased observation from a French contemporary, Henri Desgranges, who reflects that “even the most obstinate adversaries have been won over. . . . There is scarcely anybody in France,

⁹ Taylor, Michael., “Rapid Transit to Salvation: American Protestants and the Bicycle in the Era of the Cycling Craze,” *The Journal of the Gilded Age and Progressive Era* 9, no. 3 (July 2010): 337-363, URL: <https://www.jstor.org/stable/20799394>.

¹⁰ Taylor, Michael., “Rapid Transit to Salvation: American Protestants and the Bicycle in the Era of the Cycling Craze,” *The Journal of the Gilded Age and Progressive Era* 9, no. 3 (July 2010): 337-363, URL: <https://www.jstor.org/stable/20799394>.

whether rich or less fortunate, and in any position of life, to whom the safety bicycle has not afforded some moments of pleasure, while to many it has been a source of real happiness.”¹¹

¹¹ “A Frenchman’s Views on the Safety Bicycle as it Now is and its Probable Future,” *Scientific American* 72, no. 2 (January 1895): 22-23, URL: <https://www.jstor.org/stable/10.2307/26113994>.

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