Christine Ladd-Franklin: Logician, Philosopher, or Psychologist?

Dr. Sara L. Uckelman
Durham University
s.l.uckelman@durham.ac.uk
@SaraLUckelman

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Who is Christine Ladd-Franklin?

- Born in 1847, in Windsor, Connecticut. Died 1930.
- Graduated as valedictorian at Wesleyan Academy in 1865.
- Fall–Spring 1866: enrolled at Vassar College.
- Worked as a teacher until she could afford to return to Vassar.
- At Vassar, studied astronomy under Maria Mitchell.
- Turned to mathematics when a career in astronomy/physics wasn't possible.
- Numerous publications in mathematics journals (e.g., *Analyst*, where she was the first woman published) between 1875 and 1886.
- Taught mathematics at secondary school for nine years.
- Accepted to the PhD program Johns Hopkins University in 1878, with the support of James J. Sylvester.
- Married fellow student Fabian Franklin in 1882.

Christine Ladd-Franklin: Logician

- Studied mathematics and wrote a dissertation, *On the Algebra of Logic*, under the supervision of C.S. Peirce, published in 1883.
- First woman to complete the requirements for a PhD at Johns Hopkins.
- First American woman to receive graduate training in mathematics and logic.
- Known for her "antilogism", a single form to which all valid syllogistic can be reduced.
- Numerous later papers on logic (1889, 1890, 1904, 1912, 1913, 1920, 1927, 1928).
- Applied to teach at Johns Hopkins in 1893 (denied).
- Was given permission in 1904 to each one class a year, for five years.
- Awarded her PhD, in logic, in 1926.

The Antilogism (1)

Theorem

The argument of inconsistency,

$$(a \mathbin{\overline{\vee}} b)(\bar{b} \mathbin{\overline{\vee}} c)(c \vee a)\overline{\vee}$$

is the single form to which all the ninety-six valid syllogisms (both universal and particular) may be reduced (Ladd-Franklin 1883, 40).

Proof.

Any given syllogism is immediately reduced to this form by taking the contradictory of the conclusion, and by seeing that the universal propositions are expressed with a negative copula and particular propositions with an affirmative copula. (ibid.) □

The Antilogism (2)

the ideal form of the syllogism is that in which it appears as a statement of the impossibility of concurrence of the premises and the denial of the conclusion of the ordinary syllogism. . . This may be called the Inconsistency, or the Incompatibility, or, perhaps, the Antilogism (Ladd-Franklin 1901, 575).

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There is no reason why this should not be accepted as the definitive solution of the problem of the reduction of syllogisms. ***It is rather remarkable that the crowning activity in a field worked over since the days of Aristotle should be the achievement of an American woman*** *(Royce, quoted in Shen 1926, 60).*

[Ladd-Franklin] is justly credited with having solved a problem over two millennia old (Russinoff 1999, 451).

Russinoff is somewhat misguided: "what Ladd-Franklin solved was a problem due to Jevons that was first articulated in the 19th century" (Uckelman 2021, 527).

Christine Ladd-Franklin: Psychologist

- 1891–1892: Worked in Müller's lab in Göttingen and with König in Helmholtz's lab in Berlin.
- 1892: Resolved the fundamental inconsistency between Hering's theory and Helmholtz's theory with her Developmental Theory of Perception.
- 1894: Returned to König's lab.
- Among the first women to join the American Psychological Association (1893).
- Presented ten papers at APsychA between 1894–1925.
- Worked in Europe again 1901–1902, 1908.
- Lectured on psychology at Johns Hopkins 1904-1909.
- Lectured on psychology at Columbia 1914–1927.
- Also taught at Clark University, Harvard, and University of Chicago.
- First woman member of Optica (1919).
- *Color and Color Theories*, 1929 (volume of collected papers).

Christine-Ladd-Franklin: Philosopher

- The antilogism and its reception.
- Paper on the ethics of tipping (1891).
- Became a charter member of the American Philosophical Association (1902).
- Sub-editor of the *Dictionary of Psychology and Philosophy* (1902–04).
- Presented regularly at the APhilA (1905, 1906, 1914, 1923).
- "Epistemology for the Logician" (1908; Heidelberg, International Congress on Philosophy).
- Papers on non-existence and existence (1912, 1931).
- Common logic vs. symbolic logic.
- Emphasis on proper notation and vocabulary: Red thread from her earliest work on mathematics up through her latest work in psychology of perception.

More of the story to be told!

- Vast amount of material in her archives yet to be explored.
- (3000 photos taken across 30+ boxes, less than half the material!).
- Notes on philosophical topics, including fundamental concepts of logic, relationship between logic and psychology, draft book(s).
- Significant criticism of Russell-Peano logic.
- Universal languages such as Esperanto, Interlingua, Ido (work in progress).
- Extensive correspondence or engagement with: Boole, DeMorgan, Couturat, Jevons, Jones, Mitchell, Peano, Peirce, Russell, Schrödinger, Schröder, Paul Weiss, Whitehead ("You told me (when I had the happiness of seeing you) that you were very familiar with my paper on symbolic logic in the *Studies in Logic* by Members of the Johns Hopkins University—you told me in fact (much to my pleasure) that you kept the book always on your study-table."), etc.

Ladd-Franklin and Russell's published views on each other

- Russell's anecdote: "I once received a letter from an eminent logician, Mrs. Christine Ladd-Franklin, saying that she was a solipsist, and was surprised that there were no others. Coming from a logician and a solipsist, her surprise surprised me." (Russell 1948, 196).
- "Bertrand Russell and Symbolic Logic" (Ladd-Franklin 1918, 177): "That an inept symbolism is made use of in mathematics. . . would be of no consequence, but Russell and Peano treat this 'addition' [of $\in$] as constituting an important improvement over the logic which preceded them—that of Peirce and his school–instead of which it is simply erroneous."

Ladd-Franklin's unpublished views on Russell

- The evolution of the paper:
  - At the 1917 APA, CLF gave a paper "Bertrand Russell and Symbolic Logic" (abstract published in *Philosophical Review* 27 no. 2 (1918).)
  - In September 1918, CLF gave the paper again at the American Mathematical Society (summary by F.N. Cole published in *Bulletin of the American Mathematical Society* 25, no. 2 (1918).)
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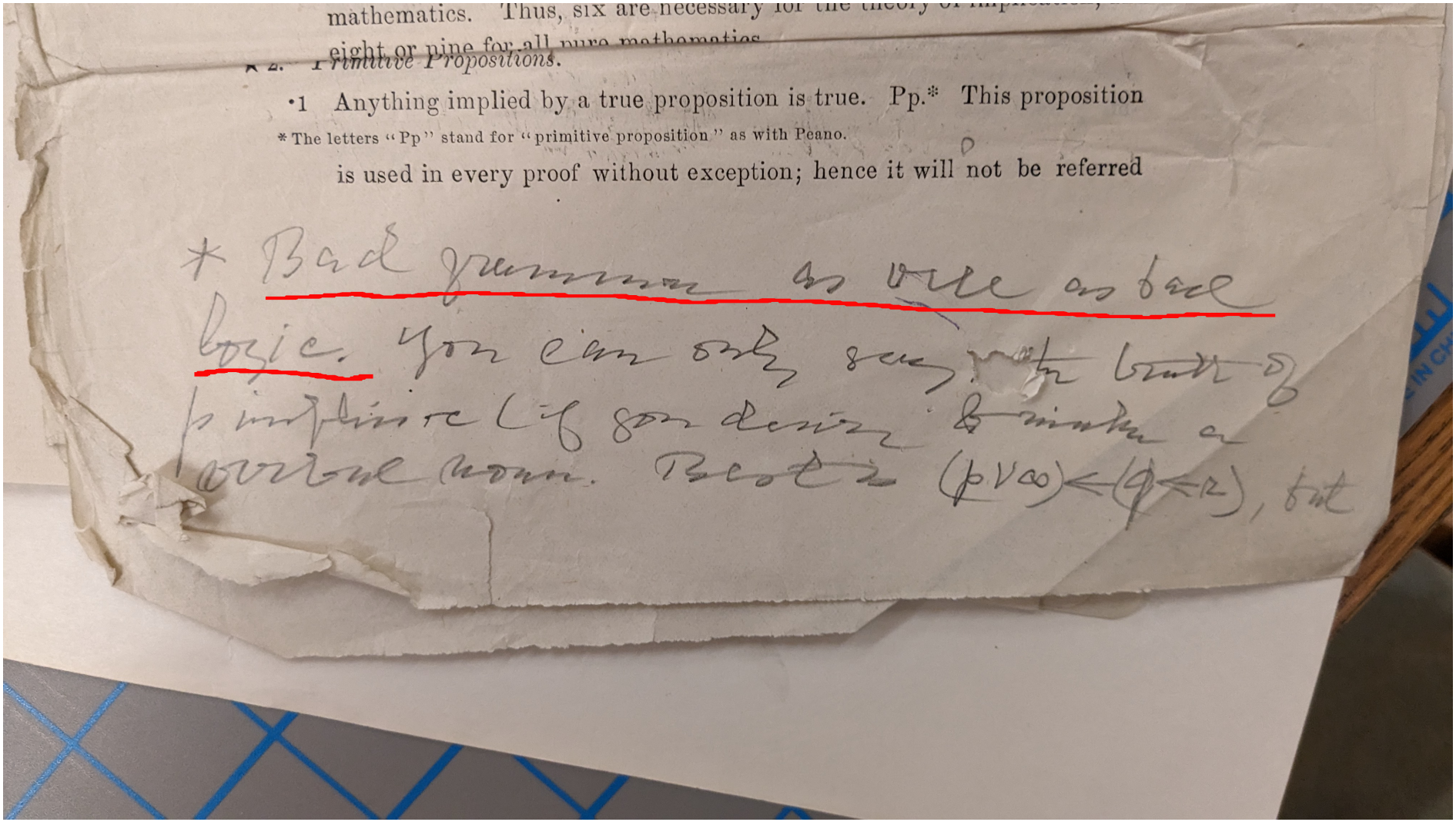
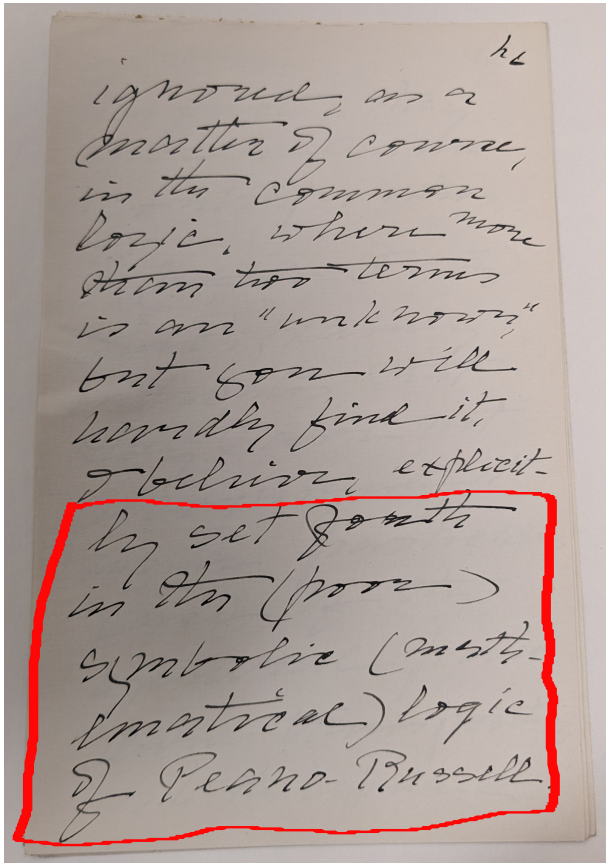
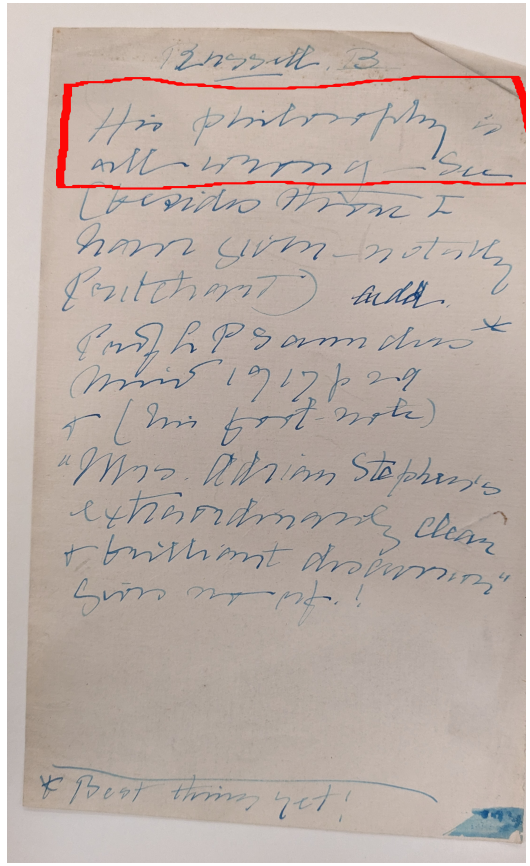
- Galley proofs of *Principia* with marginal notes.
- Numerous dismissive remarks in assorted notes.

Principia Mathematica marginalia



Assorted notes (1)





"...in the (poor) symbolic (mathematical) logic of Peano-Russell"

"His philosophy is all wrong"

Assorted notes (2)

I have been trying to persuade the philosophers that there is nothing of critical importance in the works on logic of Bertrand Russell for them,—that the uneasy feeling they have that if they have not already read his big volumes they ought to lose no time in doing so, is wholly unjustified,—that so far as those works discuss logic or philosophy at all they do it from a purely scholastic—meticulous—even (one might almost say) cranky—point of view (Box 10).

Notes on transposition (1)

Neither

$$a \leftarrow dm\,(5)$$

Nor

$$a + d \leftarrow m\,(6)$$

can suffer any transposition at all. Strange to say, these two propositions (5) and (6) are composable while their terms are not transposible. Thus

$$(5) \equiv (a \leftarrow d)(a \leftarrow m)$$

and

$$(6) \equiv (a \leftarrow m)(d \leftarrow m)$$

Notes on transposition (2)

That is to say: If you have a product in the subject or a sum in the predicate you have something which is transposible but not decomposible while if you have a sum in the subject or a product in the predicate you have something which is composable but not transposible. (7) (It is to be understood, of course, that the "something" which is or is not decomposible is the proposition while the "something" that is or is not transposible is its terms.) With this explanation (of the ambiguity of the "something"), the condensed statement (7) is accurate.

Notes on transposition (3)

Not only is this peculiarity of the copula $\leftarrow$ ignored, as a matter of course, in the common logic, where more than two terms is an "unknown," but you will hardly find it, I believe, explicitly set forth in the (poor) symbolic (mathematical) logic of Peano-Russell. In fact, they give a name, contraposition, to

$$(a \in b) \equiv (\bar{b} \in \bar{a})$$

which plainly indicates that they have not recognized it as a particular case of the general procedure: transposition with the copula $\in$. The reason that they have never thought of transposition as a property of their copula, $\in$, is that they have confined themselves to a single copula (not even admitting its simple denial)! (Box 41)

Revisiting CLF's place in the history of logic (1)

- Not an isolated/single contribution (e.g., the antilogism and nothing else)
- Continuous/consistent dialogue with contemporary philosophers, logicians, and linguists (about the antilogism and other things)
- Critical response to the mathematicization of logic.
- Embedded within the mathematical and logical millieu of the time.
- (Future work): Role in the International Congress of Philosophy 1900 (joint work with JJ!)

Revisiting CLF's place in the history of logic (2)

- Ladd-Franklin may have been marginalized in terms of academic position, but
- by no means marginalized in terms of engagement with and influence on philosophy.
- So why is she still so little known?

Revisiting CLF's place in the history of logic (2)

- Ladd-Franklin may have been marginalized in terms of academic position, but
- by no means marginalized in terms of engagement with and influence on philosophy.
- So why is she still so little known?
  - Beyond the usual "sexism" answer:
  - Segregation of biography: Ladd-Franklin the logician vs. Ladd-Franklin the psychologist (with Ladd-Franklin the philosopher almost entirely overlooked).
  - The contradictory effect of Royce's praise.
  - She was American — (??)
  - The sheer amount of unworked-on material.

Thanks!

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