

# Handbook of the 6th World Congress and School on Universal Logic

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# Contents

|           |                                                                             |           |
|-----------|-----------------------------------------------------------------------------|-----------|
| <b>I</b>  | <b>Introduction</b>                                                         | <b>1</b>  |
| <b>1</b>  | <b>Organizing, International Organizing and Scientific Committees</b>       | <b>3</b>  |
|           | Organizing Committee . . . . .                                              | 3         |
|           | International Organizing Committee . . . . .                                | 4         |
|           | Scientific Committee . . . . .                                              | 4         |
| <b>2</b>  | <b>What is Universal Logic?</b>                                             | <b>7</b>  |
| <b>3</b>  | <b>Aim of the event</b>                                                     | <b>9</b>  |
| <b>4</b>  | <b>Call for papers</b>                                                      | <b>11</b> |
| <b>II</b> | <b>6th World School on Universal Logic</b>                                  | <b>13</b> |
| <b>5</b>  | <b>Aim of the School</b>                                                    | <b>15</b> |
|           | A great variety of tutorials . . . . .                                      | 15        |
|           | A School to Promote Logical Research . . . . .                              | 15        |
|           | Logic Around the World . . . . .                                            | 15        |
| <b>6</b>  | <b>¿Why Study Logic?</b>                                                    | <b>17</b> |
| <b>7</b>  | <b>Speakers of the 6th World School on Universal Logic</b>                  | <b>19</b> |
| <b>8</b>  | <b>Tutorials</b>                                                            | <b>23</b> |
|           | The Logic of Lying, by Franca D’Agostini . . . . .                          | 23        |
|           | Logic in the Brain, by Tal Dotan Ben-Soussan . . . . .                      | 25        |
|           | The Adventures of the Turnstile ( $\vdash$ ), by Jean-Yves Beziau . . . . . | 28        |
|           | History of Medieval Logic, by Julie Brumberg-Chaumont . . . . .             | 30        |

|                                                                                                                                  |    |
|----------------------------------------------------------------------------------------------------------------------------------|----|
| The theory of topos-theoretic ‘bridges’: an introduction,<br>by Olivia Caramello . . . . .                                       | 34 |
| Lindenbaum Method, by Alex Citkin and Alexei Muravitsky . . . .                                                                  | 36 |
| Weak arithmetics and applications, by Henri-Alex Esbelin . . . .                                                                 | 39 |
| Dialectics. An Introduction, by Elena Ficara . . . . .                                                                           | 42 |
| Stoic Logic : the dialectic of the Gods, by Jean-Baptiste Gourinat                                                               | 45 |
| The inconsistency theory of truth and nominalistic mathematics,<br>by Casper Storm Hansen . . . . .                              | 48 |
| Aristotle’s Principle of Non-Contradiction, by Jean-Louis Hudry .                                                                | 50 |
| Conceptual Engineering: A Systematic Unified Framework,<br>by Manuel Gustavo Isaac . . . . .                                     | 53 |
| Leśniewski’s Evolutional Logic, by Pierre Joray . . . . .                                                                        | 55 |
| Logic of Desires, by Emiliano Lorini . . . . .                                                                                   | 58 |
| On the complexity of the model checking problem,<br>by Florent Madelaine and Malika More . . . . .                               | 59 |
| C.S. Peirce’s Logic of Relations: Graph-theoretical and Surface-<br>theoretical Models, by William James McCurdy . . . . .       | 62 |
| Reasoning on data: the ontology-mediated query answering<br>problem, by Marie-Laure Mugnier . . . . .                            | 66 |
| Logic and Computer Programming, by Mykola Nikitchenko . . . .                                                                    | 68 |
| Analogical Reasoning, by Henri Prade . . . . .                                                                                   | 70 |
| MMT — Meta-Meta-Theory and/or Tool: A Framework<br>for Defining and Implementing Logics, by Florian Rabe . . . .                 | 72 |
| Logic-based reasoning for information integration<br>and data linkage, by Marie-Christine Rousset . . . . .                      | 73 |
| Louis Couturat (1868–1914): Early symbolic logic and the dream<br>of a characteristica universalis, by Oliver Schlaudt . . . . . | 75 |
| Logic and Religion, by Ricardo Silvestre . . . . .                                                                               | 77 |
| Tractarian Logic and Semantic Technologies,<br>by Erik Thomsen and Giovanni Mion . . . . .                                       | 80 |
| On Logical Modeling of the Information Fusion, by Jerzy Tomasik                                                                  | 82 |
| Mathematics and Logic in Ancient Greece, by Ioannis Vandoulakis                                                                  | 84 |
| Tractarian Logic and Semantic Technologies,<br>by Giovanni Mion & Erik Thomsen . . . . .                                         | 90 |
| Logic-based reasoning for information integration<br>and data linkage, by Andrzej Indrzejczak . . . . .                          | 91 |
| Natural language argument, the fallacies and p-logic,<br>by Frank Zenker . . . . .                                               | 93 |
| Introduction to Unified Logics, by Xunwei Zhou . . . . .                                                                         | 97 |

|            |                                                                                                                                                                  |            |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>9</b>   | <b>Poster Session for Students</b>                                                                                                                               | <b>99</b>  |
|            | The Logic of Public Debates, by Antsa Nasandratra Nirina Avo,<br>Solo Randriamahaleo & Jean Sallantin . . . . .                                                  | 99         |
|            | Faithful Semantical Embedding of Dyadic Deontic Logic E<br>in HOL, by Christoph Benzmüller, Ali Farjami<br>& Xavier Parent . . . . .                             | 100        |
|            | Some logical and algebraic aspects of $C_\infty$ -rings,<br>by Jean Cerqueira Berni & Hugo Luiz Mariano . . . . .                                                | 100        |
|            | The Possibility Implies the Necessity: Gödel's Proof<br>for the Existence of God, by Kyle Bryant . . . . .                                                       | 100        |
|            | A paraconsistent approach to da Costa's deontic logic: beyond<br>contradictions and triviality, by Gregory Carneiro . . . . .                                    | 100        |
|            | An Abstract Approach to Algebraizable Logics with Quantifiers,<br>by Caio de Andrade Mendes & Hugo Luiz Mariano . . . . .                                        | 100        |
|            | Efficient Protocols for Privacy and Integrity in the Cloud,<br>by Anca Nitulescu . . . . .                                                                       | 101        |
|            | Multirings, Quadratic Forms and Functors: Relationship between<br>axiomatizations on quadratic forms,<br>by Kaique Matias de Andrade Roberto & Hugo Luiz Mariano | 101        |
| <b>10</b>  | <b>¿Why, what, when, where and how to publish?</b>                                                                                                               | <b>103</b> |
| <b>III</b> | <b>6th World Congress on Universal Logic</b>                                                                                                                     | <b>105</b> |
| <b>11</b>  | <b>Opening Ceremony of the 6th World Congress<br/>on Universal Logic</b>                                                                                         | <b>107</b> |
| <b>12</b>  | <b>Secret Speaker</b>                                                                                                                                            | <b>109</b> |
| <b>13</b>  | <b>Talks of Keynote Speakers</b>                                                                                                                                 | <b>111</b> |
|            | Argument-based logics, by Leila Amgoud . . . . .                                                                                                                 | 111        |
|            | Material exclusion, contradictions and other oppositions,<br>by Jonas R. Becker Arenhart . . . . .                                                               | 112        |
|            | Analogies in Civil Law, by Matthias Armgardt . . . . .                                                                                                           | 113        |
|            | Exploring the internal language of toposes, by Ingo Blechschmidt .                                                                                               | 114        |
|            | Peircean logic as semiotic and biosemiotics as transdisciplinary<br>framework, by Søren Brier . . . . .                                                          | 115        |
|            | A categorical presentation of probabilistic logic, by Pierre Cartier .                                                                                           | 117        |
|            | Quantum Theory for Kids, by Bob Coecke . . . . .                                                                                                                 | 118        |

|                                                                                                                                                                    |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| A unified view of some formalisms handling incomplete<br>and inconsistent information, by Didier Dubois . . . . .                                                  | 119 |
| Importance of distinction of levels in a logical discourse:<br>an investigation from the perspective of a theory<br>of graded consequence, by Soma Dutta . . . . . | 121 |
| Kripke and Lukasiewicz: A Synthesis, by Hartry Field . . . . .                                                                                                     | 124 |
| Logic construction and computability on algebraic abstract<br>structures, by Sergey Goncharov . . . . .                                                            | 125 |
| ‘La question est précisément de l’âge’ [Rousseau, Emile]:<br>Natural logic and the pre-history of modern psychology,<br>by Christopher Goodey . . . . .            | 127 |
| The Indispensability of Logic, by Ole Thomassen Hjortland . . . .                                                                                                  | 129 |
| The logic of causation, by Aleks Kissinger . . . . .                                                                                                               | 130 |
| Category theory and its foundations: the role of diagrams<br>and other “intuitive” material, by Ralf Krömer . . . . .                                              | 131 |
| CERES: automated deduction in proof theory, by Alexander Leitsch                                                                                                   | 132 |
| Alternating truth in argumentative dispute resolution,<br>by Elena Lisanyuk . . . . .                                                                              | 134 |
| Diagrammatic Reasoning in Peirce and Frege, by Danielle Macbeth                                                                                                    | 136 |
| A New Perspective for Relevance Logic, by David Makinson . . . .                                                                                                   | 137 |
| Jan Lukasiewicz: his many-valued logic, by Grzegorz Malinowski .                                                                                                   | 138 |
| Contradiction, triviality, inconsistency toleration<br>and other misunderstandings in the empirical sciences,<br>by María del Rosario Martínez-Ordaz . . . . .     | 139 |
| Foundational Issues: Still Meaningful, by David McGoveran . . . .                                                                                                  | 142 |
| Three Probabilistic Generalizations of Deducibility, by David Miller                                                                                               | 144 |
| Lewis Carroll’s seven charts (and many others),<br>by Amirouche Moktefi . . . . .                                                                                  | 146 |
| Tones and Chords: Fuzzy and Intuitionistic Approaches<br>to Musical Elementhood, by Thomas Noll . . . . .                                                          | 147 |
| Formalizing Umwelts, by Rohit Parikh . . . . .                                                                                                                     | 148 |
| Capturing Consequence, by Alexander Paseau . . . . .                                                                                                               | 150 |
| David Hilbert’s Early Logical Notation, by Volker Peckhaus . . . .                                                                                                 | 151 |
| Diagrammatic quantum reasoning, by Simon Perdrix . . . . .                                                                                                         | 153 |
| To Peirce Hintikka’s Thoughts, by Ahti-Veikko Pietarinen . . . . .                                                                                                 | 154 |
| Grounding as meta-linguistic relation: grounding rules<br>for implication, by Francesca Poggiolesi . . . . .                                                       | 155 |
| A Compendium for Positive Logic, by Bruno Poizat . . . . .                                                                                                         | 156 |
| Decolonizing “Natural Logic”, by Scott L. Pratt . . . . .                                                                                                          | 159 |

|                                                                                                                                |            |
|--------------------------------------------------------------------------------------------------------------------------------|------------|
| It Was So Revolting I Couldn't Take my Eyes Off It,<br>by Graham Priest . . . . .                                              | 160        |
| General principles for the design of logical notations,<br>by Dirk Schlimm . . . . .                                           | 161        |
| Place and Value of Logic at Louis Couturat, by Anne-Françoise<br>Schmid . . . . .                                              | 162        |
| Ill-Defined Attitudes, by Roy Sorensen . . . . .                                                                               | 164        |
| The Validity of Validity, by Göran Sundholm . . . . .                                                                          | 165        |
| The Ace of the Second Generation of the Lvov-Warsaw School,<br>by Kordula Świątorzecka . . . . .                               | 167        |
| Abstract Agent Argumentation (Triple-A), by Leon van der Torre,<br>Ryuta Arisaka & Ken Satoh . . . . .                         | 168        |
| Polish Contributions to Universal Logic, by Jan Woleński . . . . .                                                             | 168        |
| On the Formal Evolution of Islamic Juridical Dialectic,<br>by Walter Edward Young . . . . .                                    | 169        |
| Paraconsistency: Theory and Practice, by Anna Zamansky . . . . .                                                               | 171        |
| <b>14 Workshops</b>                                                                                                            | <b>173</b> |
| <b>Logical Geometry and its Applications</b> . . . . .                                                                         | <b>173</b> |
| Logical Oppositions in Avicenna's Hypothetical Logic,<br>by Saloua Chatti . . . . .                                            | 175        |
| On the Interaction of Tense and Aspect — Merging Kites,<br>by Dany Jaspers . . . . .                                           | 177        |
| Squares, Cubes and Circles. Sketches of Oppositional<br>Geometry between Geulincx and De Morgan,<br>by Jens Lemanski . . . . . | 178        |
| End of the square?, by Fabien Schang . . . . .                                                                                 | 181        |
| Category Theory and Logical Geometry — Is a commutative<br>diagram an Aristotelian diagram?, by Daniel Wenz . . .              | 183        |
| <b>Practices of Writing and Reading in Logic</b> . . . . .                                                                     | <b>185</b> |
| Logic as Subject and Method of a Logician's Work,<br>by Moritz Cordes . . . . .                                                | 186        |
| Writing and Drawing in Logic — the Case of Aristotelian<br>Diagrams, by Lorenz Demey . . . . .                                 | 187        |
| Teaching Begriffsschrift: Frege's Notation and the Problems<br>of Pedagogy, by David Dunning . . . . .                         | 189        |
| Practices of Writing and Reading in Logic: the 14th Century<br>case of Thomas Manlevelt, by Alfred van der Helm . . .          | 190        |
| Note on Paul Hertz and the Origins of the Sequent-Notation,<br>by Javier Legris . . . . .                                      | 192        |

|                                                                                                                                                                                    |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Truth-tables and Tautologies in Early Logical Empiricism:<br>Hans Hahn as a Pioneer of Logical Pluralism,<br>by Alexander Linsbichler . . . . .                                    | 194 |
| On the Notation of Fred Sommers' Traditional Formal Logic,<br>by Daniel Lovsted . . . . .                                                                                          | 196 |
| Truth Tables without Truth Values.<br>On 4.27 and 4.42 of Wittgenstein's Tractatus,<br>by Tabea Rohr . . . . .                                                                     | 198 |
| <b>Proof Theory</b> . . . . .                                                                                                                                                      | 199 |
| Tomographs for Substructural Display Logic,<br>by Michael Arndt . . . . .                                                                                                          | 200 |
| The Existence of Pure Proofs, by René Gazzari . . . . .                                                                                                                            | 200 |
| Extensions of Non-Monotonic and Non-Transitive Atomic Bases,<br>by Ulf Hlobil . . . . .                                                                                            | 202 |
| The mathematics of derivability,<br>by Gerard R. Renardel de Lavalette . . . . .                                                                                                   | 204 |
| Distributive Deductive Systems:<br>the case of the First-Order Logic,<br>by Dorota Leszczyńska-Jasion & Szymon Chlebowski . . . . .                                                | 206 |
| Remarks on Sequent Calculus, by Enrico Moriconi . . . . .                                                                                                                          | 207 |
| From Syntactic Proofs to Combinatorial Proofs,<br>by Lutz Straßburger . . . . .                                                                                                    | 208 |
| <b>Logic and Music</b> . . . . .                                                                                                                                                   | 211 |
| Outside-in or inside-out? A logic for human sensory system,<br>by Gaetano Albergo . . . . .                                                                                        | 213 |
| Inferentialism and Music: the Art of Implication<br>and Negation, by Vojtěch Kolman . . . . .                                                                                      | 215 |
| Musical Activity as the Basis for the Evolution of Joint<br>Intentionality and Nonlinear Grammar,<br>by Andrius Jonas Kulikauskas . . . . .                                        | 216 |
| Listening and Reading: Temporalities of Musical Performance<br>and Notation, by Giulia Lorenzi . . . . .                                                                           | 218 |
| Is there any logic of harmony?, by Ingolf Max . . . . .                                                                                                                            | 219 |
| Musical Performance: a Composition of Monads,<br>by Nick Rossiter & Michael Heather . . . . .                                                                                      | 221 |
| <b>The Logic of Social Practices</b> . . . . .                                                                                                                                     | 223 |
| A Computable Model of Amartya Sen's Social Choice<br>Function in the Framework of Category Theory Logic,<br>by Gianfranco Basti, Antonio Capolupo<br>& Giuseppe Vitiello . . . . . | 224 |

|                                                                                                                                                                                    |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Rituals as “Social Habits”, by Raffaella Giovagnoli . . . . .                                                                                                                      | 227 |
| Collective Phronesis? An investigation of collective<br>judgement and professional knowledge,<br>by Jonna Lappalainen & Eva Schwarz . . . . .                                      | 228 |
| Bridging Habits and Cognition: Inference and Category<br>Learning through Neural-Dynamic Logic,<br>by Robert Lowe . . . . .                                                        | 230 |
| Moral Bubbles in action: The Logic of Cognitive<br>Autoimmunity, by Lorenzo Magnani . . . . .                                                                                      | 231 |
| John Searle as Practice Theoretician, by Joel Patomäki . . . .                                                                                                                     | 232 |
| Social practices and philosophical practices: from habitus<br>to critique. A philosophical trajectory through<br>Bourdieu, Foucault and Wittgenstein,<br>by Mario Radico . . . . . | 233 |
| Polarization Dynamics in the Age of Social Media,<br>by Fabiana Zollo . . . . .                                                                                                    | 235 |
| The Logic of preferences and a settlement of conflicts (based<br>on the modeling of the Nagorno-Karabakh conflict),<br>by Suren Zolyan . . . . .                                   | 237 |
| <b>Model Theory</b> . . . . .                                                                                                                                                      | 238 |
| Institutional Model Theory and Syntax of Physical Theories,<br>by Mark Addis . . . . .                                                                                             | 239 |
| Syntactic and Semantic Presentations of Scientific Theories<br>in Abstract Model Theory, by Nicola Angius,<br>Maria Dimarogkona & Petros Stefaneas . . . . .                       | 239 |
| Preserving properties at expansions of models<br>of ordered theories by unary predicates,<br>by Beibut Sh. Kulpeshov & Sayan Baizhanov . . . . .                                   | 240 |
| Unification in linear multi-modal logic of knowledge<br>and non-transitive time, by Stepan I. Bashmakov . . . .                                                                    | 242 |
| Computable Modal Algebras and Contact Algebras,<br>by Nikolay Bazhenov . . . . .                                                                                                   | 243 |
| Integration on the surreals: a conjecture of Conway, Kruskal<br>and Norton, by Philip Ehrlich . . . . .                                                                            | 244 |
| On almost deterministic algebras of binary isolating formulas<br>for polygonometrical theories,<br>by Dmitry Emelyanov & Sergey Sudoplatov . . . . .                               | 245 |
| On definable sets in generic structures,<br>by Yiannis Kiouvrekis, Petros Stefaneas<br>& Sergey Sudoplatov . . . . .                                                               | 246 |

|                                                                                                                                                                      |            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| The complexity of quasivariety lattices, by Svetlana Lutsak . . . . .                                                                                                | 246        |
| Strong decidability of the classification over Gl,<br>by Veta F. Yun & Larisa L. Maksimova . . . . .                                                                 | 248        |
| On combinatorial features of definable set systems,<br>by Alireza Mofidi . . . . .                                                                                   | 248        |
| On e-spectra for families of theories of Abelian groups,<br>by Inessa Pavlyuk & Sergey Sudoplatov . . . . .                                                          | 248        |
| A definition to the concept of a model-theoretic property<br>with applications to the expressive power of first-order<br>logic, by Mikhail G. Peretyat'kin . . . . . | 249        |
| Lattices of bounded based subvarieties of discriminator<br>varieties, by Aleksandr Pinus . . . . .                                                                   | 250        |
| Calculi for definable sets, by Petros Stefaneas,<br>Yiannis Kiouvrekis & Sergey Sudoplatov . . . . .                                                                 | 251        |
| Axiomatizability of the class of subdirectly irreducible acts<br>over a group, by Alena Stepanova & Denis Ptakhov . . . . .                                          | 251        |
| On lattices in generative classes, by Sergey Sudoplatov,<br>Yiannis Kiouvrekis & Petros Stefaneas . . . . .                                                          | 253        |
| Transformation and Categoricity Spectrum,<br>by Jamalbek A. Tussupov . . . . .                                                                                       | 253        |
| The nonforking notion for Jonsson sets,<br>by Olga Ulbrikht & Aibat Yeshkeyev . . . . .                                                                              | 255        |
| Similarity of definable closures of Jonsson sets,<br>by Aibat Yeshkeyev & Gulzhan Urken . . . . .                                                                    | 256        |
| Dimension, ranks and their applications to algebraic<br>structures, by Viktor Verbovskiy . . . . .                                                                   | 257        |
| Pregeometry on subsets of fragment of Jonsson set,<br>by Aibat Yeshkeyev & Maira Kassymetova . . . . .                                                               | 257        |
| <b>Logical Correctness . . . . .</b>                                                                                                                                 | <b>259</b> |
| Computational Hermeneutics: Using Computers to Interpret<br>Philosophical Arguments,<br>by David Fuenmayor and Christoph Benzmüller . . . . .                        | 261        |
| Logical Instrumentalism and Linear Logic,<br>by Teresa Kouri Kissel . . . . .                                                                                        | 263        |
| Evidence and self-evidence in the foundations of logic,<br>by Srećko Kovač . . . . .                                                                                 | 264        |
| Identifying Logical Evidence, by Ben Martin . . . . .                                                                                                                | 265        |
| <b>Around Peirce . . . . .</b>                                                                                                                                       | <b>268</b> |
| A dinner with Charley, by Gaetano Albergo . . . . .                                                                                                                  | 269        |

|                                                                                                                                                                  |            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Frege and Peirce on the signs of generality,<br>by Ahti-Veikko Pietarinen & Francesco Bellucci . . . .                                                           | 271        |
| Peirce and distributivity, by Rodolfo C. Ertola Biraben . . . .                                                                                                  | 273        |
| Peirce on the Identity of Truth and Reality,<br>by Joshua David Black . . . . .                                                                                  | 274        |
| Logical Consequence in the Diagrammatic System of Assertive<br>Graphs, by Daniele Chiffi & Ahti-Veikko Pietarinen . .                                            | 275        |
| A Generic Figures Reconstruction of Peirce's Existential Graphs<br>(Alpha), by Jonathan Gangle & Gianluca Caterina . .                                           | 277        |
| C.S. Peirce's Existential Graphs as a Universal Tool<br>for Constructing Logical Systems, by Javier Legris . .                                                   | 279        |
| A Peircean Logic of Operations, by William James McCurdy                                                                                                         | 281        |
| G. Boole, A. De Morgan and C.S. Peirce at the birth<br>of symbolic logic, by Cassiano Terra Rodrigues . . . .                                                    | 282        |
| <b>The Lvov-Warsaw School: Past, Present and Future . . . .</b>                                                                                                  | <b>284</b> |
| Methodological peculiarities of the Lvov-Warsaw School,<br>by Marcin Będkowski, Anna Brożek, Alicja Chybińska,<br>Stepan Ivanyk & Dominik Traczykowski . . . . . | 286        |
| On Ludwik Borkowski's philosophico-logical views,<br>by Bożena Czernecka-Rej . . . . .                                                                           | 287        |
| Free Ontology as the logic for reism, by Jan Czerniawski . . .                                                                                                   | 288        |
| From Aristotle to Lvov-Warsaw School, by Angel Garrido . .                                                                                                       | 288        |
| Jan Łukasiewicz and Many-Valued Logic, by Angel Garrido .                                                                                                        | 292        |
| On Grzegorzczyk's Logics of Descriptions and Descriptive<br>Equivalences, by Joanna Golińska-Pilarek<br>& Taneli Huuskonen . . . . .                             | 293        |
| On the Notion of Independence, by Joanna Grygiel . . . . .                                                                                                       | 296        |
| Stanisław Jaśkowski and the first textbook based on Natural<br>Deduction, by Andrzej Indrzejczak . . . . .                                                       | 297        |
| Methodological aspects of research on the Ukrainian branch<br>of the Lvov-Warsaw School, by Stepan Ivanyk . . . . .                                              | 298        |
| Polish trends in the logic of questions,<br>by Dorota Leszczyńska-Jasion . . . . .                                                                               | 298        |
| Ontology of logic and mathematics in the Lvov-Warsaw School,<br>by Roman Murawski . . . . .                                                                      | 300        |
| The application of Cz. Lejewski's Chronology in determining<br>mereological genidentity, by Marek Porwolik . . . . .                                             | 300        |
| Lvov-Warsaw School and the Artificial Intelligence,<br>by Dariusz Surowik . . . . .                                                                              | 301        |

|                                                                                                                                                 |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| The Axiom of Choice and the Road Paved by Sierpiński,<br>by Valérie Lynn Therrien . . . . .                                                     | 303 |
| Jerzy Łoś' Juvenilia,<br>by Marcin Tkaczyk & Anna Maria Karczewska . . . .                                                                      | 304 |
| Abstraction principles via Leśniewskian definitions:<br>potential infinity and arithmetic, by Rafał Urbaniak .                                  | 305 |
| Jerzy Śłupecki and the Consequence Operation,<br>by Jan Woleński . . . . .                                                                      | 306 |
| The Rasiowa-Pawlak School: From Algebra of Logic<br>to Algebra of Data (and Back), by Marcin Wolski . . .                                       | 307 |
| The Lvov-Warsaw School and Indian Logic, by Piedad Yuste                                                                                        | 308 |
| How to reply today to the issues raised by Kazimierz<br>Twardowski in his <i>Images and Concepts</i> (1898)?,<br>by Urszula M. Żegleń . . . . . | 308 |
| <b>Reflections on Paraconsistency</b> . . . . .                                                                                                 | 310 |
| (De)motivating Gluts, by Jonas R. Becker Arenhart<br>& Ederson Safra Melo . . . . .                                                             | 312 |
| The Role of Paraconsistency in Scientific Change,<br>by Hakob Barseghyan . . . . .                                                              | 313 |
| A paraconsistent approach to da Costa's deontic logic:<br>beyond contradictions and triviality,<br>by Gregory Carneiro . . . . .                | 314 |
| On the Possibility of Dialetheic Metaphysics,<br>by Ebubekir Muhammed Deniz . . . . .                                                           | 315 |
| Paradoxes, Hypodoxes, Hypodox-paradox duality<br>and Hypodoxical Paradoxes, by Peter Eldridge-Smith                                             | 316 |
| What is a Contradiction?, by Ben Martin . . . . .                                                                                               | 317 |
| How to Compose Models in Belnapian Dynamic Logic?,<br>by Manuel A. Martins & Diana Costa . . . . .                                              | 321 |
| It Was So Revolting I Couldn't Take my Eyes Off It,<br>by Graham Priest . . . . .                                                               | 323 |
| Paraconsistency meets refutation: a case of maximality,<br>by Adam Trybus . . . . .                                                             | 324 |
| Reasoning about Complexity Needs Reflections<br>on Paraconsistency, by Max Urchs . . . . .                                                      | 325 |
| On the Possibility of Metaphysical Dialetheism,<br>by Katherine Valde . . . . .                                                                 | 326 |
| <b>Logic, Probability and their Generalizations</b> . . . . .                                                                                   | 328 |
| Is there any really autonomous proof for the non-existence of<br>probabilistic inductive support?, by Máira Bittencourt                         | 329 |

|                                                                                                                                                                             |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| A generalization of Popper's probability theory,<br>by Juliana Bueno-Soler . . . . .                                                                                        | 331 |
| Paraconsistent autonomous probabilities, by Walter Carnielli                                                                                                                | 332 |
| Logical Modalities in Statistical Models,<br>by Julio Michael Stern, Luís Gustavo Esteves,<br>Rafael Izbicki & Rafael Bassi Stern . . . . .                                 | 334 |
| Probability Valuations, by Joachim Mueller-Theys . . . . .                                                                                                                  | 335 |
| On the universality of the probability concepts,<br>by Vladimir Reznikov . . . . .                                                                                          | 337 |
| Paraconsistency, evidence and probability, by Abílio Rodrigues<br>& Walter Carnielli . . . . .                                                                              | 338 |
| <b>Logic for Dynamic Real-World Information</b> . . . . .                                                                                                                   | 340 |
| Impacts of Statistical Learning Theory for Enterprise<br>Software, by Erik Marcade . . . . .                                                                                | 345 |
| Datalog access to real-world web services,<br>by John Samuel & Christophe Rey . . . . .                                                                                     | 345 |
| Singular reference, dynamic thoughts and spatial<br>representation, by Carlos Mario Márquez Sosa . . . . .                                                                  | 347 |
| Smart, Sentient and Connected: Trends and Directions in<br>Information-Driven Applications, by David Stodder . .                                                            | 348 |
| Logic-Grounded Ontological Fusion of Sensor Data<br>and Natural Language, by Erik Thomsen . . . . .                                                                         | 348 |
| A Universal (?) Framework for Representing Knowledge about<br>Real World Phenomena, by Uwe Wolter<br>& Cyril Pshenichny . . . . .                                           | 349 |
| <b>Naming Logics II</b> . . . . .                                                                                                                                           | 352 |
| In which sense <i>symbolic logic</i> is symbolic?,<br>by Jean-Yves Beziau . . . . .                                                                                         | 353 |
| In which sense informal logic is informal?, by Vedat Kamer .                                                                                                                | 354 |
| Is logic a theory of symbolization?, by Arnaud Plagnol . . . .                                                                                                              | 356 |
| Logic, Philosophy and Philosophical Logic,<br>by Ricardo Silvestre . . . . .                                                                                                | 358 |
| <b>Logics and Metalogics</b> . . . . .                                                                                                                                      | 359 |
| Society semantics and meta-levels of many-valued logic,<br>by Walter Carnielli . . . . .                                                                                    | 361 |
| Dialetheic Validity, by Graham Priest . . . . .                                                                                                                             | 362 |
| Formalizing Ontological Disputes of the Systems<br>in Metaphysics by Augmenting First Order<br>Quantificational Logic: A Meta-logical Inquiry,<br>by Jolly Thomas . . . . . | 363 |

|                                                                                                                                                                                 |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Sociology and Anthropology of Logic: Past and Present . .</b>                                                                                                                | 364 |
| Pathologies of rationalities and embodied logic: Malebranche's<br>conception of Madness as a case study,<br>by Delphine Antoine-Mahut . . . . .                                 | 366 |
| Later Wittgenstein: Logic, Necessity and Social Practice,<br>by Sorin Bangu . . . . .                                                                                           | 367 |
| When Science Is and Isn't Paraconsistent,<br>by Gregory Rupik & Hakob Barseghyan . . . . .                                                                                      | 369 |
| Anthropology and Sociology of Logic as a Norm in the Middle<br>Ages, by Julie Brumberg-Chaumont . . . . .                                                                       | 371 |
| The Grammar of Conflict, by Kevin M. Cahill . . . . .                                                                                                                           | 371 |
| Hegel on the Naturalness of Logic, by Elena Ficara . . . . .                                                                                                                    | 373 |
| Pathology of logical thought: Paranoia as a case study,<br>by Samuel L     . . . . .                                                                                            | 374 |
| Analyzing the Logic of the Unconscious. Notes on the Work<br>of Ignacio Matte Blanco and its Ramifications,<br>by Andreas Mayer . . . . .                                       | 375 |
| The Contention over Algebra and the Perpetual Peace<br>of Intuitionism. On the Role of Linguistic Modelling<br>and Formalism in Quantum Mechanics,<br>by Stefano Papa . . . . . | 375 |
| Learning Logic in a Department of Philosophy:<br>An Ethnographical Account, by Claude Rosental . . .                                                                            | 376 |
| Logic-in-Action? AlphaGo, Surprise Move 37 and Interaction<br>Analysis, by Philippe Sormani . . . . .                                                                           | 378 |
| <b>Hintikka's Logical Thought . . . . .</b>                                                                                                                                     | 380 |
| World Lines Semantics and the Contingent <i>A Priori</i> ,<br>by Matthieu Fontaine . . . . .                                                                                    | 381 |
| Tableau Approach to Epistemic Logic Based on Relating<br>Logics, by Krzysztof Krawczyk & Tomasz Jarmu     .                                                                     | 383 |
| Dialogues and Strategies in Aristotle's Logic: Furthering Hin-<br>tikka's Insights, by Zoe McConaughy . . . . .                                                                 | 384 |
| Hintikka on the "Kant-Frege view": A critical assessment,<br>by Giovanni Mion . . . . .                                                                                         | 385 |
| <b>Logic for Children . . . . .</b>                                                                                                                                             | 387 |
| Community of Philosophical Inquiry, by Anne Brel Cloutier .                                                                                                                     | 389 |
| Visualization as Restructuring and thus a Source of Logical<br>Paradox, by Andrius Jonas Kulikauskas . . . . .                                                                  | 391 |
| Elementary introduction to pasting,<br>by Fernando Lucatelli Nunes . . . . .                                                                                                    | 393 |

|                                                                                                                                                              |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Subjectivism and inferential reasoning on teaching practice,<br>by Laura Rifo . . . . .                                                                      | 393 |
| <b>Categories and Logic</b> . . . . .                                                                                                                        | 395 |
| Proof Diagrams as Concurrent Syntax for Sequent Calculi,<br>by Matteo Acclavio . . . . .                                                                     | 396 |
| $\kappa$ -filter pairs and non-finitary logics, by Peter Arndt,<br>Hugo Luiz Mariano & Darllan Conceição Pinto . . . . .                                     | 397 |
| Beyond the categorial forms of the Axiom of Choice,<br>by Andreas B.M. Brunner, Darllan Conceição Pinto,<br>Hugo Luiz Mariano & Samuel G. da Silva . . . . . | 398 |
| Boole-Weyl Algebras in a Categorical Context,<br>by Rafael Diaz . . . . .                                                                                    | 400 |
| Logical rules are fractions, by Dominique Duval . . . . .                                                                                                    | 400 |
| Makkai duality, descent and definability, by Jesse Han . . . . .                                                                                             | 401 |
| Fibrations of contexts beget fibrations of toposes,<br>by Sina Hazratpour . . . . .                                                                          | 402 |
| An Abstract Approach to Algebraizable Logics<br>with Quantifiers, by Caio de Andrade Mendes<br>& Hugo Luiz Mariano . . . . .                                 | 403 |
| Interchangeable formulas and categories of logics,<br>by Francisco Antonio Vibrentis<br>& José Luis Castiglioni . . . . .                                    | 404 |
| Galois theory for computable numbers, by Konrad Voelkel . . . . .                                                                                            | 406 |
| Differential Geometry in Modal Type Theory,<br>by Felix Wellen . . . . .                                                                                     | 406 |
| A Pierce representation theorem for varieties with BFC,<br>by William Zuluaga . . . . .                                                                      | 407 |
| <b>Logic, Law and Legal Reasoning</b> . . . . .                                                                                                              | 409 |
| Analogical Reasoning in Dworkin's Law as Interpretation,<br>by Wilson Anosike . . . . .                                                                      | 411 |
| The Interaction of Logic and Jurisprudence in the Islamic<br>Tradition: A Genealogy of a Long-Lasting<br>Antagonism, by Zidani Farid . . . . .               | 412 |
| Ludics for modelling the role of a judge during legal debates,<br>by Christophe Fouqueré & Myriam Quatrini . . . . .                                         | 413 |
| Textual Discourse Analysis: Towards an Illocutionary-<br>Argumentative Model for the International Legal<br>Discourse, by Hális A.N. França . . . . .        | 414 |
| Abū Ishāq al-Shīrāzī's System of Co-Relational Inferences<br>by Indication, by Muhammad Iqbal . . . . .                                                      | 416 |

|                                                                                                                                                                                      |            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| A Dialogical Framework for Analogy in European Legal Reasoning, by Hans Christian Nordtveit Kvernenes . .                                                                            | 417        |
| Vagueness in the Law and the Sorites Paradox,<br>by Sébastien Lacroix . . . . .                                                                                                      | 419        |
| Abductive Inference in Legal Reasoning: Reconceiving Res Ipsa Loquitur, by Douglas Lind . . . . .                                                                                    | 420        |
| A Formal Analysis of (Human) Rights and (State) Duties,<br>by Réka Markovich . . . . .                                                                                               | 422        |
| Cohen's Criticisms of the Use of Probability in the Law,<br>by David Miller . . . . .                                                                                                | 425        |
| Narrations in judiciary fact-finding and the difficulty about<br>conjunction, by Rafał Urbaniak . . . . .                                                                            | 426        |
| Coping with inconsistencies in legal reasoning, by Max Urchs                                                                                                                         | 429        |
| <b>Logic and Physics . . . . .</b>                                                                                                                                                   | <b>430</b> |
| From Quantum to Cognition, by Bob Coecke . . . . .                                                                                                                                   | 431        |
| Theory of Forms: a reconstruction of ancient metaphysics<br>applied to the logical foundations of modern physics,<br>by Douglas Moore . . . . .                                      | 431        |
| Eigenlogic, by Zeno Toffano . . . . .                                                                                                                                                | 433        |
| A Categorical Reconstruction of Quantum Theory,<br>by Sean Tull . . . . .                                                                                                            | 435        |
| Negations and Truth-perspectives pertaining to Qudit based<br>Multi-valued Quantum Computational Logics,<br>by Ranjith Venkatrama, Roberto Giuntini<br>& Giuseppe Sergioli . . . . . | 437        |
| <b>15 Sessions . . . . .</b>                                                                                                                                                         | <b>439</b> |
| <b>Universal . . . . .</b>                                                                                                                                                           | <b>439</b> |
| Logics as models versus logics as proposals, by Pavel Arazim                                                                                                                         | 439        |
| Preservationist Consequence and Logical Pluralism,<br>by Bryson Brown . . . . .                                                                                                      | 440        |
| Universal Logic $\stackrel{?}{=}$ Logic of the Universal, by Laurent Dubois .                                                                                                        | 442        |
| Characterizing Context-Independent Logical Notions Among<br>the Context-Dependent Ones. The Case of<br>Quantifiers and Inferences, by Stanisław Krajewski . .                        | 443        |
| Intensionality as a unifier: Logic, Language and Philosophy,<br>by María Manzano, Manuel A. Martins<br>& Manuel C. Moreno . . . . .                                                  | 445        |
| Semantics for combined Hilbert calculi, by Sérgio Marcelino<br>& Carlos Caleiro . . . . .                                                                                            | 446        |

|                                                                                                                                                                                                           |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Modular analysis of Hilbert calculi, by Sérgio Marcelino<br>& Carlos Caleiro . . . . .                                                                                                                    | 447 |
| On Dissent Pluralism and Paradigm-shifts from plural<br>perspectives, by Tony Marmo . . . . .                                                                                                             | 448 |
| Disjunctive and conjunctive multiple-conclusion consequence<br>relations, by Marek Nowak . . . . .                                                                                                        | 449 |
| S5 is a semi-bivalent logic, and so is classical logic,<br>by Fabien Schang . . . . .                                                                                                                     | 450 |
| Tarski: Logical Concepts as Invariants, by Jan Woleński . . .                                                                                                                                             | 452 |
| <b>Modal</b> . . . . .                                                                                                                                                                                    | 453 |
| Polynomial Semantics for Normal Modal Logics,<br>by Juan C. Agudelo-Agudelo . . . . .                                                                                                                     | 453 |
| Divided modality for Ockhamists, by Jacob Archambault . . .                                                                                                                                               | 454 |
| Hypersequential Argumentation Frameworks:<br>An Instantiation in the Modal Logic S5,<br>by AnneMarie Borg and Ofer Arieli . . . . .                                                                       | 454 |
| Completeness of a Fragment of Buridan’s Modal Logic,<br>by Spencer Johnston . . . . .                                                                                                                     | 456 |
| Topology and Measure in Logics for Point-free Space,<br>by Tamar Lando . . . . .                                                                                                                          | 456 |
| Intensional: what it is about?, by Antonia Huertas,<br>María Manzano & Manuel C. Moreno . . . . .                                                                                                         | 458 |
| Moving from the Opposition of Normal and Non-Normal Modal<br>Logics to Universal Logic: Synthesizing T, S4, Tr,<br>Verum and Falsum systems by the Square and Hexagon,<br>by Vladimir Lobovikov . . . . . | 459 |
| The Logic of Change LC enriched by Leibnizian modalities,<br>by Marcin Łyczak . . . . .                                                                                                                   | 460 |
| Correctness and Strong Completeness for Logic of Time and<br>Knowledge, by Bojan Marinković, Zoran Ognjanović<br>& Paola Glavan . . . . .                                                                 | 461 |
| Modal logics obtained by means of Jaśkowski’s model<br>of discussion, by Marek Nasieniewski,<br>Krystyna Mruczek-Nasieniewska<br>& Andrzej Pietruszczak . . . . .                                         | 462 |
| A Modal Logics Framework for the Modeling of Human<br>Reasoning, by Serge Robert . . . . .                                                                                                                | 464 |
| Notes on logic of a certain Leibnizian contingency theory,<br>by Kordula Świątorzecka . . . . .                                                                                                           | 465 |

|                                                                                                                                                                          |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Modal approach to region-based theories of space:<br>undecidability of modal definability, by Tinko Tinchev                                                              | 466 |
| On the modal and first-order definability, by Tinko Tinchev<br>& Philippe Balbiani . . . . .                                                                             | 467 |
| <b>Non-Classical Logics</b> . . . . .                                                                                                                                    | 469 |
| Abduction for Reconstructing Proto-Languages,<br>by Cristina Barés Gómez, Ángel Nepomuceno-Fernández<br>& Francisco Salguero . . . . .                                   | 469 |
| Universal Logic and Generalized Probability Theory,<br>by Huacan He & Yanquan Zhou . . . . .                                                                             | 471 |
| The Syllogistic System: A Paraconsistent Logic Model<br>for Human Reasoning, by Bora Kumova . . . . .                                                                    | 472 |
| A Probabilistic Interpretation for an Intuitionistic Sequent<br>Predicate Calculus with Strong Negation,<br>by François Lepage . . . . .                                 | 474 |
| A basic dual intuitionistic logic, by José M. Méndez,<br>Gemma Robles & Francisco Salto . . . . .                                                                        | 476 |
| Many-Valued Decision Logic for Rough Sets,<br>by Yotaro Nakayama, Seiki Akama & Tetsuya Murai .                                                                          | 477 |
| On a correspondence of positive and negative modalities<br>on the basis of some non-normal logics,<br>by Marek Nasieniewski<br>& Krystyna Mruczek-Nasieniewska . . . . . | 478 |
| Fuzzy Logic and Communication in a Social Context,<br>by Rohit Parikh . . . . .                                                                                          | 480 |
| Expansions of relevance logics with a quasi-Boolean negation<br>of intuitionistic character, by Gemma Robles . . . . .                                                   | 481 |
| A pluralist account of relevant implication and a sequent cal-<br>culus for classical logic's version, by Peter Verdée . . .                                             | 483 |
| S-shape Transconsistent Logic System,<br>by Jincheng Zhang & Yanquan Zhou . . . . .                                                                                      | 484 |
| Universal M-Valued logic, by Tihomir Žilić, Mario Essert,<br>Ivana Kuzmanović, & Juraj Benić . . . . .                                                                   | 485 |
| <b>Argumentation</b> . . . . .                                                                                                                                           | 486 |
| Abduction in Unconceded-Preserving Dialogues,<br>by Matthieu Fontaine & Cristina Barés Gómez . . . .                                                                     | 486 |
| Analytic Tableaux for Argumentation Frameworks,<br>by Fernando Tohmé & Gustavo Adrián Bodanza . . .                                                                      | 488 |
| How not to aggregate reasons, by Frank Zenker . . . . .                                                                                                                  | 490 |
| <b>Language and Semiotics</b> . . . . .                                                                                                                                  | 492 |

|                                                                                                                                                      |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| How Combinatory Logic can be used to formalize meanings,<br>by Jean-Pierre Desclés . . . . .                                                         | 492 |
| The Structural Unconscious: the Logic of Differences,<br>by Ricardo Jardim . . . . .                                                                 | 493 |
| A Structural Semiotic Study of How We Use Variables<br>in Math and Logic, by Andrius Jonas Kulikauskas . .                                           | 494 |
| The origin of semantics in formal languages,<br>by Víctor Aranda Utrero . . . . .                                                                    | 496 |
| Bilingual Logic Based on the Scientific Method System,<br>by Xiaohui Zou & Shunpeng Zou . . . . .                                                    | 497 |
| <b>Tools and Results</b> . . . . .                                                                                                                   | 500 |
| A second order propositional logic with subtyping,<br>by Nino Guallart . . . . .                                                                     | 500 |
| The generalized probability theory and intelligent<br>information processing, by Huacan He<br>& Yanquan Zhou . . . . .                               | 501 |
| Tableau Systems for Epistemic Interpretations of Jerzy Łoś'<br>$\mathcal{R}$ -Operator Logics, by Krzysztof Krawczyk<br>& Tomasz Jarmużek . . . . .  | 501 |
| A Natural Deduction System for Leśniewski's Protothetic,<br>by Pierre Joray . . . . .                                                                | 502 |
| Comparing Classical and Relativistic Kinematics<br>in First-Order Logic, by Koen Lefever<br>& Gergely Székely . . . . .                              | 504 |
| Type Theory and the Theory of Forms, by Goran Lojkić . . .                                                                                           | 505 |
| Coloring Venn Diagrams, by Raja Natarajan . . . . .                                                                                                  | 506 |
| Some mathematical approaches for defining the notion<br>of quasi-topology, by Anca Christine Pascu,<br>Jean-Pierre Desclés & Ismaïl Biskri . . . . . | 507 |
| On Generalized Unified Boolean-Fregean Semantics,<br>by Sergey Pavlov . . . . .                                                                      | 508 |
| The Rule of Explicit Substitution into (Hyper)intensional<br>Contexts, by Jiří Raclavský . . . . .                                                   | 509 |
| Nested Sequents, Focusing and Synthetic Connectives,<br>by Lutz Straßburger . . . . .                                                                | 510 |
| Embodiment of some Logical, Computable and Categorical<br>Notions by a Logic of Operators,<br>by Benoît Sauzay & Gaëll Guibert . . . . .             | 512 |
| On First-order Mereological Complementation,<br>by Hsing-chien Tsai . . . . .                                                                        | 513 |

|                                                                                                                                                                                        |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Philosophy</b> . . . . .                                                                                                                                                            | 515 |
| Philosophy, Art, Science, Economy (PHASE) of self<br>and internal integrity, by Tal Dotan Ben-Soussan<br>& Patrizio Paoletti . . . . .                                                 | 515 |
| Is Life Logical? Application of the Peirce-Leśniewski-Tarski<br>Meta-Logics to the Organic Mathematics<br>of the Perplexity of Natural Sorts and Kinds,<br>by Jerry Chandler . . . . . | 516 |
| A Formal Representation of Reasoning for Chemistry,<br>by Michèle Friend . . . . .                                                                                                     | 520 |
| A Common Framework for the Empirical Sciences,<br>by Maurício Vieira Kritz . . . . .                                                                                                   | 521 |
| The Analytic and the Synthetic. From Homology<br>to Heterology, by Sylvain Lavelle . . . . .                                                                                           | 522 |
| The logic of content and contentual understanding<br>of sentences, by Piotr Lukowski . . . . .                                                                                         | 524 |
| Stereology, by Nikolay Milkov . . . . .                                                                                                                                                | 524 |
| What Philosophy of Logic are we Teaching?,<br>by Elizabeth Olsen . . . . .                                                                                                             | 525 |
| A Reply to Logical Revisionists: Strict Finitism, Feasibility<br>and Structural Rules, by Fabrice Pataut . . . . .                                                                     | 527 |
| Knowledge, Behavior, and Rationality,<br>by Todd Stambaugh & Rohit Parikh . . . . .                                                                                                    | 530 |
| On the Status of Questions in the Practice of Science,<br>by William Rawleigh . . . . .                                                                                                | 531 |
| On the universality of the principle of determination,<br>by Denis Vernant . . . . .                                                                                                   | 532 |
| Logic does not distinguish any extralogical content,<br>by Jan Woleński . . . . .                                                                                                      | 533 |
| <b>Computation</b> . . . . .                                                                                                                                                           | 534 |
| Is Classical Mathematics Appropriate for Theory<br>of Computation?, by Farzad Didehvar . . . . .                                                                                       | 534 |
| Methodological Principles for Program Logic Construction,<br>by Vitalii Gavryluk and Mykola Nikitchenko . . . . .                                                                      | 534 |
| Turing's Fallacy of Substitution, by Timm Lampert . . . . .                                                                                                                            | 536 |
| Towards formalizing finite set Combinatorics in Type theory,<br>by Raja Natarajan & Abhishek Kr. Singh . . . . .                                                                       | 537 |
| Direct Products on Computing Languages and Models:<br>A preliminary, by Cyrus F. Nourani<br>& Johannes Fähndrich . . . . .                                                             | 538 |

|                                                                                                                                                             |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Extending Classical Logic with Quasiary Predicates,<br>by Mykola Nikitchenko & Stepan Shkilniak . . . . .                                                   | 540 |
| Rules versus Axioms: a Constructive View of Theories,<br>by Andrei Rodin . . . . .                                                                          | 541 |
| Hypercomputation and Philosophy of Mathematics,<br>by Krzysztof Wójtowicz . . . . .                                                                         | 542 |
| A Universal Language for First-Order Constraints,<br>by Uwe Wolter . . . . .                                                                                | 543 |
| <b>History</b> . . . . .                                                                                                                                    | 545 |
| Logic Functions in the Philosophy of Al-Farabi,<br>by Abduljaleel Kadhim Alwali . . . . .                                                                   | 545 |
| A New Method of Demonstration for Aristotle’s Ontological<br>Syllogistic, by Emre Arda Erdenk . . . . .                                                     | 546 |
| Does the Metalogic that Underlies the Aristotelian Logic<br>Resemble what Timothy Williamson Calls<br>a “Folk Logic”?, by Stamatios Gerogiorgakis . . . . . | 548 |
| Interpretations of Chance within the Dialectic,<br>by Paul M. Healey . . . . .                                                                              | 550 |
| The Essence of Transformation in Methods of Inference<br>in Medieval Islam, by Fatma Karaismail . . . . .                                                   | 551 |
| The Principle of Excluded Middle in Kant, by Esma Kayar . . . . .                                                                                           | 552 |
| Nondeterminism and Chinese Traditional Logic,<br>by Yu Li & JianMing Zhou . . . . .                                                                         | 553 |
| Eristic and the origin of logic, by Geneviève Lachance . . . . .                                                                                            | 555 |
| Should Hegel’s theory of the syllogism be included<br>in the history of logic?, by Brian MacPherson . . . . .                                               | 556 |
| A justification for Aristotle’s Thesis on the basis of the law<br>of non-contradiction, by Sara Ipakchi . . . . .                                           | 558 |
| Renaissance Analysis as a Solution to the Problem<br>of Induction, by John Martin . . . . .                                                                 | 559 |
| Alsted’s Encyclopedia, by Ruxandra Irina Vulcan . . . . .                                                                                                   | 559 |
| Two Syllogisms in the <i>Mozi</i> : Chinese Logic and Language,<br>by Byeong-uk Yi . . . . .                                                                | 560 |
| <b>Algebra and Category</b> . . . . .                                                                                                                       | 561 |
| A Constructive Proof of Coherence Theorem for Symmetric<br>Monoidal Category, by Matteo Acclavio . . . . .                                                  | 561 |
| Filter pairs: A new way of presenting logics, by Peter Arndt,<br>Ramon Jansana, Hugo Luiz Mariano<br>& Darllan Conceição Pinto . . . . .                    | 562 |

|                                                                                                                                                                                                                  |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Swap Structures and non-deterministic algebraization<br>of logics, by Aldo Figallo-Orellano, Marcelo Esteban<br>Coniglio & Ana Claudia Golzio . . . . .                                                          | 563 |
| Dual Logic Concepts based on Mathematical Morphology<br>in Stratified Institutions: Applications to Spatial<br>Reasoning, by Alexandre Goy, Marc Aiguier & Is-<br>abelle Bloch . . . . .                         | 565 |
| Categorical semantics for a variation of subjective logic,<br>by Nino Guallart & Ángel Nepomuceno-Fernández . .                                                                                                  | 568 |
| Analogies of meaning across logic and categories,<br>by Gaëll Guibert & Benoît Sauzay . . . . .                                                                                                                  | 569 |
| Strong Standard Completeness of IUL plus $t \Leftrightarrow f$ ,<br>by Sándor Jenei . . . . .                                                                                                                    | 570 |
| Prime and maximal filters for the free algebra<br>in the subvariety of BL-algebras generated<br>by $[0, 1]_{\mathbf{MV}} \oplus H$ , by Noemí Lubomirsky,<br>Manuela Busaniche & José Luis Castiglioni . . . . . | 571 |
| On Two Mutually Inverse Isomorphisms between NEmHC<br>and NEK4.Grz, by Alexei Muravitsky . . . . .                                                                                                               | 572 |
| Visualizing Geometric Morphisms, by Eduardo Ochs . . . . .                                                                                                                                                       | 574 |
| Semantic Construction for Hilbert's Category,<br>by Eleonoura Enoque da Silva, Giovanni Silva Queiroz<br>& Enoaldo Enoque da Silva . . . . .                                                                     | 574 |
| <b>Philosophy of Mathematics</b> . . . . .                                                                                                                                                                       | 575 |
| Universality and intersubjectivity of mathematical<br>constructions. <i>Toward a dialogical reading of Brouwer's<br/>proof of the bar theorem</i> , by Clément Lion . . . . .                                    | 575 |
| Discovery in mathematics from a heuristic perspective:<br>the case of the calculus and its development,<br>by Giulia Miotti . . . . .                                                                            | 576 |
| What is Law?: the perception of Category Theory,<br>by Nick Rossiter & Michael Heather . . . . .                                                                                                                 | 578 |
| Is the Logic Behind Cantor's Theory of Transfinite Numbers<br>Sound?, by Erdiñç Sayan . . . . .                                                                                                                  | 579 |
| Visual Images and Non-Deductive Rules in Mathematical<br>Discovery, by Irina Starikova . . . . .                                                                                                                 | 580 |
| Structural investigation of the categorial logic-geometrical<br>system, by Krzysztof Śleziński . . . . .                                                                                                         | 581 |
| Explanation and Existence in Mathematics,<br>by Krzysztof Wójtowicz . . . . .                                                                                                                                    | 582 |

|                                                                                                                                                                                           |                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>16 Contest Logic Prizes</b>                                                                                                                                                            | <b>585</b>     |
| <b>A prize of Logic in every country!</b> . . . . .                                                                                                                                       | 586            |
| <b>Logic Prizes around the world</b> . . . . .                                                                                                                                            | 587            |
| Newton da Costa Logic Prize, in Brazil . . . . .                                                                                                                                          | 587            |
| Schotch-Jennings Logic Prize, in Canada . . . . .                                                                                                                                         | 588            |
| Georgius Benignus Logic Prize, in Croatia . . . . .                                                                                                                                       | 588            |
| Vasiliev Logic Prize, in Russia . . . . .                                                                                                                                                 | 589            |
| Bimal Krishna Matilal Logic Prize, in India . . . . .                                                                                                                                     | 590            |
| SILFS Italian Logic Prize, in Italy . . . . .                                                                                                                                             | 590            |
| Aristotle Logic Prize, in Italy . . . . .                                                                                                                                                 | 591            |
| Alfred Tarski Logic Prize, in Poland . . . . .                                                                                                                                            | 591            |
| Louis Couturat Logic Prize, in France . . . . .                                                                                                                                           | 591            |
| <b>Talks of Contest Logic Prizes</b> . . . . .                                                                                                                                            | 593            |
| New logics for quantum non-individuals?,<br>by Jonas R. Becker Arenhart . . . . .                                                                                                         | 593            |
| Logics of variable inclusion and Płonka sums of matrices,<br>by Stefano Bonzio . . . . .                                                                                                  | 593            |
| On the modal logic of Jeffrey conditionalization,<br>by Zalán Gyenis . . . . .                                                                                                            | 595            |
| Canonical Extensions and Kripke-Galois Semantics<br>for Non-Distributive Propositional Logics,<br>by Takis Hartonas . . . . .                                                             | 596            |
| Developing Metalogic to Formalize Ontological Disputes<br>of the Systems in Metaphysics by Introducing<br>the Notion of Functionally Isomorphic Quantifiers,<br>by Jolly Thomas . . . . . | 598            |
| FDE, Ł3, K3, RM3, LP: Making Many-Valued Logic Work,<br>by Allen P. Hazen & Francis Jeffry Pelletier . . . . .                                                                            | 599            |
| Abstract logical constants, by Tin Perković . . . . .                                                                                                                                     | 600            |
| Natural Deduction for Regular Three-Valued Logics<br>and their Four-Valued Analogues,<br>by Yaroslav Petrukhin . . . . .                                                                  | 601            |
| A note on a description logic of concept and role typicality,<br>by Ivan Varzinczak . . . . .                                                                                             | 602            |
| <br><b>IV Publishers, Sponsors and Partners</b>                                                                                                                                           | <br><b>605</b> |
| <br><b>17 Book Exhibition</b>                                                                                                                                                             | <br><b>607</b> |

**18 Sponsors and Partners** **609**

**Index of Authors** **611**

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## On definable sets in generic structures

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## The complexity of quasivariety lattices

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We consider two complexity measures of (relative) quasivariety lattices: the  $Q$ -universality and the Nurakunov non-computability property. The concept of  $Q$ -universality was introduced by M.V. Sapir [1] in 1985. A quasivariety  $K$  is  *$Q$ -universal* if, for any quasivariety  $R$  of a finite type, the quasivariety lattice  $L_q(R)$  is a homomorphic image of a sublattice of the quasivariety lattice  $L_q(K)$ . The second complexity measure was suggested by A. M. Nurakunov [2] in 2012. We say that a class  $K$  of algebraic structures of a fixed type has the Nurakunov non-computability property if the set of all (isomorphism types of) finite sublattices of the quasivariety lattice  $L_q(K)$  is not computable.

In [3], it was proved that a class  $K$  is  $Q$ -universal if and only if it contains a subclass which has the Nurakunov non-computability property. In this regard, the following questions arose [cf. 3,4]:

- Does any  $Q$ -universal class  $K$  contain a subclass which has the Nurakunov non-computability property?
- Is there a class of algebraic structures which is not  $Q$ -universal but which has the Nurakunov non-computability property?

A positive answer to the first question was given by M. V. Schwidefsky [4] for almost all the known  $Q$ -universal quasivarieties. The author gives a positive answer to the second question, cf. Theorems 1 and 2 and [5].

**Theorem 1.** If a class  $K$  of algebraic structures of finite type contains an AD-class then it contains continuum many proper subclasses  $K' \subset K$  which have the Nurakunov non-computability property but which are not  $Q$ -universal.

**Theorem 2.** For the following classes  $K$  of algebraic structures, there are continuum many subclasses  $K' \subset K$  which have the Nurakunov non-computability property but which are nevertheless not  $Q$ -universal:

1. *the variety of all unars;*
2. *the variety of all pointed Abelian groups;*
3. *the quasivariety of all [directed] graphs;*
4. *the variety of all differential groupoids;*
5. *the variety of all commutative rings with unit;*
6. *any finite-to-finite universal quasivariety;*
7. *the variety of MV-algebras;*
8. *the variety of Cantor algebras;*
9. *the variety of modular  $(0, 1)$ -lattices;*
10. *the Sapir quasivariety which is generated by a single semigroup.*

In case (1), the classes  $K'$  can be chosen as quasivarieties.

Theorem 1 can be applied to almost all known  $Q$ -universal quasivarieties. In theorem 2, we list just some examples, where theorem 1 applies; this list is however not exhaustive.

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## Strong decidability of the classification over Gl

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## On combinatorial features of definable set systems

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## On e-spectra for families of theories of Abelian groups

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We consider  $e$ -spectra for families of theories of Abelian groups [1]. By  $A, B, \Gamma, E$  we denote the classes of all theories of Abelian groups, whose positive Szmielew invariants are exhausted by  $\alpha_{p,n}, \beta_p, \gamma_p, \varepsilon$ , respectively. For  $X, Y, Z, U \in \{A, B, \Gamma, E\}$  we denote by  $XY, XYZ, XYZU$ , respectively, the set of all theories of Abelian groups whose positive Szmielew invariants are exhausted by corresponding  $\alpha_{p,n}, \beta_p, \gamma_p, \varepsilon$  for  $X, Y, Z, U$ . By  $\mathcal{F}$  we denote the set of all theories of Abelian groups with finite Szmielew invariants. Choose

# Index of Authors

- Acclavio, Matteo, 396, 561  
 Addis, Mark, 239  
 D'Agostini, Franca, 17, 19, 23, 310  
 Agudelo-Agudelo, Juan C., 453  
 Aiguier, Marc, 565  
 Akama, Seiki, 477  
 Akrami, Musa, 4  
 Albergo, Gaetano, 213, 269  
 Alwali, Abduljaleel Kadhim, 4, 545  
 Amgoud, Leila, 111, 486  
 Angius, Nicola, 239  
 Anosike, Wilson, 411  
 Antoine-Mahut, Delphine, 366  
 Aranda Utrero, Víctor, 496  
 Arazim, Pavel, 439  
 Archambault, Jacob, 454  
 Arenhart, Jonas R. Becker, 112, 311, 312, 587, 593  
 Arieli, Ofer, 455  
 Arisaka, Ryuta, 168  
 Armgardt, Matthias, 113, 409  
 Arndt, Michael, 200  
 Arndt, Peter, 395, 397, 562  
 Avo, Antsa Nasandratra Nirina, 99  
 Avron, Arnon, 4  
 Ayari, Yanis, 3  
 Bachelet, Bruno, 3  
 Baizhanov, Sayan, 240  
 Balbiani, Philippe, 467  
 Bangu, Sorin, 367  
 Barés Gómez, Cristina, 469, 487  
 Barseghyan, Hakob, 313, 369  
 Bashmakov, Stepan I., 242  
 Basti, Gianfranco, 224  
 Bazhenov, Nikolay, 243  
 Będkowski, Marcin, 286  
 Bellucci, Francesco, 271  
 Ben-Soussan, Tal Dotan, 19, 25, 515  
 Van Bendegem, Jean Paul, 4  
 Benevides, Mario, 587  
 Benić, Juraj, 485  
 Benignus, Georgius, 589  
 Benoit, Charlotte, 107  
 van Benthem, Johan, 4  
 Benz Müller, Christoph, 100, 261  
 Bernard, Stephan, 3  
 Berni, Jean Cerqueira, 100  
 Beziau, Jean-Yves, 3, 17, 28, 103, 107, 352, 353, 586, 587, 591  
 Bigaj, Tomasz, 591  
 Biraben, Rodolfo C. Ertola, 273  
 Biskri, Ismaïl, 507  
 Bittencourt, Maíra, 329  
 Black, Joshua David, 274  
 Blackburn, Patrick, 4  
 Blechschmidt, Ingo, 114, 395  
 Bloch, Isabelle, 565  
 Bodanza, Gustavo Adrián, 488  
 Bonzio, Stefano, 590, 593  
 Borg, AnneMarie, 454  
 Bornard, Marie, 3  
 Bourdieu, Béatrice, 3  
 Brady, Ross, 5  
 Brier, Søren, 115, 223  
 Brown, Bryson, 440, 588

- Brożek, Anna, 286  
Brumberg-Chaumont, Julie, 19, 30, 364, 371, 592  
Brunner, Andreas, 587  
Brunner, Andreas B.M., 398  
Bryant, Kyle, 100  
Buchsbaum, Arthur, 3  
Bueno-Soler, Juliana, 328, 331  
Busaniche, Manuela, 571  
  
Cahill, Kevin M., 371  
Caleiro, Carlos, 5, 446, 447  
Capolupo, Antonio, 224  
Caramello, Olivia, 19, 34  
Carneiro, Gregory, 100, 314  
Carnielli, Walter, 5, 328, 332, 338, 361  
Cartier, Pierre, 103, 117, 395  
Castiglioni, José Luis, 404, 571  
Caterina, Gianluca, 277  
Chakraborty, Mihir K., 4, 359, 590  
Chandler, Jerry, 516  
Charasse, Cécile, 107  
Chatterjee, Amita, 590  
Chatti, Saloua, 175, 380  
Chevalier, Jean-Marie, 268  
Chiffi, Daniele, 275  
Chlebowski, Szymon, 206  
Chybińska, Alicja, 286  
Citkin, Alex, 19, 36  
Ciucci, Davide, 4  
Cloutier, Anne Brel, 389  
Coecke, Bob, 118, 388, 430, 431  
Coniglio, Marcelo Esteban, 564  
Cordes, Moritz, 186  
Corsi, Giovanna, 590  
Costa, Diana, 321  
da Costa, Newton, 5, 587  
Couturat, Louis, 592  
  
Czelakowski, Janusz, 591  
Czernecka-Rej, Bożena, 287  
Czerniawski, Jan, 288  
  
Demey, Lorenz, 173, 187  
Deniz, Ebubekir Muhammed, 315  
Desclés, Jean-Pierre, 492, 507, 592  
Diaz, Rafael, 400  
Didehvar, Farzad, 534  
Dimarogkona, Maria, 239  
Dionísio, Francisco, 4  
Dória, Francisco Antônio, 587  
Dowek, Gilles, 592  
Dubois, Didier, 103, 119, 469, 592  
Dubois, Laurent, 442  
Dunn, Michael, 5  
Dunning, David, 189  
Dutta, Soma, 121, 359  
Duval, Dominique, 400  
  
Ehrlich, Philip, 244  
Eldridge-Smith, Peter, 316  
Emelyanov, Dmitry, 245  
Erdenk, Emre Arda, 546  
Esbelin, Henri-Alex, 3, 19, 39  
Essert, Mario, 485  
Esteves, Luís Gustavo, 334  
Estrada-González, Luis, 4  
  
Fähndrich, Johannes, 538  
Farid, Zidani, 412  
Farjami, Ali, 100  
Ficara, Elena, 19, 42, 310, 373  
Field, Hartry, 124, 515, 585  
Figallo-Orellano, Aldo, 563  
Fontaine, Matthieu, 381, 486  
Fouqueré, Christophe, 413  
França, Hális A.N., 414  
Friend, Michèle, 5, 520, 585  
Fuenmayor, David, 261

- Gabbay, Dov, 5  
 Gaëll, Guibert, 569  
 Gangle, Jonathan, 277  
 Garrido, Angel, 284, 288, 292  
 Gaultier, Benoit, 268  
 Gavryluk, Vitalii, 534  
 Gazzari, René, 200  
 Gerogiorgakis, Stamatios, 548  
 Ghilardi, Silvio, 590  
 Ghorfi, Tayeb Abderrahmani, 3  
 Giovagnoli, Raffaella, 223, 227  
 Giuntini, Roberto, 437, 590  
 Glavan, Paola, 461  
 Golińska-Pilarek, Joanna, 293  
 Golzio, Ana Claudia, 564  
 Goncharov, Sergey, 125, 238  
 Goodey, Christopher, 127  
 Gourinat, Jean-Baptiste, 19, 45  
 Goy, Alexandre, 565  
 Grygiel, Joanna, 296  
 Guallart, Nino, 500, 568  
 Guibert, Gaëll, 512  
 Gyenis, Zalán, 591, 595
- Han, Jesse, 401  
 Hansen, Casper Storm, 19, 48  
 Hartonas, Takis, 591, 596  
 Hazen, Allen P., 588, 599  
 Hazratpour, Sina, 402  
 He, Huacan, 5, 471, 501  
 Healey, Paul M., 550  
 Heather, Michael, 221, 578  
 Heine, Clemens, 103  
 Heinemann, Anna-Sophie, 185  
 van der Helm, Alfred, 190  
 Hjortland, Ole Thomassen, 129, 259  
 Hlobil, Ulf, 202  
 Hosni, Hykel, 590  
 Hudry, Jean-Louis, 19, 50
- Huertas, Antonia, 458  
 Huuskonen, Taneli, 293
- Indrzejczak, Andrzej, 4, 91, 297, 591  
 Ipakchi, Sara, 558  
 Iqbal, Muhammad, 416  
 Isaac, Manuel Gustavo, 19, 53, 352  
 Ivanyk, Stepan, 286, 298  
 Izbicki, Rafael, 334
- Jäger, Gerhard, 5  
 Jansana, Ramon, 562  
 Jardim, Ricardo, 493  
 Jarmużek, Tomasz, 383, 501  
 Jaspers, Dany, 177  
 Jenei, Sándor, 570  
 Jennings, Ray, 588  
 Johnston, Spencer, 456  
 Joray, Pierre, 20, 55, 502, 592
- Kamer, Vedat, 4, 107, 354  
 Karaismail, Fatma, 551  
 Karczewska, Anna Maria, 304  
 Kassymetova, Maira, 257  
 Kayar, Esma, 552  
 Kiouvrekis, Yiannis, 246, 251, 253  
 Kissinger, Aleks, 130, 430  
 Kolman, Vojtěch, 215  
 Koslow, Arnold, 5  
 Koueya, Nestor, 3  
 Kouri Kissel, Teresa, 263  
 Kovač, Srećko, 4, 264, 588  
 Krajewski, Stanisław, 443  
 Krawczyk, Krzysztof, 383, 501  
 Kritz, Maurício Vieira, 521  
 Krömer, Ralf, 131, 388  
 Kulikauskas, Andrius Jonas, 216, 391, 494

- Kulpeshov, Beibut Sh., 240  
Kumova, Bora, 472  
Kuzmanović, Ivana, 485  
Kvernenes, Hans Christian  
    Nordtveit, 409, 417  
  
Lachance, Geneviève, 555  
Lacroix, Sébastien, 419  
Lampert, Timm, 536  
Lando, Tamar, 456  
Lapointe, Sandra, 588  
Lappalainen, Jonna, 228  
Lavelle, Sylvain, 522  
Lefever, Koen, 504  
Legris, Javier, 192, 279  
Leitsch, Alexander, 132, 199  
Lemanski, Jens, 178  
Lepage, François, 474, 588  
Leszczyńska-Jasion, Dorota, 206,  
    298  
Lézé, Samuel, 374  
Li, Yu, 553  
Lind, Douglas, 420  
Linnebo, Øystein, 4  
Linsbichler, Alexander, 194  
Lion, Clément, 575  
Lisanyuk, Elena, 134, 486, 589  
Lobovikov, Vladimir, 459  
Lojkić, Goran, 505  
Lorenzi, Giulia, 218  
Lorini, Emiliano, 20, 58  
Lovsted, Daniel, 196  
Lowe, Robert, 223, 230  
Lubomirsky, Noemí, 571  
Łukowski, Piotr, 524  
Lutsak, Svetlana, 246  
Łyczak, Marcin, 460  
  
Macbeth, Danielle, 136, 268  
MacCaull, Wendy, 588  
MacPherson, Brian, 556  
  
Madelaine, Florent, 20, 59  
Magnani, Lorenzo, 231  
Makinson, David, 137, 469  
Maksimova, Larisa L., 248  
Malinowski, Grzegorz, 138, 284,  
    285, 585  
Malinowski, Jacek, 591  
Manzano, María, 445, 458  
Marcade, Erik, 345  
Marcelino, Sérgio, 446, 447  
Mariano, Hugo Luiz, 100, 101,  
    397, 399, 403, 562  
Marinković, Bojan, 461  
Markovich, Réka, 422  
Marmo, Tony, 448  
Marquis, Jean-Pierre, 588  
Martin, Ben, 265, 317  
Martin, John, 559  
Martínez-Ordaz, María del  
    Rosario, 139, 311  
Martins, Manuel A., 321, 445  
Matilal, Bimal Krishna, 590  
Max, Ingolf, 211, 219  
Mayer, Andreas, 375  
McConaughey, Zoe, 384  
McCurdy, William James, 20, 62,  
    281  
McGoveran, David, 142, 341  
Melo, Ederson Safrá, 312  
Mendes, Caio de Andrade, 403  
Méndez, José M., 476  
Miginiac, Séverine, 3  
Milkov, Nikolay, 524  
Miller, David, 144, 328, 425  
Minari, Pierluigi, 590  
Mion, Giovanni, 20, 80, 90, 385  
Miotti, Giulia, 576  
Mofidi, Alireza, 248  
Moktefi, Amirouche, 146, 174,  
    185

- Moore, Douglas, 431  
 More, Malika, 20, 59  
 Moreno, Manuel C., 445, 458  
 Moriconi, Enrico, 207  
 Mruczek-Nasieniewska, Krystyna, 462, 478  
 Mueller-Theys, Joachim, 335  
 Mugnier, Marie-Laure, 20, 66  
 Murai, Tetsuya, 477  
 Muravitsky, Alexei, 20, 36, 572  
 Murawski, Roman, 300, 591  
  
 Nakayama, Yotaro, 477  
 Nasieniewski, Marek, 462, 478, 591  
 Natarajan, Raja, 4, 506, 537, 590  
 Ndoj, Albert, 3  
 Németi, István, 5  
 Nepomuceno-Fernández, Ángel, 469, 568  
 Nikitchenko, Mykola, 17, 20, 68, 535, 540  
 Nitulescu, Anca, 101  
 Noll, Thomas, 147, 211  
 Nourani, Cyrus F., 538  
 Nowak, Marek, 449  
 Nunes, Fernando Lucatelli, 387, 393  
  
 Ochs, Eduardo, 387, 574  
 Ognjanović, Zoran, 461  
 Olsen, Elizabeth, 525  
 D'Ottaviano, Itala, 587  
  
 Paoletti, Patrizio, 515  
 Paoli, Francesco, 5  
 Papa, Stefano, 375  
 Parent, Xavier, 100  
 Parikh, Rohit, 103, 148, 359, 480, 530, 590  
 Pascu, Anca Christine, 507  
  
 Paseau, Alexander, 150, 439  
 Pataut, Fabrice, 527  
 Patomäki, Joel, 232  
 Pavlov, Sergey, 508  
 Pavlyuk, Inessa, 248  
 Peckhaus, Volker, 151  
 Pelletier, Francis Jeffry, 588, 599  
 Perdrix, Simon, 153, 430  
 Peretyat'kin, Mikhail G., 249  
 Perkov, Tin, 589, 600  
 Pessoa, Osvaldo, 587  
 Petrukhin, Yaroslav, 589, 601  
 Peybernès, Hélène, 3  
 Piecha, Thomas, 199  
 Pietarinen, Ahti-Veikko, 154, 271, 275, 380, 585  
 Pietruszczak, Andrzej, 4, 462, 591  
 Pinto, Darllan Conceição, 397, 398, 562  
 Pinus, Aleksandr, 250  
 Plagnol, Arnaud, 356  
 Poggiolesi, Francesca, 155, 199, 592  
 Poizat, Bruno, 156, 238, 592  
 Połacik, Tomasz, 591  
 Porwolik, Marek, 300  
 Prade, Henri, 20, 70  
 Pratt, Scott L., 159, 365  
 Priest, Graham, 160, 311, 323, 362  
 Pshenichny, Cyril, 349  
 Ptakhov, Denis, 251  
  
 Quatrini, Myriam, 413  
 Queiroz, Giovanni, 574  
  
 Rabe, Florian, 20, 72  
 Raclavský, Jiří, 509  
 Radico, Mario, 233  
 Rahman, Shahid, 409  
 Randriamahaleo, Solo, 99

- Rawleigh, William, 531  
 Renardel de Lavalette, Gerard  
     R., 204  
 Rey, Christophe, 3, 107, 345, 592  
 Reznikov, Vladimir, 337  
 Rifo, Laura, 393  
 Robert, Serge, 464  
 Roberto, Kaique Matias de  
     Andrade, 101  
 Robles, Gemma, 476, 481  
 Rodin, Andrei, 541  
 Rodrigues, Abílio, 338, 587  
 Rodrigues, Cassiano Terra, 282  
 Rohr, Tabea, 198  
 de Ronde, Christian, 4  
 Rosental, Claude, 364, 376  
 Rossiter, Nick, 221, 578  
 Rousset, Marie-Christine, 20, 73  
 Roussey, Catherine, 3  
 Rupik, Gregory, 369  
  
 Salguero, Francisco, 469  
 Sallantin, Jean, 99  
 Salto, Francisco, 476  
 Salva, Sébastien, 3  
 Samuel1, John, 345  
 Sankappanavar,  
     Hanamantagouda P., 590  
 Satoh, Ken, 168  
 Sauzay, Benoît, 512, 569  
 Sayan, Erdiñç, 579  
 Schang, Fabien, 181, 259, 450  
 Schlaudt, Oliver, 20, 75  
 Schlimm, Dirk, 161  
 Schmid, Anne-Françoise, 162, 545  
 Schotch, Peter K., 588  
 Schroeder-Heister, Peter, 199, 585  
 Schwarz, Eva, 228  
 Sergioli, Giuseppe, 437  
 Shkilniak, Stepan, 540  
  
 Šikić, Zvonimir, 588  
 da Silva, Eleonoura, 574  
 da Silva, Enoaldo, 574  
 da Silva, Samuel G., 398  
 Silvestre, Ricardo, 20, 77, 358  
 Singh, Abhishek Kr., 537  
 Śleziński, Krzysztof, 581  
 Smessaert, Hans, 173  
 Smokrović, Nenad, 588  
 Sodaigui, Cyril, 3  
 Sorensen, Roy, 164, 311  
 Sormani, Philippe, 378  
 Sosa, Carlos Mario Márquez , 347  
 Stambaugh, Todd, 530  
 Starikova, Irina, 580  
 Stefaneas, Petros, 4, 238, 239,  
     246, 251, 253  
 Stepanova, Alena, 251  
 Stern, Rafael Bassi, 334  
 Stodder, David, 348  
 Straßburger, Lutz, 208, 510  
 Sudoplatov, Sergey, 238, 245,  
     246, 248, 251, 253  
 Sundholm, Göran, 165, 353, 585  
 Surowik, Dariusz, 301  
 Świętorzecka, Kordula, 167, 285,  
     465  
 Székely, Gergely, 504  
  
 Tarski, Alfred, 591  
 Therrien, Valérie Lynn, 303  
 Thomas, Jolly, 363, 590, 598  
 Thomsen, Erik, 21, 80, 90, 340,  
     348  
 Tinchev, Tinko, 466, 467  
 Tkaczyk, Marcin, 304  
 Toffano, Zeno, 433  
 Tohmé, Fernando, 488  
 Tomasik, Jerzy, 21, 82  
 van der Torre, Leon, 168, 486,  
     585

- Toumani, Farouk, 3, 107  
 Traczykowski, Dominik, 286  
 Trafford, James, 259  
 Trybus, Adam, 324  
 Tsai, Hsing-chien, 513  
 Tull, Sean, 435  
 Tussupov, Jamalbek A., 253
- Ulbrikht, Olga, 255  
 Urbaniak, Rafał, 305, 426  
 Urchs, Max, 325, 429  
 Urken, Gulzhan, 256  
 Urquhart, Alasdair, 588
- Valde, Katherine, 326  
 Vandoulakis, Ioannis, 17, 21, 84  
 Varzinczak, Ivan, 592, 602  
 Vasiliev, Nicolai Alexandrovich, 589  
 Vasyukov, Vladimir L., 5  
 Venkatrama, Ranjith, 437  
 Verbovskiy, Viktor, 257  
 Verdée, Peter, 483  
 Vernant, Denis, 532  
 Vibrentis, Francisco Antonio, 404  
 Vitiello, Giuseppe, 224  
 Voelkel, Konrad, 406  
 Vuković, Mladen, 589  
 Vulcan, Ruxandra Irina, 559
- Wansing, Heinrich, 5  
 Wellen, Felix, 406
- Wenz, Daniel, 183  
 Wójtowicz, Krzysztof, 542, 582  
 Woleński, Jan, 168, 285, 306, 452, 533  
 Wolski, Marcin, 307  
 Wolter, Uwe, 349, 543  
 Woods, John, 588  
 Wybraniec-Skardowska, Urszula, 284
- Yeshkeyev, Aibat, 255–257  
 Yi, Byeong-uk, 560  
 Yon, Loïc, 3  
 Young, Walter Edward, 169, 409  
 Yun, Veta F., 248  
 Yuste, Piedad, 308
- Zamansky, Anna, 171, 469  
 Žarnić, Berislav, 589  
 Żegleń, Urszula M., 308  
 Zenker, Frank, 21, 93, 490  
 Zhang, Jincheng, 484  
 Zhao, Chuan, 4  
 Zhou, JianMing, 554  
 Zhou, Xunwei, 21, 97  
 Zhou, Yanquan, 471, 484, 501  
 Žilić, Tihomir, 485  
 Zollo, Fabiana, 235  
 Zolyan, Suren, 237  
 Zou, Shunpeng, 497  
 Zou, Xiaohui, 497  
 Zuluaga, William, 407