C

Christine Ladd-Franklin

Roger K. Thomas
University of Georgia, Athens, GA, USA

Christine Ladd (1865) Student at Vassar College. (Photo Courtesy of Rare Book and Manuscript Library, Columbia University)

Introduction

Christine Ladd (1847–1930) was born in Windsor, Connecticut. Her mother died when Ladd was 12, but she received encouragement and support from her father and grandmother to receive education through high school.

Desiring to attend college, Ladd sought her grandmother's support in recruiting her father's assistance. Her grandmother objected that, after 4 years of college she would be too old to get married. Ladd replied that, although it would give her "great pleasure to entangle a husband," it was unlikely because of the females in New England greatly outnumbered males (this was one year after the end of the American Civil War) and that she "was decidedly *not* handsome." Therefore, she argued that if she needed to support herself, she needed a college education. Her grandmother acquiesced and, in the Fall of 1866, she enrolled at Vassar College (Furumoto 1992, p. 178).

At Vassar, Ladd reported that she devoted most of her time to astronomy under the influence of Maria Mitchell, whom Rossiter (1982, p. 12) described as "the most important woman scientist in America in the nineteenth century." Rossiter's opinion was supported by the following:

> In 1847 Maria Mitchell not only calculated the position of a new comet but also observed it across the sky and thereby won (after some controversy) the gold medal that the king of Denmark had promised to the discoverer. This made the twenty-eight-year old a celebrity. She was soon elected the first woman member of the American Academy of Arts and Sciences . . . the American Association for the advancement of Science . . . and eventually (1869) one of the first American women in the American Philosophical Society of Philadelphia.

After graduation from Vassar, Ladd taught for several years at secondary schools for women, an occupation she did not enjoy.

J. Vonk, T. K. Shackelford (eds.), *Encyclopedia of Animal Cognition and Behavior*,
https://doi.org/10.1007/978-3-319-47829-6_2077-1

Eventually (1882), Ladd would attend and complete the requirements for a Ph.D. in mathematics and logic at Johns Hopkins University. However, as Johns Hopkins did not officially enroll female students, she was only able to attend with the support of Mathematics Professor, James J. Sylvester, who had been impressed by Ladd's published papers in mathematics. Ladd studied mathematics with Sylvester and logic with Charles S. Pierce which made her the first American woman to study mathematics and logic at the graduate level (Agler and Durmus 2013). While at Johns Hopkins, Ladd married Fabian Franklin who earned his Ph.D. degree in mathematics there in 1880. Ladd-Franklin completed her Ph. D. requirements in 1882, but she did not receive the degree until 1926, occasioned somewhat by Johns Hopkins' 50th Anniversary. At age 79, and 44 years after earning her degree, she attended the ceremony to receive it (Rossiter 1982).

Some of the most recognized historians who have written about aspects of Ladd-Franklin's life (e.g., Furumoto 1992; Rossiter 1982; Scarborough and Furumoto 1987) have tended to emphasize Ladd-Franklin's hard-fought career and efforts to gain recognition for women scientists and, at length, her conflict with Edward Bradford Titchener (more below), and they tended to write less about Ladd's contributions to mathematics, logic, and psychology. This entry will include some information about Ladd-Franklin's hard-fought career, but it will also include information about some of her contributions as a psychologist and logician.

Trials and Tribulations

Among her trials and tribulations, Ladd-Franklin never had the equivalent of a tenured or tenure-track academic position, although she taught (often without pay) at Johns Hopkins and other universities, perhaps, most notably Columbia University. Fabian Franklin, by then professor of mathematics at Johns Hopkins, resigned in 1895 to become editor of the *Baltimore News*. In 1908, he became associate editor of the *New York Evening News* (Furumoto 1992) which is why Ladd-Franklin affiliated with Columbia. Most of Ladd-Franklin's university-level positions were in psychology departments, because after she developed the Ladd-Franklin theory of color vision, she mostly self-identified as a psychologist. She also continued to teach and publish in logic throughout her career.

The Society of Experimentalists: Ladd-Franklin Versus Titchener

Edward B. Titchener (1857–1927) was a founding member (1892) of the American Psychological Association (APA). By 1904, he became dissatisfied by too few presentations at APA of "pure" experimental psychology as he defined it, so Titchener resigned from APA and organized what eventually became the Society of Experimentalists. Titchener insisted on excluding women from its membership and from attendance at its meetings. His primary reasons were that the presence of women would inhibit frank discussions and would interfere with the men's enjoyment of smoking. Ladd-Franklin's conflict with Titchener is discussed extensively in Rossiter (1982), Scarborough and Furumoto (1987), and Proctor and Evans (2014).

Who Was Titchener?

Titchener, a native of England, earned an A.B.. degree (1890) from Oxford University specializing in evolutionary biology, and he stayed an extra year to study with the eminent physiologist, John Burden-Sanderson. He then earned a Ph.D. (1892) in Psychology with Wilhelm Wundt, the widely recognized founder of experimental psychology. Titchener came to Cornell University in 1892 where he remained until his death in 1927 (Boring 1950).

Women and the Society of Experimentalists

Many women psychologists confronted Titchener about his barring women from the Society of Experimentalists. Perhaps, Ladd-Franklin's most dramatic encounter with Titchener occurred in 1914 when the Society was to meet at Columbia University, where Ladd-Franklin was teaching,

and a topic to be discussed was color vision about which she was a world authority. Seeking permission to attend, she wrote a fiery letter that included the following:

> Is this good time for you to hold the mediaeval attitude of not admitting me to your coming psychological conference . . . at my very door? So unconscientious, so immoral – worse than that – so unscientific!
>
> . . .Both the Psychological and Philosophical Associations have long admitted women to their smokers and everything (I smoke – I should be very unfashionable if I didn't . . ..). It is only this acute-thinking and discussing little organization of yours (which seems to be so sadly dominated by *you*!) which still holds out. So mediaeval! – such an indignity! – well meant, I know – you have told me so – but such a mistaken kindness! Do quickly repent! And you need me!. (Rossiter 1982, p. 280)

Titchener did not repent, and Ladd-Franklin asked James McKeen Cattell, the meeting's Columbia host, to take her as his guest, which he did. The members, apparently begrudgingly, allowed her to attend the discussions on color vision.

After Titchener's death, Margaret Washburn and other women were admitted, but Ladd Franklin was never invited to join.

Proctor and Evans (2014) defended Titchener against charges of misogyny. Among their points, Titchener supervised the Ph.D. degrees of 21 women, including Margaret Washburn, America's first woman to earn a Ph.D. in Psychology (1894). Titchener also supervised the Ph.B. (Bachelor of Philosophy, 1896) of Celestia S., Parrish who may be best remembered for establishing the first psychological laboratory in the southern United States, which she did at Randolph-Macon Woman's College in Lynchburg, VA (Thomas 2006). Washburn in 1927 expressed her long-term dislike for Titchener (see Scarborough and Furumoto 1987, p. 128), but in 1925 Parrish wrote that he gave her ". . . the most generous assistance then [referring to his role in her earning her degree] and afterwards became my very kind friend" (see Thomas 2006, p. 28).

Ladd-Franklin's Accomplishments in Logic

Ladd-Franklin's dissertation supervisor was Charles S. Pierce. Historically, Pierce was, perhaps, America's most important logician (Putnam 1982). Ladd-Franklin's dissertation, *On the logic of algebra,* was published in *Studies in logic by members of the Johns Hopkins University* that was edited by Pierce (Agler and Durmus 2013). Agler and Durmus (2013, p. 306) wrote:

> . . .Ladd-Franklin was not simply a pupil of Pierce, she was also his friend, managing editor, and as Shea Zellweger (1997, p. 336) writes "as much Pierce's mentor as she was his student."

Time Magazine in 1926 recognized that Johns Hopkins had that year awarded Ladd-Franklin's Ph.D. degree, 44 years late. About Ladd-Franklin it was written:

> She completed her studies with distinction, demonstrating a form of rebuttal in argument called antilogism, which has been recognized as "the crowning achievement in a field [logic] worked over since the days of Aristotle" (*Time*, Vol.7 Issue 9, p. 30).

At age 81, Ladd-Franklin (1928, p. 532) reported:

> I take it very ill of Mr. W. E. Johnson that he has robbed me without acknowledgement, of my beautiful word, "antilogism". He says "Correlative to the syllogism we may here introduce the antilogism" (p. 75, Vol. II. Of his *Logic*), without any reference to the fact that the antilogism is the basic feature of my theory of deductive reasoning. (see Eugene Shen in MIND, pp. 54–60, 1927)

She continued by, once again, defining and illustrating the use of the antilogism. The antilogism is not easily explained, but perhaps a few quotations from Ladd-Franklin (1928, p. 532) will help.

> This is, in fact, the natural form of reasoning . . . invented before the more abstract and remote syllogism. I give at once an example of it – a real occurrence. A little girl of four years . . . was making . . . the experiment of eating her soup with a fork. Her nurse said to her, "Nobody eats soup with a fork, Emily," and Emily immediately replied "But I do, and I am somebody." (The connecting logic-word in the case of the antilogism is *but* instead of *therefore*, *so*, or *consequently.*) This instance (which may be taken as typical) is enough to show that the

> antilogism is quite as easy and as natural (in the proper circumstances) as any other form of deductive reasoning.

The interested reader is encouraged to read this entire two-page account of the antilogism as well as seek her many other contributions to logic.

Ladd-Franklins Accomplishments in Vision and Color Vision

On this topic, Ladd-Franklin is best known for 24 of her publications ranging from 1892 to 1926 that she compiled at age 82 for her book, *Colour and Colour Theories* (1929); the 24 publications are listed on page 281.

Before Ladd-Franklin, the two dominant theories of color vision were the Young-Helmholtz trichromatic theory and Hering's opponent process theory. Helmholtz updated Young's (1802) theory by using the latest information from physics and physiology. Hering drew from physiology but also from psychological experiments using humans. Accompanying her husband, Fabian, on his sabbatical to Germany in 1891, Ladd-Franklin visited Helmholtz and Hering and worked in the laboratories of Helmholtz's protégé, Arthur König, and Hering's protégé, G. E. Müller. According to Kargon (2014), Ladd-Franklin added two new disciplines to her approach to color vision: evolutionary biology and symbolic logic.

Ladd-Franklin sought to reconcile the differences and deficiencies of the trichromatic and opponent process theories. The quoted summary below of her theory was based on her in-depth knowledge evident in Part I of her book of the evolution of color vision, the anatomy and physiology of the retina, the physics of light, and psychological research. Her knowledge of the various forms of color blindness also contributed to her theory of the evolution of color vision.

> . . .there is a light sensitive substance in the rods which gives off, under the influence of light, a reaction-product which is the basis of the primitive sensation of whiteness. In the cones the next higher stage of development of the colour-sense (the yellow and blue vision of bees, that of partially chroma-blind individuals and of our own mid-periphery), the same light-sensitive substance has become, by a simpler molecular rearrangement, more specific in its response to light . . . such . . . that the two ends of the spectrum act separately to produce nerve excitant substances which . . . when . . . produced both at once, unite chemically to form the "white" nerve-excitant out of which they were developed. In the third and final stage the "yellow" nerve-excitant has again undergone a development in the direction of greater specificity, and red and green vision are acquired. (Ladd-Franklin 1929, p. 161).

Closing Remarks

Ladd-Franklin's first publication on color vision was in the *Proceedings of the International Congress of Experimental Psychology, London* (1892) and was based on her oral presentation at the 1892 meeting. She critiqued deficiencies in Helmholtz's trichromatic theory and Hering's opponent process theory. Helmholtz was present. Overhead later that evening criticizing one of the presentations (not Ladd-Franklin's), Helmholtz was asked what he thought of Ladd-Franklin's presentation. Helmholtz replied (English translation), *Oh, Mrs. Franklin, she understands the matter* (Ladd-Franklin 1929, p. 148). "She understands the matter" would have been an appropriate epitaph for Ladd-Franklin.

Cross-References

- ▶ Color Change
- ▶ Edward B. Titchener
- ▶ Electromagnetic Spectrum
- ▶ Evolution of Animal Color Vision
- ▶ Hermann von Helmholtz
- ▶ Margaret Washburn
- ▶ Sensory Receptors

References

Agler, D. W., & Durmus, D. (2013). Christine Ladd-Franklin: Pragmatist and feminist. *Transactions of the Charles S. Pierce Society, 49*, 299–321.

Boring, E. G. (1950). *A history of experimental psychology. Second Edition*. New York, NY: Appleton-Century-Crofts, Inc.

Furumoto, L. (1992). Joining separate spheres – Christine Ladd Franklin, woman-Scientist. *American Psychologist, 47*, 175–182.

Kargon, J. (2014). The logic of color: Theory and graphics in Christine Ladd-Franklin's explanation of color vision. *Leonardo, 47*, 151–157. https://doi.org/10.1162/LEON/47/2.

Ladd-Franklin, C. (1928). The antilogism. *Mind, 37*, 532–534.

Ladd-Franklin, C. (1929). *Colour and colour theories*. New York: Harcourt, Brace, and Company.

Proctor, R. W., & Evans, R. (2014). E. B. Titchener, Women psychologists, and the experimentalists. *American Journal of Psychology, 127*, 501–526.

Putnam, H. (1982). Pierce the logician. *Historia Mathematica, 9*, 290–301.

Rossiter, M. W. (1982). *Women scientists in America: Struggles and strategies to 1940*. Baltimore: The Johns Hopkins University Press.

Scarborough, E., & Furumoto, L. (1987). *Untold lives: The first generation of American women psychologists*. New York: Columbia University Press.

Thomas, R. K. (2006). Celestia Susannah Parrish (1853–1918): Pioneering psychologist, native Virginian, and "Georgia's greatest woman". *The Feminist Psychologist, 33*, 16 & 28.