Fred Sommers and the Evolution of a Logic

Abstract

When contemporary philosophers use, refer to, or study formal logic, the formal system in question is overwhelmingly first-order logic (FOL). But, insofar as logic is a tool for representing human inference, FOL is far from the only possible formal logic. In the late 1960s, American philosopher Fred Sommers (1923—2014) conceived a radically unconventional formal logic called TFL (Term-Functor Logic; Traditional Formal Logic), drawing on pre-modern logical paradigms. The following decades saw successive, careful revisions by Sommers to TFL’s algorithms and notation, deep development of and fierce debate over TFL’s theoretical foundations, and increasing interest in the cognitive and linguistic merits of TFL. Sommers’ logical career thus offers a richly instructive example of the evolution of a formal logic, and poses a unique challenge to the logical orthodoxy of modern philosophy.

Two Historical Paradigms of Logic

1. Traditional Period: ca. 350 B.C.—1879
   - People: Aristotle, Medieval scholastics, Gottfried Leibniz, George Boole
   - General statements (e.g. “All puppies are dogs”) or “Some dogs have fleas” are more important than singular statements (e.g. “Fido is a good boy”).
   - Analyses the internal structure of statements before compounds.
   - Models specific patterns of inference called syllogisms

2. Modern Period: 1879—present
   - People: Gottlob Frege, Bertrand Russell, W.V.O. Quine
   - Singular statements considered primitives, general statements constructed from singular ones via quantifiers.
   - Subject and predicate are of different kinds
   - Inter-statement compounds more fundamental than internal structures.
   - Models a wide range of inferences

Fig. 1: Traditional parsing of the sentence “All classes are full.”
Fig. 2: Modern parsing of the sentence “All classes are full.”

Logic and Notation

- 1959: Ontological Origins
  - Sommers theorizes that ontological categories can be revealed through plausible predicate relations in language
  - Plausible predications of “hungry”:
    - hungry child
    - hungry cow
  - Sommers’ logic offers a richly instructive example of the evolution of a formal logic, and poses a unique challenge to the logical orthodoxy of modern philosophy.

- 1967: Fractional Notation
  - Sommers presents a notion for general statements, taking universal predication, term negation, and denial as primitive:
    - $A$: All are B
    - $A^{-1}$: Not All are B
  - Algorithm for syllogistic validity, based on algebraic rules:
    - $A^{-1} = (A^{-1})^{-1}$
    - $A$: valid (correct equation)
  - Restrictions necessary, and few inferences modelled: “The scheme is not meant to be a logical instrument of any generality” (79)

- 1973: Historical Justification
  - Sommers appeals to Leibniz and Hobbes to justify his use of a plus-minus notation:
    - Thomas Hobbes […] rightly stated that everything done by the mind is a computation, by which is understood either (an addition or a subtraction). So just as there are two primary signs of algebra and analytics, ÷ and , in the same way there are, as it were, two copulas, ‘is’ and ‘is not.’
  - Leibniz

- 1976: Relationalists
  - Use of subscripts for relational signs (from 1 to n for n-place):
    - $A_n$ gives B to C
    - $A_{n+1}$ gives S to P

References


Poster by: Daniel Lovsted
Supervisor: Dirk Schlimm

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