Tomoya Sato

curriculum vitæ

University of California, San Diego
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Education

since 2009   Ph.D. Philosophy, University of California, San Diego, USA. (expected March 2016)

Dissertation Title: *The Limits of Logic*.

Supervisor: Gila Sher.

Committee: Samuel Buss, Rafael E. Núñez, Clinton Tolley, Christian Wüthrich.

2005-2007   M.A. Philosophy, State University of New York, Stony Brook, USA.

2002-2004   M.I.S. Information Sciences, Tohoku University, Japan.

1999-2001   M.S. Mathematics, Tohoku University, Japan.

1995-1999   B.S. Mathematics, Tohoku University, Japan.

Areas of Specialization

Philosophy of Logic, Philosophical Logic

Areas of Competence

History of Analytic Philosophy, Metaphysics, Philosophy of Mathematics

Submitted Paper

"Logicality of Operators." (Under review after editorial request to revise and resubmit)

"A New Semantic Characterization of Second-Order Logical Validity." (Under review)

Presentations

April 2014	"Why a Logical Consequence Relation Has to Satisfy Reflexivity and Transitivity" at the 2013-14 Spring Meeting of the Association for Symbolic Logic (with the 2014 APA Pacific Division Meeting), San Diego.
February 2014	"The Invariance Criterion for Logical Pluralism" at the 2014 APA Central Division Meeting, Chicago.
October 2013	"The Invariance Criterion for Logical Pluralism" at the 2013 Annual Meeting of the Western Canadian Philosophical Association, Winnipeg, Canada.
October 2013	Comment on W. Jim Jordan's "Closing a Route to Logical Pluralism" at the 2013 Annual Meeting of the Western Canadian Philosophical Association, Winnipeg, Canada.
April 2013	"Three Questions about Genuine Logic" at UNILOG 2013 - World Congress on Universal Logic, Rio de Janeiro, Brazil.
February 2013	"The Invariance Criterion for Non-Classical Logics" at the 2013 UCLA-USC Graduate Conference in Philosophy, Los Angeles.

Teaching Experience

Instructor	Symbolic Logic (Summer 2013, Summer 2014).
TA	Introduction to Logic (Winter 2010, Spring 2010, Summer 2011, Winter 2013, Spring 2013, Spring 2014, Fall 2014, Spring 2015).
	Symbolic Logic (Fall 2009).
	Logic and Decision Making (Summer 2012).
	Scientific Reasoning (Fall 2012).
	Nature of Reality (Summer 2015)
	First Year Japanese (Fall 2010).
	Second Year Japanese (Winter 2011, Spring 2011, Fall 2011, Winter 2012, Spring 2012).
	Third Year Japanese (Fall 2015).

Professional Service

Journal	*Synthese* (Reviewer)
Conference	The 5th World Congress on the Square of Opposition, Easter Island, Chile. (Organizing committee member) http://www.square-of-opposition.org/square2016.html

Graduate Course Work Coursework ("A" indicates audited)

Epistemology	Truth^A (Gila Sher)
Ethics	Collective Responsibility (Saba Bazargan)
History	Aristotle's Politics (Georgios Anagnostopoulos)
	Democritus (Monte Johnson)
	Frege (Clinton Tolley)
	Truth in Kant (Gila Sher)
Logic	Foundations of Modern Logic (Gila Sher)
	Incompleteness (Gila Sher and Shlomi Sher)
	Mathematical Logic (Samuel Buss)
	Set Theory^A (Samuel Buss)
Metaphysics	Metaphysics^A (Christian Wüthrich)
	Modality (Craig Callender)
	Structuralism (Christian Wüthrich)
Philosophy of Science	Philosophy of Biology (William Bechtel)
	Neurophilosophy (Paul Churchland)

Dissertation Abstract : *The Limits of Logic*

Logical validity is relative to logical systems. Some arguments are logically valid in classical logic but logically invalid in intuitionistic logic. There are various logical systems, each of which has been developed based on some notion of what logic is or should be. Whether an argument is logically valid or not depends on one's notion of logic. The main purpose of my dissertation is to establish a new notion of logic and propose a new characterization of logical validity. The new notion, which I call the *minimal notion*, is that logical validity is the validity grounded in a special kind of formal law. Using the minimal notion and the new characterization, I approach two important problems that have been discussed in the literature: (i) What arguments in a second-order language are logically valid?; and (ii) what non-classical logics can be regarded as "logics" in a true sense?

To obtain the new characterization, a correct definition of logical constants is necessary. In the contemporary model-theoretic approach to logic, logical constants have been characterized using the concepts of invariance and similarity relation: A term is logical if the operator associated with it is invariant under "appropriate" similarity relations between structures. Regarding what similarity relations are appropriate, several candidates have been proposed, and as a result, there are several theories available. In my dissertation, I propose another similarity relation and another criterion of logical constants, based on which logical terms of both classical logic and non-classical logics can be defined. Some noteworthy results are the following: (i) All standard components of first-order logic— the truth-functional connectives and the universal and existential quantifiers—are logical constants; (ii) the identity relation is not a logical constant; (iii) the modal operators of the standard modal logics are all logical constants; (iv) the standard logical components of intuitionistic logic and relevant logic are logical constants.

It has been controversial whether or not second-order logic with standard semantics is proper logic. Various criticisms have been made, one of which is that some arguments/sentences indirectly expressing particular facts about sets (e.g., Cantor's theorem) can be validated in the logical system. For the characterization of logically valid arguments in a second-order language, I argue, using the minimal notion, that for the validity of an argument to be regarded as logical, it has to hold not only in standard structures but also in certain Henkin structures. I then conclude that standard semantics fails to identify second-order logical validity. Instead of the standard semantics, I propose a version of Henkin semantics as the right semantic system to define logically valid arguments.

Regarding the problem of non-classical logics, I particularly pay attention to non-classical logics with Kripke semantics in which domains are connected by an accessibility relation. Different non-classical logics use different accessibility relations. Some accessibility relations are transitive, and some are symmetric. I then ask what accessibility relations can be thought of as "logical" relations between domains under the minimal notion. Applying the method that I developed for the characterization of logical constants, I argue that there are thirteen kinds of logical accessibility relations. Based on the argument, I conclude that multiple non-classical logical systems can be regarded as logics in a true sense under the minimal notion. In the characterization of true non-classical logics, a few major modal logical systems (e.g., K and D) can count as proper logics. However, many other logical systems that have been of great importance in the study of non-classical logic such as modal systems T, $S4$, intuitionistic logic, and relevant logic are excluded from the list of proper non-classical logics.

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