

Colin S. McLarty

Truman P. Handy Professor of Intellectual Philosophy, and of Mathematics
Case Western Reserve University

211 Clark Hall
Cleveland OH 44106

Phone: (w) 216 368-2632 (h) 440 286-7431
Fax: 216 368-0814
Email: colin.mclarty@case.edu
Homepage: cwru.edu/artsci/phil/mclarty.html

Education

Ph.D. Philosophy, Case Western Reserve University, 1980.

Dissertation: Things and Things in Themselves: The Logic of Reference in Leibniz,
Lambert, and Kant.

Advisors: Raymond J. Nelson and Chin-Tai Kim.

M.A. Philosophy, Case Western Reserve University, 1975.

B.S. Mathematics, Case Institute of Technology, 1972.

Area of Specialization: Logic; history and philosophy of mathematics.

Areas of Competence: Philosophy of Science; History of Philosophy esp. Plato, Kant;
Contemporary French Philosophy.

Employment

Shanxi University, China. Visiting Lecturer, Philosophy of Science and Technology, 2011.

University of Notre Dame, Visiting Associate Professor, Philosophy, Fall 2002.

Harvard University, Visiting Scholar, Mathematics 1995–1996.

Case Western Reserve University, Philosophy 1987–. Chair of Department 1996–2010.

Cleveland State University, Lecturer, Mathematics 1984–1986.

Cleveland Art Institute, Lecturer, Philosophy 1984–1986.

Current Research

My Summer School in Denmark on a structural foundation for mathematics, expanded my Beijing (2007) talk and is now a book forthcoming with OUP. I pursue the perspective one mathematician expressed saying “philosophers should know our objects only have the properties we say they do.” Those are structural properties and in practice rely on *category theory*. My recent articles show how this ontology suits current research. And I have a series of articles on Emmy Noether (1882–1935, generally considered the greatest of woman mathematicians) and Saunders Mac Lane (1909–2005, greatly influenced by Noether) showing how deep the attitude goes in 20th century mathematics.

I write on Alexander Grothendieck’s vast reconception of geometry and number theory. His life is also dramatic, e.g. he was among 5,000 children sheltered from the Nazis in Le Chambon France. I am preparing a biography. For comparison I have published on Greek mathematics and Plato.

On-going technical work on logic is in my *Philosophia Scientiae*, *Theory and Applications of Categories* and *Bulletin of Symbolic Logic* articles, and a series of recent talks and preprints on the set theory of cohomology.

Selected Grants

Co-organizer (with Ralf Krömer and Michael Wright) of a one week Mini-Workshop Category Theory and Related Fields: History and Prospects, Mathematisches Forschungsinstitut Oberwolfach, February 2009.

Director of a six week NEH Summer Seminar: "Proofs and refutations in mathematics today", at CWRU June 25–August 3, 2001.

NSF Science, Society and Technology Studies Scholars Award, \$79,993 for "Alexander Grothendieck and the history of homology theory", 1995–98.

NEH Summer Stipend for "The idea of 'shape' in early topology", 1994.

NEH Summer Seminar Michael Resnik's "Frege and the Philosophy of Mathematics", UNC Chapel Hill, June 8–July 31, 1992.

NEH Summer Institute George Lucas's "Philosophic Uses of Historical Tradition", Clemson University, June 13–July 26, 1990.

Languages

Conversational French.

Speaking and reading German.

Reading and touristic speaking in Dutch and Italian.

Reading ancient Greek.

Basic social Mandarin.

Publications

Book

Elementary Categories, Elementary Toposes, 1992, Clarendon Press Oxford. Paperback 1995.

On a website

A. Rodin ed. "A discussion between Colin McLarty and Andrei Rodin about Structuralism and Categorical Foundations of Mathematics." canoe.ens.fr/rodin/spip/IMG/pdf/colin.pdf

Articles

Forthcoming:

"David Corfield interviewed by Colin McLarty," invited, in draft for a book to grow out of the meeting "Mathematics and Narrative," Delphi, Greece, July 2007.

Pre-prints:

"A finite order arithmetic foundation for cohomology," the mathematics arXiv site, 1102.1773v3

“Zariski cohomology in second order arithmetic,” the mathematics arXiv site, 1207.0276v2

“Set theories mutually interpretable with higher order arithmetic,” the mathematics arXiv site, 1207.6357v1

In Print:

“Foundations as truths which organize mathematics,” *The Review of Symbolic Logic*, Volume 6, Issue 01, (March 2013), 76–86.

“Editor’s introduction: Hypotheses and progress in mathematics,” special Plato issue of *Philosophia Mathematica*, June 2012, pp. 135–42.

“Categorical Foundations and Mathematical Practice,” *Philosophia Mathematica*, February 2012, pp. 111–13

“Theology and its discontents: David Hilbert’s foundation myth for modern mathematics,” invited, A. Doxiades and B. Mazur eds. *Circles Disturbed: The Interplay of Mathematics and Narrative*, Princeton University Press 2012, pp. 105–29.

“Recent Debate over Categorical Foundations” invited, G. Sommaruga ed. *Foundational Theories of Classical and Constructive Mathematics* (Western Ontario Series in Philosophy of Science), Springer-Verlag 2011, pp. 145–154.

“Emmy Noether’s first great mathematics and the culmination of first-phase logicism, formalism, and intuitionism” *Archive for History of Exact Sciences* Volume 65, no. 1 (2011) 99–117.

“What does it take to prove Fermat’s Last Theorem? Grothendieck and the logic of number theory” *Bulletin of Symbolic Logic* Volume 16, Issue 3 (2010), 359–377. Translated as 用什么来证明Fermat大定理? Grothendieck与数论的逻辑, for *Mathematical Advance in Translation*/(数学译林), Chinese Academy of Sciences, 2013 Vol. 32 (3): 214–228.

“The central insight of categorical mathematics,” invited, C. Glymour, W. Wang, D. Westerstahl eds. *Logic, Methodology and Philosophy of Science: Proceedings of the Thirteenth International Congress, Beijing, 2007*. Studies in Logic and Foundations of Mathematics, King’s College Pub’ns, London, 2009.

“Emmy Noether” biographical article for T. Gowers ed. *The Princeton Companion to Mathematics*. Princeton University Press 2008. Pages 800–01.

Two articles: “What structuralism achieves,” and “‘There is no ontology here’: visual and structural geometry in today’s arithmetic,” invited for Paolo Mancosu ed. *The Philosophy of Mathematical Practice*, Oxford University Press, 2008. Pages 354–406.

Biographies of Claude Chevalley, Jean Dieudonné, André Weil (the founders of the group Bourbaki) total 11,000 words. *New Dictionary of Scientific Biography* 2007.

Biography of Garrett Birkhoff, *New Dictionary of Scientific Biography* 2007.

Biography of Saunders Mac Lane, co-authored with William Lawvere, *New Dictionary of Scientific Biography* 2007.

“The Rising Sea: Grothendieck on simplicity and generality I” in Jeremy Gray and Karen Parshall eds. *Episodes in the History of Recent Algebra*, American Mathematical Society, 2007, pp. 301–26.

"The last mathematician from Hilbert's Göttingen: Saunders Mac Lane as a philosopher of mathematics", *British Journal for the Philosophy of Science* **58** (2007), 77-112.

"Two aspects of constructivism in category theory" invited by *Philosophia Scientiae*, Cahier Spécial 6, 2006, 95-114.

"Emmy Noether's 'Set Theoretic' Topology: From Dedekind to the rise of functors", Jeremy Gray and José Ferreirós ed.s *The Architecture of Modern Mathematics: Essays in history and philosophy*, Oxford, 2006, 211-35.

"Saunders Mac Lane and the universal in mathematics" *Scientiae Mathematicae Japonicae*, **19** (2006) 25-28.

"Every Grothendieck topos has a one-way site", *Theory and Applications of Categories*, **16**, (2006) 123-26.

"Emmy Noether and the Independent Social Democratic Party of Germany", *Science in Context* **18** (2005) 429-50.

"Saunders Mac Lane (1909-2005) His Mathematical Life and Philosophical Works", *Philosophia Mathematica* **13** (2005) 237-251.

"'Mathematical platonism' versus gathering the dead: What Socrates teaches Glaucon", *Philosophia Mathematica* **13** (2005) 115-34.

Philosophical commentary to: William Lawvere "An Elementary Theory Of The Category Of Sets (Long Version)," in *Reprints in Theory and Applications of Categories* **12** (2005) 1-35.

"Learning from Questions on Categorical Foundations", *Philosophia Mathematica* **13** (2005) 44-60.

"Exploring Categorical Structuralism", *Philosophia Mathematica* **12** (2005) 37-53.

"Richard Courant in the German Revolution", *Mathematical Intelligencer* **23** no.3 (2001) 61-67.

"Semantics for first and higher order realizability", in Anderson and Zeleny eds. *Logic, Meaning, and Computation*, Kluwer Academic 2001, 353-64.

"Mac Lane, Saunders", biographical article for *Encyclopaedia Britannica*, January 2000.

"Voi Dire in the case of mathematical progress", in E. Grosholz and H. Breger eds, *The Growth of Mathematical Knowledge*. Kluwer, 2000. 269-80.

"Category theory: Introduction to" and "Category theory: Applications to the foundations of mathematics". *Routledge Encyclopedia of Philosophy* (1998).

"Poincaré: Mathematics & Logic & Intuition", *Philosophia Mathematica* **5** (1997) 97-115.

"Category theory in real time", *Philosophia Mathematica* **2** (1994) 36-44.

"Numbers can be just what they have to", *Noûs* **27** (1993), 487-98. Translated to Hungarian as "Miért ne lehetnének a számok azok, amiknek lenniük kell?" in Csaba Ferenc ed. *A matematika filozófiája a 21. század küszöbén* (Philosophy of Mathematics at the Start of the 21st Century), Budapest: Osiris, 2003.

"Anti-foundation and self-reference", *Journal of Philosophical Logic* **22** (1993) 19-28.

"Failure of cartesian closedness in NF", *Journal of Symbolic Logic* **57** (1992) 555-56. Reprinted in Follesdal ed. *The Philosophy of Quine*, Garland, 2000, vol.5, 109-11.

"Axiomatizing a category of categories", *Journal of Symbolic Logic* **56** (1991) 1243–60.

"The uses and abuses of the history of topos theory", *British Journal for the Philosophy of Science*, **41** (1990) 351–75.

"Stable surjection logic", *Diagrammes*, **22** (1989) 45–57.

"Defining sets as sets of points of spaces", *Journal of Philosophical Logic*, **17** (1988) 75–90.

"Elementary axioms for canonical points of toposes", *Journal of Symbolic Logic*, **52** (1987) 202–04.

"Left exact logic", *Journal of Pure and Applied Algebra*, **41** (1986) 63–66.

"Local, and some global, results in synthetic differential geometry", in A. Kock ed. *Category Theoretic Methods in Geometry*, (Aarhus Denmark: Aarhus Universitet, 1983), 226–56.

Book Reviews

J.-P. Marquis, *From a Geometrical Point of View: A Study of the History and Philosophy of Category Theory*, New York: Springer, 2010, in *Historia Mathematica* scheduled 2012.

S. Duffy, *Virtual Mathematics: The Logic of Difference*, Bolton England: Clinamen Press 2006, the *Australasian Journal of Philosophy* (June, 2008) 332–36.

C. Chihara, *A Structural Account of Mathematics*, Oxford, 2004, in *Notre Dame Philosophical Reviews*, August 2004, (2,500 words).

J. Mayberry *The Foundations of Mathematics in the Theory of Sets* Cambridge 2000, in *Philosophy of Science* **69** (2002), 404–06.

A. Herreman, *La topologie et ses signes*. L'Harmattan 2000, in *Isis* **93** (2002), 328.

P. Ehrlich, *Real Numbers, Generalizations of the Reals, and Theories of Continua*, Kluwer 1994, in *Philosophy of Science* **66** (1999) 500–01.

S. Lavine *Understanding the Infinite*, Harvard 1994, in *Notre Dame Journal for Formal Logic*, **38** (1998) 314–24.

J-P. Belna, *La notion de nombre chez Dedekind, Cantor, Frege, Vrin* 1996, in *Isis* **89** (1998), 145–46.

J. Chapman and F. Rowbottom, *Relative Category Theory and Geometric Morphisms*, Oxford 1992, in *Modern Logic* **4** (1994) 345–47.

J.L. Bell, *Toposes and Local Set Theory*, Oxford 1988, in *Notre Dame Journal of Formal Logic*, **31** (1990) 150–61.

S. Mac Lane, *Mathematics: Form and Function*, Springer-Verlag 1986, in *Journal of Philosophy*, **84** (1987) 33–37.

Reviews In Mathematical Reviews

- O. Caramello and P. Johnstone, "De Morgan's law and the theory of fields," MR2562778.
- M. Livio, *Is God a mathematician?*. Simon & Schuster, New York, 2009. 2010b:00004.
- J. van Oosten, *Realizability: an introduction to its categorical side*. Studies in Logic and the Foundations of Mathematics, 152. Elsevier B. V., Amsterdam, 2008. 2010c:03044.
- R. Krömer, *Tool and Object. A History and Philosophy of Category Theory*. Birkhäuser Verlag, 2007. 2008d:01013.
- G. Hellman, "Mathematical pluralism: the case of smooth infinitesimal analysis", 2007k:03193.
- H. Nishimura, "Synthetic differential geometry of higher-order differentials", 2008a:18011a.
- S. Awodey, *Category Theory*. Oxford 2006. 2007i:18001.
- M. Grandis, "Equilogical spaces, homology and noncommutative geometry", 2006e:18005.
- S. Awodey, and J. Eliasson, "Ultrasheaves and double negation", 2005m:03138.
- F. Lawvere, "Foundations and applications: axiomatization and education (Paris, 2000)", 2004j:03011.
- P. Johnstone, *Sketches of an Elephant: A Topos Theory Compendium*. Oxford 2002. 2003k:18005.
- G. Mazzola, *The Topos of Music. Geometric Logic of Concepts, Theory, and Performance*. With CD-ROM. Birkhäuser Verlag 2002. 2004a:00013.
- C. Oriat, *Étude des spécifications modulaires: constructions de colimites finies, diagrammes, isomorphismes*. I and II. 01g:68066 and 01g:60867.
- I. Moerdijk and J. Vermeulen, "Proof of a conjecture of A. Pitts", 01c:1800.
- A. Kock and G. Reyes, "A note on frame distributions", 2000i:18006.
- I. Moerdijk, "Classifying spaces for toposes with enough points", 99m:18002.
- S. Awodey, "Structure in mathematics and logic", 99c:03106.
- C. Jay, "Finite objects in a topos", 98a:18003.
- M. Gerner and R. Guitart, "The locally free relatively filtered diagram as an inductive completion of a system of choice", 98a:03102.
- J. Tavakoli, "Locally free vector spaces in a topos", 96m18010.
- A. Carboni, "Some free constructions in realizability and proof theory", 96j03088.
- M. Bunge and A. Carboni, "The symmetric topos", 96i18004.
- H. Simmons, "The glueing construction and lax limits", 96d10002.
- F. Lawvere, "Cohesive toposes and Cantor's lauter Einsen", 95e00020.

I. de Freitas Druck, "Un modèle de filtres pour l'analyse réelle synthétique", 94g18001.

J. Chapman and F. Rowbottom, *Relative category theory and geometric morphisms. A logical approach*. Oxford 1992. 93i:18004.

L. Stout, "The logic of unbalanced subobjects", 93c03071.

W. Tulczyjew, "Partial categories of differentiable relations", 93b10000.

Robinson et al., "Colimit completions and the effective topos", 91f03130.

S. Mac Lane, "Concepts and categories in perspective", 90k01019a and b.

H. Sato, "E-CCC: Between CCC and topos", 90e68068.

C. Szasz, "(n,m)-objekt in einem Elementartopos", 89i10002.

M. Makkai, "Stone duality for first order logic", 89h03067.

G. Meloni and E. Rogora, "Global and infinitesimal observables", 89m58003.

Selected Talks

“Grothendieck’s cohomology founded on finite order arithmetic,” invited address, Association for Symbolic Logic, Joint Mathematics Meetings, San Diego, January 2013.

“Algebra and the connections of space,” Harvard-Radcliffe exploratory seminar on Folds, Networks, Fissures: Topological Thinking in Philosophy, Art and Literature, Boston, December 2-3, 2011.

“Current status and prospects for a low-logical strength proof of Fermat’s Last Theorem,” Midwest Phil of Math Workshop, Notre Dame Indiana, November 2011. Updated for Dept of Logic and Philosophy of Science, UC Irvine, June 2012.

“Emmy Noether on Galois Theory”, Société mathématiques de France bicentennial of the birth of Evariste Galois, Institut Henri Poincaré, Paris. October 24-27, 2011. Video on-line at www1.cpm.upmc.fr/videotheque/differe.php?collec=S_C_galois&video=3

“Cohomology in the category of categories.” Symposium on sets in geometry, Nancy, France July 2011.

“Universes in algebraic geometry and number theory,” Infinity Conference, Centre de Recerca Matemàtica (CRM), Bellaterra, Barcelona, Spain, July 2011.

“Why is so much of category theory constructivist?” Kurt Gödel Institute, Vienna, Austria, July 2011.

“Weak categorical foundations for cohomological number theory,” International Academy at Traunkirchen conference on Foundational Questions in the Mathematical Sciences, Traunkirchen, Austria, July 2011.

“Foundations as truths which organize mathematics,” Association for Symbolic Logic 2011 North American Annual Meeting, Berkeley CA, March 2011.

“On the state of and prospects for the philosophy of mathematics,” Montreal Inter-University Workshop on History and Philosophy of Mathematics, December 2011.

“Grothendieck’s ‘incurable naïvety’ in building worlds for Mathematics,” Third Congreso Colombiano de Filosofía, Cali, Colombia, October 2010.

Panelist on “Foundations of Mathematics: What and Why?,” University of Paris 7, June 2010.

“Emmy Noether’s first great mathematics,” International Conference on the History of Modern Mathematics, Northwest University, Xi’an, China, August 2010. Also University of Paris 7, June 2010.

“Focusing on what mathematical objects do, rather than what they are,” Beijing University Department of Philosophy; and Shanxi University Research Center for Philosophy of Science and Technology, August 2010.

“Single-sorting, and first order axioms for the category of categories as foundation,” invited for special session, European conference of the Association for Symbolic Logic, Sofia Bulgaria, August 2009.

“Identity and existence in categorical foundations,” Conference on Philosophy and Foundations of Mathematics, Swedish Collegium for Advanced Study, Uppsala, May 2009; also invited for special session Association for Symbolic Logic summer meeting, South Bend, May 2009.

“Philosophy of Mathematics and Current Mathematics,” Ideals of proof project, Paris 2009.

"Hilbert and the origin myth of modern mathematics," American Mathematical Society National Meeting, Washington DC, January 2009.

"Arithmetic for Philosophers: current methods in number theory," Midwest Philosophy of Mathematics Work shop, University of Notre Dame, November 2008.

"The central insight of categorical mathematics," invited talk at the Thirteenth International Congress of Logic, Methodology and Philosophy of Science, Beijing, 2007. Expanded to 15 hour Summer School at Roskilde University, Denmark, July–August 2008.

"Emmy Noether's 'Set Theoretic Foundations' for topology: from Dedekind to the rise of functors", Universidad de Sevilla, Spain, September 17–19, 2003, Université de Paris 7, October 2005.

"Mathematics, philosophy, and foundations in the work of F.W. Lawvere", École Normale Supérieure, Paris, October 2005. Streaming video at www.diffusion.ens.fr/index.php?res=conf&idconf=933

"Mathematics as Philosophy: Mac Lane, Grothendieck, Lawvere", Ramifications of Category Theory Symposium, Florence Italy, November 18–22, 2003.

"The Rising Tide: Alexander Grothendieck on simplicity and generality", at the Mathematical Sciences Research Institute, Berkeley CA conference: The History of Algebra in the 19th and 20th Centuries April 21–25, 2003. Streaming video at www.msri.org/communications/video/index06.html

"Geometry and Logic", Conference on the History and Philosophy of Modern Mathematics, Open University, Milton Keynes, UK, May 2002.

"Emmy Noether and the notion of structuralist mathematics", Centre de Recherches Mathématiques, Montréal, Canada, November 2001.

"Georg Cantor's Kardinalzahlen as categorical set theory", joint meeting of the American Philosophical Association and the Association for Symbolic Logic Minneapolis, May 2001.

"Category theory along the Seaway", Centre de Recherches Mathématiques, Montréal, Canada, August 2000.

"Element-centered axioms for the category of sets", Saunders Mac Lane's category theory seminar, Chicago, November 1999.

"Resnik's 'science of patterns' as a generalized mereology", Wholes and Parts conference, Istituto Mitteleuropeo di Cultura, Bolzano Italy, June 1998.

"Early adventures in the life of 'logicism, formalism, and intuitionism'", Department of Philosophy, Harvard, December 1996.

"'Poor taste as a bright trait of character': Emmy Noether's politics and mathematics", Department of the History of Science, Harvard, December 1996.

"Geometry and Logic", Deutsche Gesellschaft für mathematischen Logik und Grundlagenforschung annual meeting, Jena Germany, September 1996.

"On Michael Resnik's theory of patterns", Canadian Society for History and Philosophy of Mathematics, St. Catherine's Ontario, June 1996.

"Comparative set theory", UCLA Logic Colloquium, February 1995.

"Voir Dire in the case of mathematical progress", Conference on the Growth of Mathematical Knowledge, Pennsylvania State University, April 1995.

"Towards a history of Alexander Grothendieck's algebraic geometry", University of Chicago Algebraic Geometry Seminar, December 1994.

"The peripeties of intuitionistic logic", American Mathematical Society Mathfest, Session on History of Mathematical Logic, Minneapolis, August 1994.

"Modern and Post-Modern in the history of mathematics: What's France got to do with it?", Department of History of Science, Harvard, December 1993.

"Category theoretic foundations", Department of Philosophy, University of Florence, Italy, November 1991.

"Why category theory is not a foundation for mathematics", International Congress on Logic, Methodology and Philosophy of Science, Uppsala Sweden, August 1991.

"Anti-foundation and self-reference", Association for Symbolic Logic meeting, Pittsburgh, January 1991.

"Axiomatizing a category of categories", Bangor, Wales, July 1989. University of Florence November 1991.

"Real time conceptual change in mathematics", Sigma Club, Cambridge England, June 1989.

"Stable surjection logic", at the conference Journées d'Étude en Logique, Université de Paris 7, 1988.

"J.H. Lambert: Scientific rationalism in Kant's immediate pre-critical background", Tri-State Philosophical Association meeting, Edinboro PA, 1978.

Service

On the Editorial Boards of *Philosophia Mathematica* and of *The Notre Dame Journal for Formal Logic*, Editorial Advisory Board of the series "Advanced Studies in Mathematics and Logic" for Polimetrica Publishers.

Book MS refereed for: Birkhäuser Verlag, Oxford University Press, Cambridge University Press, SUNY Press, University of Chicago. Articles refereed for: *Philosophia Mathematica*, *Journal of Symbolic Logic*, *Notre Dame Journal of Formal Logic*, *Synthese*, *Australasian Journal of Philosophy*.

Taught in pilot project for the Seminar Approach to General Education and Scholarship, undergraduate curriculum reform for CWRU. Three years of a freshman seminar on mathematics from Thales and Pythagoras to Hypatia, teaching geometry, philosophy, and critique of historical evidence.

Ph.D. examiner for: Université de Montréal (Canada), Université Nice Sophia Antipolis (France), University of Chicago, University of Western Ontario, University of Adelaide (Australia), CWRU.

Grant applications reviewed for: Guggenheim Foundation, National Endowment for Humanities USA, Natural Science and Engineering Research Council of Canada, Social Science and Humanities Research Council of Canada, Fonds pour la Formation de Chercheurs et l'Aide à la Recherche Québec. Idaho Board of Education.

Professional Memberships And Honors

Association for Symbolic Logic, Philosophy of Science Association, American Philosophical Association.

Associate of the Center for Philosophy of Science, University of Pittsburgh.

Listed in *American Men and Women of Science*, since 1995. Listed in *Who's Who in the World* since 2000. Listed in *Who's Who in America* since 2002.

Named as Fulbright Specialist in mathematics education. 2011.