Christine Ladd-Franklin on "Common Logic"

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Introduction

- Who is Christine Ladd-Franklin?
- Common Logic in the 19th C
- Venn on Common Logic
- Ladd-Franklin on Common Logic

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.

Ladd-Franklin's work in logic and philosophy (1)

- 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.

Ladd-Franklin's work in logic and philosophy (2)

- Emphasis on proper notation and vocabulary.
- 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.

What is Common Logic? (in the 19th C)

Three typical views:

1. Aristotelian logic
2. Ordinary reasoning
3. *Not* symbolic

View 1, "Aristotelian logic"

- Boole (1854): "the Logic of Aristotle. . . sets forth the elementary processes of which all reasoning consists, and that beyond these there is neither scope nor occasion for a general method. I have no desire to point out the defects of the common Logic" [2, p. 10]. (Cf. also Hughlings [5].)
- Bain (1870): "in the common Logic of the Schools, the Syllogistic or Deductive Logic" [1, p. 1].
- Murphy (1880): "in this paper the common logic is treated as being that branch of the logic of relatives which deals with the relations of inclusion and exclusion" [13, p. 1].
- Bosanquet (1895): "common Logic" (and its once used synonym, "traditional Logic") is Aristotelian syllogistics, including conversion rules and the Square of Opposition [3, pp. 115, 120, 146].

View 2 "Ordinary reasoning"

- DeMorgan (1860): "common logic has rooted it in common language that 'Every X is Y' is the converse ... of 'Every Y is X'" [4, p. 16]. Cf. also "Incompleteness of common logic (legitimate subtleties)", §96.
- Jevons (1864), Chapter XII "Of Relation to Common Logic" [6]: "the logic of common thought... A certain natural disinclination to exertion causes us to simplify our modes of thought as much as possible, and to leave in the background everything that is not essential" [6, p. 53].
- Bain (1870): "There may be a common Logic of Induction, although not of Observation" [1, p. 38].

View 2 "*Not* symbolic logic"

Common Logic in the (late) 19th Century, explicitly distinguished from Symbolic Logic.

- Read (1898):
  - "When we are told that logical propositions are to be considered as equations, we naturally expect to be shown some interesting developments of method in analogy with the equations of Mathematics; but from Hamilton's innovations no such thing results. This cannot be said, however, of the equations of Symbolic Logic; which are the starting-point of very remarkable processes of ratiocination. As the subject of Symbolic Logic, as a whole, lies beyond the compass of an ordinary manual, it will be enough to give Dr. Venn's equations corresponding with the four propositional forms of common Logic" [14, p. 84].
  - "Symbolic Logic. . . obtains results which the common Logic reaches (if at all) with much greater difficulty" [14, p. 86].

Common Logic in the works of Venn (1)

Venn (1881): A more expansive account of Common Logic.

The phrase "Common Logic" occurs numerous times in Venn's monstrous 1881 work *Symbolic Logic*, with an entire subsection of Chapter XVII devoted to "Generalizations of the Common Logic", and "the Generalizations of the Symbolic Logic and their relation to the common system" [15, p. v] being the third topic of the introduction to Venn's textbook.

Venn took the mathematical/symbolic turn in logic to be an *extension* of the "Common Logic" [15, p. xxviii], as opposed to an *alternative* to it:

> *Common Logic should in fact be no more regarded as superseded by the generalization of the Symbolic System than is Euclid by those of Analytical Geometry. And the grounds for retaining in each case the more elementary study seem to be identical [15, p. xxvi].*

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(These grounds include Common Logic being both more narrow and more concrete, and hence "easier for a beginner to understand" [15, p. xxvi].)

Common Logic in the works of Venn (2)

Common Logic deals with simplicities and simplifications:

- "This does well enough for such simple terms and propositions as the common Logic mostly has to do with; but when we come to grapple with more complicated terms and propositions we shall find a need for some corresponding advance in our technical language" [15, p. 86].
- "Common Logic, dealing as it does with seldom more than two or three terms at a time, can evade the consequent difficulty, or can make tacit suppositions which will help to solve it in most cases" [15, p. 110].

Common Logic in the works of Venn (3)

Symmetry and Common Logic:

- It deserves notice that ordinary language does occasionally recognize the advisability of using symmetrical expressions of this kind, though the common Logic shows no fondness for them. We should as naturally say, for example, that 'cheapness, beauty, and durability, never go together,' or that 'nothing is at once cheap, beautiful, and durable,' as we should use one of the forms which divide these three terms between the subject and the predicate. But this latter plan is what would be adopted presumably by the strict logician, by his arranging it in some such form as 'no cheap things are beautiful-durable' [15, p. 27].

Common Logic in the works of Ladd-Franklin

- "Common Logic" is mentioned in various logical and philosophical works published after her thesis ("On the Algebra of Logic", 1883) [7, 10, 9, 12, 8].
- It's also discussed in some of the unpublished archival material that I have worked with.
- She distinguishes it from Symbolic Logic or Deductive Logic [11].

Common Logic in Ladd-Franklin's dissertation (1)

1883 dissertation focuses primarily on symbolic logic/algebras of logic [7]:

- Logic considers two types of propositions: affirmations of the identity of the subject and predicate and non-affirmations. (p. 17)
- Algebras of logic are characterized by how they express the non-identities — or rather, to whether they assign "quantity" to the copula or to the subject (p. 23). If to the subject, there is one copula (=); if to the copula, then there is a universal copula and a particular copula.
- Purpose of symbolic logic: (1) uniting and separating propositions; (2) insertion or omission of terms (or immediate inference); (3) elimination with the least possible loss of content (syllogism) (p. 32).
- Algebras of logic are all about: How to represent propositions, modify them, and calculate with them.

Common Logic in Ladd-Franklin's dissertation (2)

Ladd-Franklin, like Venn, argues for a symmetric copula and highlights its relationship to simplicity:

- "An advantage of writing $abc\overline{\vee}$ instead of $abc = 0$ is that the copula can be inserted at any point in the excluded combination, and that elimination can be performed on the premises as they are given, when they have been expressed negatively, without first transposing all the members to one side" [7, p. 51].
- (1928): "The [antilogism], as already given, is symmetrical, and that is a source of great simplicity—there is only *one* valid form of the antilogism instead of the fifteen valid forms of the syllogism which common logic requires us to bear in mind" [8, p. 532].

Common Logic in Ladd-Franklin's dissertation (3)

The phrase "Common Logic" is never used in her dissertation.

But: Once her preferred algebra of logic has been defined and motivated, the remainder of the dissertation is on what she would probably call Common Logic later on—the application of this algebraic form of reasoning to various natural-language examples, by translating them into symbolic form, and solving various equations.

"Some Remarks on Common Logic" (1890)

The most explicit published discussion of Ladd-Franklin's views on Common Logic.

> *The natural repugnance which the ordinary logician felt, at first, to seeing processes of deductive reasoning made the subject of a great development' by a purely mechanical process, has in great part passed away; it would have been hard for it to survive the eloquent persuasiveness of Mr. Venn's Symbolic Logic. It seems, therefore, to be time for the simplified ways of looking at things which prevail in Symbolic Logic to begin to sink into the elementary expositions of the subject. The simple reforms which I am about to propose in the present paper have nothing in the world to do with Symbolic Logic; but they will, nevertheless, be most likely to commend themselves to one who has been in the habit of moving in the orderly region to which that discipline has reduced the field of Thought [10, p. 75].*

"Some Remarks on Common Logic" (2)

"It seems, therefore, to be time for the simplified ways of looking at things which prevail in Symbolic Logic to begin to sink into the elementary expositions of the subject" [10, p. 75].

Her recommendations concern:

1. Names (i.e., logical vocabulary and technical terms)
2. Particular propositions
3. The eight copulas
4. The laws of thought
5. Proving related propositions

Names (1)

- Names should be established such that they display “the greatest possible number of resemblances and differences” and that “the same thing, if it is a subject for consideration in several different branches of learning, should receive the same name in all” [10, p. 75]. Lots of logical vocabulary, such as ‘obverse’, ‘converse’, ‘reciprocal’, ‘contrapositive’, ‘inverse’, etc. do not satisfy these requirements.
- Proposal: A set of new names.

Names (2)

- "Proposition" should be uniquely defined, rather than the two definitions that are out there:
  - "a portion of discourse in which a predicate is affirmed or denied of a subject" [10, p. 76].
  - "every portion of knowledge conveyed in language, everything propounded for belief or disbelief" [10, p. 76].
- According to the first def, "All x is y" and "No non-y is x" are different propositions; according to the second, they are the same. "it is better to say that [these] are all *different forms* of the *same proposition*" [10, p. 76]. (If these are not the same proposition, there needs to be *something* that says that "there is a very important respect in which they are one and the same *thing*, and it ought to be possible to indicate that fact by a name" [10, p. 76].

Names (3)

[10, Table II]:

	o	c	0	∞
A	**original** $x \prec y$	**contraposed** $\bar{y} \prec \bar{x}$	retroposed $x\bar{y} \prec 0$	pro-posed $\infty \prec \bar{x} + y$
$\forall$	**obverse** $\bar{x} \prec \bar{y}$	**contraverse** $y \prec x$	retroverse $\bar{x}y \prec 0$	proverse $\infty \prec x + \bar{y}$
E	oblate $x \prec \bar{y}$	contralate $y \prec \bar{x}$	retrolate $xy \prec 0$	prolate $\infty \prec \bar{x} + \bar{y}$
$\exists$	offert $\bar{x} \prec y$	contrafert $\bar{y} \prec x$	retrofert $\bar{x}\bar{y} \prec 0$	profert $\infty \prec x + y$

"it would doubtless conduce to clear thinking (and not be a feat impossible of accomplishment) if they were introduced into common life" [10, p. 79].

Particular propositions

"The copula, $\prec$, and its negative are the copulas of Mr. Peirce's Symbolic Logic, but that is not a sufficient reason for not using them in common Logic as a mere printer's abbreviation for 'is wholly' and 'is not wholly'. . . With the aid of this phonetic mark, brief expression can be given to the four different forms of the four different particular propositions" [10, p. 82].

The eight copulas (1)

Instead of keeping the copula fixed, and varying the terms, to generate all the types of propositions, it is possible to keep the terms fixed and vary the copula:

- "for the sake of simplicity in the rules, a slight change may be made in Mr. Peirce's copula; namely, the horizontal line may be inverted and allowed to fall within the angle to the right, thus: cannot render glyph here. For the other universal proposition which is essentially affirmative, but which is essentially affirmative, but which is symmetrical, we can take the same sign turned up... The ordinary negative proposition... is naturally written with a completed wedge $\overline{\nabla}$; and for the remaining universal proposition, which is also essentially negative, we may use the same sign with the angle turned down, thus: cannot render glyph here" [10, p. 84].

The eight copulas (2)

"Every universal is made up of an odd number of marks (namely, three), and every particular made up of an even number of marks (namely, two or four)…any rotation of a copula necessitates a change of sign in the *subject*, and the introduction of a negative sign into the angle of a copula, or the reverse, necessitates a change of sign in both subject and predicate" [10, p. 85].

TABLE IV.

All of x is y.	None but x is y.	None of x is y.	All but x is y.
A $x \lessdot y$	∀ $x \lesssim y$	E $x \bar{\vee} y$	Ǝ $x \veebar y$
a $x \bar{\lessdot} y$	ɐ $x < y$	e $x \vee y$	ə $x \overline{\veebar} y$
Not all of x is y.	Some besides x is y.	Some of x is y.	Not all but x is y.

A brief aside

Ladd-Franklin's 1890 review of Jones's *Elements of Logic as a Science of Propositions*:

- We cannot help thinking that the classification is overdone. . . For instance, the final division of everything is into absolute and relative. . . —a division which is entirely irrelevant to common Logic" [9, p. 560].

The short-comings of Common Logic

In both published and unpublished material, Ladd-Franklin expresses dissatisfaction with Common Logic:

- 1926: "Common logic, however, insists upon it that the term common to two premises must be absolutely and exactly the same. . . Senator N. said: "*It-cannot-be-that* any of these measures are idiotic, *for* they are all necessary, and nothing that is necessary is idiotic." This is not common logic. What, then, is it? What *is* logic?" [11, p. 358].
- 1927: "[My] system [of logic] has been devised to take account of such difficulties as I have here brought up, and thousands more of the same kind. It gives a vast extension to common logic" [12, p. 102].
- Undated, unpublished notes from her archives on next slides.

Unpublished thoughts on Common Logic (1)

Box 40, notes on “Unless and Not Unless”:

- The nearest Common Logic (this is meant—following Alfred Sidgwick—as a term of depreciation) comes to treating such cases as this is to say that they can be “transformed” into cases of simple propositions by the [?addition] of such words as thing, case, &c. Thus for $(a \leftarrow b) \leftarrow (c \leftarrow d)$ — That *a* is all *b* involves that *c* is all *d* — you can say, if you like, “The cases in which *a* is all *b* are-included-among the cases in which *c* is all *d*.” This looks rather simple but let us see now if it would go in such an instance as the “not unless relation.” This parallels a simple proposition which has itself not yet fallen under the notice of Common Logic.
- “the simple relations remain without wholly inconsidered by the Common Logicians, and hence both sorts may as well be examined at once, ab initio.”

Unpublished thoughts on Common Logic (2)

Box 34, notes on "The ABC of Logic"

- "is so fundamental a part of Common logic (in this term one does not include the newer mathematics-like developments of logic)"

Box 34, notes on "Common Logic"

- "Common Logic (I use this term, following Peano and Smith ([illegible]) in the derogatory sense) has hitherto made [?prominent]. But one has only to give attention for a moment to this character of symmetry in logic to be able to predict its extreme importance. Let us look at it for a moment... The different propositional forms which Common Logic takes cognizance of are [?few] [three illegible words] number. We shall presently show that this is only half of the number which really exist, and the [?accident] of having omitted from consideration another form is quite an unaccountable one."

Conclusions

- While "common logic" was often used in the 19th century to refer to either Aristotelian syllogistics or the sort of "ordinary reasoning" of the everyday man, Ladd-Franklin (like Venn) takes "Common Logic" to be something of a mix of the two: ordinary everyday reasoning that has been systematized or "scientised" into a formal (not necessarily mathematical) activity.
- While Venn sees Symbolic Logic as an *extension* of Common Logic, Ladd-Franklin thinks that Symbolic Logic can be used to *amend* (or rehabilitate?) Common Logic.
- But this leaves me with a question. . .

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- for future work!

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