

LOGIC, THOUGHT AND ACTION

LOGIC, EPISTEMOLOGY, AND THE UNITY OF SCIENCE

VOLUME 2

Editors

Shahid Rahman, *University of Lille III, France*

John Symons, *University of Texas at El Paso, U.S.A.*

Editorial Board

Jean Paul van Bendegem, *Free University of Brussels, Belgium*

Johan van Benthem, *University of Amsterdam, the Netherlands*

Jacques Dubucs, *University of Paris I-Sorbonne, France*

Anne Fagot-Largeault, *Collège de France, France*

Bas van Fraassen, *Princeton University, U.S.A.*

Dov Gabbay, *King's College London, U.K.*

Jaakko Hintikka, *Boston University, U.S.A.*

Karel Lambert, *University of California, Irvine, U.S.A.*

Graham Priest, *University of Melbourne, Australia*

Gabriel Sandu, *University of Helsinki, Finland*

Heinrich Wansing, *Technical University Dresden, Germany*

Timothy Williamson, *Oxford University, U.K.*

Logic, Epistemology, and the Unity of Science aims to reconsider the question of the unity of science in light of recent developments in logic. At present, no single logical, semantical or methodological framework dominates the philosophy of science. However, the editors of this series believe that formal techniques like, for example, independence friendly logic, dialogical logics, multimodal logics, game theoretic semantics and linear logics, have the potential to cast new light on basic issues in the discussion of the unity of science.

This series provides a venue where philosophers and logicians can apply specific technical insights to fundamental philosophical problems. While the series is open to a wide variety of perspectives, including the study and analysis of argumentation and the critical discussion of the relationship between logic and the philosophy of science, the aim is to provide an integrated picture of the scientific enterprise in all its diversity.

Logic, Thought and Action

Edited by

Daniel Vanderveken

*University of Quebec, Trois-Rivières,
QC, Canada*

 Springer

A C.I.P. Catalogue record for this book is available from the Library of Congress.

ISBN 1-4020-2616-1 (HB)
ISBN 1-4020-3167-X (e-book)

Published by Springer,
P.O. Box 17, 3300 AA Dordrecht, The Netherlands.

Sold and distributed in North, Central and South America
by Springer,
101 Philip Drive, Norwell, MA 02061, U.S.A.

In all other countries, sold and distributed
by Springer,
P.O. Box 322, 3300 AH Dordrecht, The Netherlands.

Cover image:
Adaptation of a Persian astrolabe (brass, 1712-13), from the collection of the Museum of the
History of Science, Oxford. Reproduced by permission.

Printed on acid-free paper

All Rights Reserved
© 2005 Springer

No part of this work may be reproduced, stored in a retrieval system, or transmitted
in any form or by any means, electronic, mechanical, photocopying, microfilming, recording
or otherwise, without written permission from the Publisher, with the exception
of any material supplied specifically for the purpose of being entered
and executed on a computer system, for exclusive use by the purchaser of the work.

Printed in the Netherlands.

**In Memoriam
J.-Nicolas Kaufmann
1941–2002**

Contents

Contributing Authors	xi
1 Introduction <i>Daniel Vanderveken</i>	1
Part I Reason, Action and Communication	
2 The Balance of Reason <i>Marcelo Dascal</i>	27
3 Desire, Deliberation and Action <i>John R. Searle</i>	49
4 Two Basic Kinds of Cooperation <i>Raimo Tuomela</i>	79
5 Speech Acts and Illocutionary Logic <i>John R. Searle and Daniel Vanderveken</i>	109
6 Communication, Linguistic Understanding and Minimal Rationality in Universal Grammar <i>André Leclerc</i>	133
Part II Experience, Truth and Reality in Science	
7 Truth and Reference <i>Henri Lauener[†]</i>	153

8	Empirical Versus Theoretical Existence and Truth	163
	<i>Michel Ghins</i>	
9	Michel Ghins on the Empirical Versus the Theoretical	175
	<i>Bas C. van Fraassen</i>	
Part III Propositions, Thought and Meaning		
10	Propositional Identity, Truth According to Predication and Strong Implication	185
	<i>Daniel Vanderveken</i>	
11	Reasoning and Aspectual-Temporal Calculus	217
	<i>Jean-Pierre Desclés</i>	
12	Presupposition, Projection and Transparency in Attitude Contexts	245
	<i>Rob van der Sandt</i>	
13	The Limits of a Logical Treatment of Assertion	267
	<i>Denis Vernant</i>	
Part IV Agency, Dialogue and Game-Theory		
14	Agents and Agency in Branching Space-Times	291
	<i>Nuel Belnap</i>	
15	Attempt, Success and Action Generation: a Logical Study of Intentional Action	315
	<i>Daniel Vanderveken</i>	
16	Pragmatic and Semiotic Prerequisites for Predication	343
	<i>Kuno Lorenz</i>	
17	On how to be a Dialogician	359
	<i>Shahid Rahman and Laurent Keiff</i>	
18	Some Games Logic Plays	409
	<i>Ahti-Veikko Pietarinen</i>	

<i>Contents</i>	ix
19	
Backward Induction Without Tears?	433
<i>Jordan Howard Sobel</i>	
Part V Reasoning and Cognition in Logic and Artificial Intelligence	
20	
On the Usefulness of Paraconsistent Logic	465
<i>Newton C.A. da Costa, Jean-Yves Béziau, and Otávio Bueno</i>	
21	
Algorithms for Relevant Logic	479
<i>Paul Gochet, Pascal Gribomont and Didier Rossetto</i>	
22	
Logic, Randomness and Cognition	497
<i>Michel de Rougemont</i>	
23	
From Computing with Numbers to Computing with Words — From Manipulation of Measurements to Manipulation of Perceptions	507
<i>Lofti Zadeh</i>	

Contributing Authors

Nuel Belnap is Alan Ross Anderson Distinguished Professor of Philosophy and Professor of the History and Philosophy of Science at the University of Pittsburgh. He has written chiefly in philosophical logic, having co-authored *The Logic of Questions and Answers* (Yale University Press, 1976) with Thomas Steel, *Entailment: the Logic of Relevance and Necessity* (Princeton University Press) vol. I (1975) with Alan Ross Anderson and vol. II (1992) with Anderson and J. Michael Dunn, *The Revision Theory of Truth* (MIT Press, 1993) with Anil Gupta, and *Facing the Future: Agents and Choices in our Indeterminist World* (Oxford University Press, 2001) with Michael Perloff and Ming Xu.

Jean-Yves Béziau is now Professor of the Swiss National Science Foundation at the Institute of Logic of the University of Neuchâtel. He got a PhD in mathematical logic in Paris and a PhD in philosophy in São Paulo. He worked as a research fellow in Brazil, Poland and California (UCLA, Stanford). His main interests are paraconsistent logic, universal logic, philosophy of logic and philosophy of mathematics. He has written with Newton da Costa and Otavio Bueno the book *Elementos de teoria paraconsistente de conjuntos*, Cle-Unicamp, Campinas, 1998, 188pp. and more than 50 papers in Journals and collective books.

Otávio Bueno is Associate Professor of Philosophy at the University of South Carolina. His main research area is in philosophy of science, philosophy of mathematics, philosophy of logic, and paraconsistent logic. He has published papers in many journals and collections including *Philosophy of Science*, *Synthese*, *Journal of Philosophical Logic*, *Studies in History and Philosophy of Science*, *British Journal for the Philosophy of Science*, *Analysis*, *Erkenntnis*, *History and Philosophy of Logic*, and *Logique et Analyse*. He is the author of two books: *Constructive Empiricism: A Restatement and Defense* (CLE, 1999), and *Elements*

of *Paraconsistent Set Theory* (CLE, 1998) with Newton da Costa and Jean-Yves Béziau.

Newton da Costa is retired Professor of Philosophy at the University of São Paulo, Brazil, and currently Visiting Professor of Philosophy at the Federal University of Santa Catarina, Brazil. His main research interests are non classical logic, model theory, foundations of inductive inference and the philosophy of science. His publications include *Logiques Classiques et non Classiques* (Paris, Masson, 1997), *El Conocimiento Científico* (Mexico, UNAM, 2000) and *Science and Partial Truth* (Oxford University Press, 2003), as well as some other books and numerous papers in specialized journals.

Marcelo Dascal is a Professor of Philosophy at Tel Aviv University, Israel. He has taught in major universities in Europe, the Americas, and Australia. He has been a fellow of the Netherlands Institute of Advanced Studies (Wassenaar), of the Institute of Advanced Studies (Jerusalem), Leibniz Professor at the Center for Advanced Studies (Leipzig), and is currently Gulbenkian Professor at the University of Lisbon (PT). He was awarded the Alexander von Humboldt Prize for 2002-2003. His main research areas are the philosophy of language and communication, the philosophy of mind, pragmatics, the history of modern philosophy, and the study of controversies. As a Leibniz specialist, he has published *La sémiologie de Leibniz* (Paris, 1978), *Leibniz: Language, Signs and Thought* (Amsterdam, 1987), and has co-edited *Leibniz and Adam* (Tel Aviv, 1991) and *Leibniz the Polemicist* (Amsterdam, forthcoming). In the area of pragmatics and the philosophy of language he has published *Pragmatics and the Philosophy of Mind, vol. 1: Language and Thought* (Amsterdam, 1983) and *Interpretation and Understanding* (Amsterdam, 2003); he has edited *Dialogue — An Interdisciplinary Approach* (Amsterdam, 1985) and co-edited *Philosophy of Language — A Handbook of Contemporary Research* (Berlin, 1991, 1995). He is the founder and editor of the journal *Pragmatics & Cognition* and of several book series.

Jean-Pierre Desclés is professor of Computer Sciences and Linguistics at Sorbonne University. He is vice president of the Académie Internationale de Philosophie des Sciences. His research interests are in the domain of the logic and natural languages; cognition and language; time, tense and space; logic of object determination. His publications include *Langages applicatifs, langues naturelles et cognition* (Paris, Hermès 1990) and articles in journals dealing with combinatory Logic, theoreti-

cal linguistics, artificial intelligence and epistemology of human sciences in relation with computers.

Bas van Fraassen is McCosh Professor of Philosophy at Princeton University. His research interests straddle philosophical logic and philosophy of science, with special interests in empiricism, (anti-)realism, probability, foundations of relativity and quantum physics, and philosophy of literature. His publications include *The Scientific Image* (Oxford 1980), *Laws and Symmetry* (Oxford 1989), *Quantum Mechanics: An Empiricist View* (Oxford 1991), and *The Empirical Stance* (Yale 2002).

Michel Ghins is professor at the Université Catholique de Louvain. He has taught at the Universities of Pittsburgh, Campinas (Brazil), Turin and the Catholic University of America (Washington, D.C.) He has published *L'inertie et l'espace-temps absolu de Newton à Einstein. Une analyse philosophique*. (Académie Royale de Belgique, 1990) and a number of papers on history and philosophy of physics, scientific realism and the semantic view of theories. He is the editor of the *Revue philosophique de Louvain*.

Paul Gochet, Pascal Gribomont and Didier Rossetto are respectively Professor Emeritus at Université de Liège, Professor at Université de Liège and at Faculté universitaire de Namur (Belgium). Among their publications are *Outline of a Nominalist Theory of Propositions* (Dordrecht, Reidel 1980); *Ascent to Truth* (Munich, Philosophia Verlag 1986); “Concurrency without toil: a systematic method for parallel program design” (in *Science of Computer Programming*, 21, pp. 1–56, 1993); *Logique I : Méthodes pour l'informatique fondamentale* (Paris, Hermès 1990, 1991, 1998); *Logique II : Méthodes pour l'étude des programmes* (Paris, Hermès 1994); *Logique III : Méthodes pour l'intelligence artificielle* (Hermès 2000); *Éléments de programmation en Scheme* (Paris, Dunod 2000); “Simplification of Boolean Verification Conditions” (in *Theoretical Computer Science*, 239, pp. 165–189, 2000); “Quantification, Being and Canonical Notation” (in *a companion to philosophical logic* pp. 265–280, Oxford, Blackwell 2002); “Epistemic Logic” (forthcoming in the *Handbook of History and Philosophy of Logic*, Dov Gabbay and John Woods (Eds), Amsterdam, Elsevier.)

Laurent Keiff is currently chargé de cours at the university of Lille 3, where he teaches logic and history of philosophy. He also teaches

philosophy in the Lycée E. Thomas (Nord-Pas de Calais). He is a PhD student in philosophy of logic, under the direction of S. Rahman (Lille 3), working on a dialogical way to give a satisfying account of logical pluralism.

Henri Lauener was initially an expert in the philosophy of Hegel. He studied philosophy in his country (Switzerland) and later at the University of Paris. He was appointed to a chair of philosophy at the University of Bern. Meanwhile he had moved to analytic philosophy. He was visiting professor at the University of Helsinki and several times at the University of California at San Diego. Editor of *Dialectica* from 1977 to 2001, he established it as a prominent forum for all kinds of debates within analytic theoretical philosophy. He organized the now legendary colloquia in Bienne (Switzerland). Henri Lauener's own philosophy is an original blend of both Kantian and Quinean influences. His more recent writings, apart from his monograph *W.v.O. Quine* (Beck, Munich, 1982), were assembled under the title *Offene Transzendentalphilosophie* (Hamburg, Verlag Dr.Kovac, 2001). See *Dialectica* 56:4, 2002, pp.293-298.

André Leclerc is Professor of Philosophy at the Federal University of Paraíba at João Pessoa, Brazil. He got his Ph.D. from the University of Québec at Trois-Rivières with a doctoral thesis on illocutionary aspects of meaning in the tradition of Universal Grammar. He is working and publishing regularly in the philosophy of language and of mind, and is teaching epistemology and philosophy of science. He has publications on the history of linguistics, philosophy of language and on mental causation and externalism in the philosophy of mind.

Ahti-Veikko Pietarinen is a Post-Doctoral Research Fellow of the Academy of Finland at the Department of Philosophy, University of Helsinki. He has published articles on logical, philosophical, game-theoretical and semantic/pragmatic topics in several journals, including *Acta Analytica*, *Cognitive Systems Research*, *Foundations of Science*, *Interaction Studies*, *Linguistic Analysis*, *Logic Journal of the IGPL*, *Logique et Analyse*, *Nordic Journal of Philosophical Logic*, *Notre Dame Journal of Formal Logic*, *Open Systems & Information Dynamics*, *Quality & Quantity*, *Semiotica*, *Theoretical Linguistics*, and *Transactions of the Charles S. Peirce Society*.

Shahid Rahman is full professor of logic and epistemology at the University Lille 3 (Humanities), France. He works on philosophy and history of logic and epistemology. He published among others *Über Dialogue, protologische Kategorien und andere Seltenheiten* (Peter Lang, 1993); *Wege zur Vernunft. Philosophieren zwischen Tätigkeit und Reflexion*, edited with Kai Buchholz and Ingrid Weber (Campus, 1999); “*New Perspectives in Dialogical Logic*” edited with Helge Rückert (*Synthese*, 127, nos. 1-2, 2001); *Logic, Epistemology and the Unity of Science*, edited with Dov Gabbay, John Symons and Jean-Paul van Bendegem (Kluwer, 2004). He is editor with John Symons of the new Kluwer series: *Logic, Epistemology and the Unity of Science*.

Michel de Rougemont is a Computer Science Professor at the University of Paris II (Panthéon-Assas) since 1995 and a researcher at LRI (Laboratoire de Recherche en Informatique) of Paris-South University at Orsay. He received his Ph.D. in Computer Science from UCLA in 1983, was a researcher at the European Computer Industry Research Centre (ECRC) in Munich from 1984 until 1987 and then a Professor at the Ecole Nationale Supérieure de Techniques Avancées (E.N.S.T.A.) in Paris until 1995. His main interests are logic, complexity and the analysis of problems with uncertainty where both Logic and randomized algorithms interact. He is co-author of the book *Logic and Complexity* at Springer in 2004.

Rob van der Sandt is professor in Philosophy of Language and Logic at the University of Nijmegen. His main field is natural language semantics and pragmatics. His primary research interests are dynamic semantics, discourse processing and dialogue. His publications include *Context and Presupposition* (Routledge 1988), *Focus. Linguistic, Cognitive and Computational Perspectives* (Cambridge University Press, 1999) (edited with Peter Bosch) and numerous articles on presupposition and discourse processing. He is associate editor of the *Journal of Semantics*.

John R. Searle is Mills Professor of Philosophy at the University of California at Berkeley. He is well-known for his theory of speech acts, his critique of strong AI, his work on intentionality and consciousness in the philosophy of mind and his theory of social reality and institutions. Among his publications are *Speech Acts* (Cambridge University Press, 1969), *Expression and Meaning: Studies in the Theory of Speech Acts* (Cambridge University Press, 1979), *Intentionality: An Essay in the Philosophy of Mind* (Cambridge University Press, 1983), with Daniel

Vanderveken *Foundations of Illocutionary Logic* (Cambridge University 1985), *The Rediscovery of the Mind* (MIT Press, 1992), *The Construction of Social Reality* (Free Press, 1995), *The Mystery of Consciousness* (New York Review Press, 1997), *Mind, Language and Society* (Basic Books 1998) and *Rationality in Action* (MIT Press, Bradford Books, 2001).

Jordan Howard Sobel is Professor Emeritus at the University of Toronto, and Visiting Professor at Uppsala University, works in logic, probability, rational choice, ethics, and philosophy of religion. His publications include *Taking Chances: Essays on Rational Choice* (Cambridge 1994), *Puzzles for the Will: Fatalism, Newcomb and Samarra, Determinism and Omniscience* (Toronto 1998), *Logic and Theism: Arguments for and against Beliefs in God* (Cambridge 2004), “Utilitarianisms: Simple and General” (*Inquiry* 1970), “Ramsey’s Foundations Extended to Desirabilities” (*Theory and Decision* 1998), and “Blackburn’s Problem: On its not Insignificant Residue” (*Philosophy and Phenomenological Research* 2001). Projects in advanced stages include papers on liar paradoxes, on probable *modus ponens* and *modus tollens* and updating on uncertain evidence, and on Fregean and Gödelian “collapsing arguments”, a book on metaethics, Moore through Mackie, and books on the moral philosophies of Plato, Aristotle, Hume, and Kant.

Raimo Tuomela is Professor at the Department of Philosophy of Helsinki University in Finland. His main field of research is the philosophy of social action. He was recipient of several grants and awards, including the von Humboldt Foundation Research Award, awarded in recognition of achievements in research. He is member of the editorial board of several journals and book series. Among Tuomela’s recent books, let us mention: *The Importance of us: A Philosophical Study of Basic Social Notions*. (Stanford UP, 1995), *Cooperation: A Philosophical Study* (Kluwer, 2000), *The Philosophy of Social Practices: A Collective Acceptance View* (Cambridge UP, 2002).

Daniel Vanderveken is Professor at the University of Québec at Trois-Rivières where he is the director of a Research Group on Communication. His research interests are illocutionary and intensional logics, the logic of action, formal semantics and pragmatics of discourse and semiotics. He is the co-author with John Searle of *Foundations of Illocutionary Logic* (Cambridge UP 1985). His other main books are: *Les actes de discours* (Mardaga, Liège Brussels 1988) and *Principles of Language Use*

and *Formal Semantics of Success and Satisfaction* Volumes 1 and 2 of *Meaning and Speech Acts* (Cambridge U P 1990-91). He is the guest editor of the special issue *Searle with his Replies* of *Revue internationale de philosophie* (n°216, 2001) and co-editor with Susumu Kubo of *Essays in Speech Act Theory* (P&b ns 77, John Benjamins, 2001). His webpage is: www.vanderveken.org.

Denis Vernant is Professor of philosophy at the University Pierre Mendès France at Grenoble where he is director of the research group Philosophie, Langues & Cognition. His major research interests are logic and philosophy of logic, pragmatics of dialogue and praxiology. His main publications are *Introduction à la philosophie de la logique* (Mardaga, Bruxelles 1986), *La Philosophie mathématique de B. Russell* (Paris, Vrin, 1993), *Du Discours à l'action, études pragmatiques* (Paris, PUF, 1997), *Introduction à la logique standard* (Paris, Flammarion, 2001) and *Bertrand Russell* (Paris, Garnier-Flammarion, 2004). His electronic address is denis.vernant@upmf-grenoble.fr. For more information see his web page: www.upmf-grenoble.fr/sh/persophilo/denisvernant/presentation.html.

Lotfi A. Zadeh is Professor in the Graduate School and Director of Berkeley Initiative in Soft Computing (BISC). Since 1965, his research has been directed at the development of fuzzy set theory and fuzzy logic. Currently, his work is focused on computing with words and perceptions, and on development of a unified theory of uncertainty and a theory of hierarchical definability. His recent publications include “A new Direction in AI — Toward a Computational Theory of Perceptions,” *AI Magazine* 22(1): 73–84, 2001; and “Toward a Perception-Based Theory of Probabilistic Reasoning with Imprecise Probabilities,” *Journal of Statistical Planning and Inference*, 105, 233–264, 2002. To appear: “Precisiated Natural Language (PNL),” *AI Magazine*; and “A Note on Web Intelligence, World Knowledge and Fuzzy Logic,” *Data and Knowledge Engineering*. His web page is <http://www.cs.berkeley.edu/~zadeh>.