Centre of Australian Category Theory (CoACT)
A Macquarie University Research Centre

Annual Report for 2003

I. List of members

Advisory Board

Professor Ross Street	Director of CoACT
Professor Michael Johnson	Associate Director of CoACT
Emeritus Professor Max Kelly	University of Sydney
Dr Wesley Phoa	Capital Strategy Research, USA
Associate Professor Dominic Verity	Division of ICS, Macquarie University
Professor Di Yerbury	Vice-Chancellor, Macquarie University
Professor Ray Offen	Dean, Division of ICS, Macquarie University

Other Members

Dr Michael Batanin	Scott Russell Johnson Memorial Fellow, Math Dept
Dr John Corbett	Senior Research Fellow, Math Dept
Dr Alexei Davydov	Research Fellow, Math Dept
Dr Brian Day	Research Associate, Math Depart
Dr Lee Flax	Lecturer, Computing Dept
Ms Carolyn Kennett	Postgraduate, Macquarie University Numeracy Centre
Dr Steve Lack	Lecturer, School of Quantitative Methods and Mathematical Sciences, University of Western Sydney
Ms Catherine Menon	PhD Student, Computing Dept
Ms Margaret Mitchell	PhD Student, Computing Dept
Mr Elango Panchadcharam	PhD Student, Math Dept
Mr Daniel Steffen	PhD Student, Math Dept
Dr Joost van Hamel	Research Fellow, School of Mathematics and Statistics, University of Sydney

Visitors in 2003

Professor George Janelidze	Mathematical Institute of the Academy of Science, Tbilisi (Nov 2003 - April 2004)
Mr Zurab Janelidze	State University of Georgia (Nov 2003 - Apr 2004)
Dr Simona Paoli	Warwick University, England (12 Jul-14 Nov 2003)
Professor John Baez	University of California, Riverside, California (January-March 2003)
Isar Stubbe	Université Catholique de Louvain-la-Neuve, Belgium (January 2003)

II. Short account of each researcher's contribution

The principal business of CoACT is research based in an area of mathematics called Category Theory. The members making major contributions to the research are R. Street, M. Johnson, G.M. Kelly, M. Batanin, A. Davydov, B. Day, and S. Lack. Members occasionally contributoring in this area are D. Verity, J. Corbett, and J. van Hamel. Moreover, L. Flax works on applications of category theory to computer science.

D. Steffen is a final year PhD student (supervisor R. Street). M. Mitchell is a final year PhD student (supervisor M. Johnson). C. Menon is a recently arrived PhD student (supervisor M. Johnson). E. Panchardcharam is a recently arrived PhD student (supervisor R. Street).

S. Lack and D. Steffen organize the Australian Category Seminar held on Wednesday afternoons that feature two speakers per week. Our visitors are fundamental to the maintenance of freshness and breadth to our Seminars and our collaborations. D. Steffen frequently provides valuable technical computing support to CoACT members at Macquarie. S. Lack maintains the Australian Category Seminar web page: <www.maths.usyd.edu.au:8000/u/stevel/auscat/>.

CoACT is deeply saddened to report the death, on 20 March 2004, of C.N.G. (Kit) Dampney who successfully applied Category Theory to industry's needs. We are grateful for his talks to our Seminar over the years and for his joint work with M. Johnson.

The Scott Russell Johnson Memorial Fellowship was advertised during 2003 and it was decided that two positions could be supported. The quality of the 11 applicants was very pleasing. The referees' reports for Dr Michael Batanin were glowing and he was reappointed to a continuing position. The second position will be a 3 year fixed term appointment; an offer has been made.

More detailed research contributions are made explicit in the later sections.

III. Summary of research projects undertaken

In a sense, each paper prepared for publication is a project in its own right; these are listed in Section VI. However, these smaller modules represent progress towards larger goals covered by the following grant projects.

Title: Category theory arising from geometry, algebra, computer science and physics

Personnel: Ross Street (Chief Investigator), Max Kelly (CI), Michael Johnson (CI), Stephen Lack (CI), Brian Day, Michael Batanin, George Janelidze, Isar Stubbe, Zurab Janelidze, John Corbett., Daniel Steffen, Catherine Menon.

Summary: Category theory is a branch of mathematics concerned with transformation and composition. It provides an algebra of wide-spread applicability for the synthesis of systems and processes in fields as diverse as geometry, physics and computer science, and also in mathematics itself. Often it can be used to clarify and simplify the learning, teaching and development of mathematics. The aim of this project is to develop the general theory of categories and specifically to investigate aspects appropriate to algebra, physics and computer science.

Title: Invariants of higher-dimensional categories, with applications
Personnel: Ross Street (CI), Alexei Davydov, John Baez, Simona Paoli.
Summary: Complex systems in mathematics are difficult to tell apart so one constructs simpler structures from them. These structures must be equal, isomorphic or equivalent when the original systems are equivalent; the word invariant is used for such constructions. Higher-dimensional categories are complex structures that are currently gaining a lot of attention from mathematicians, physicists and computer scientists because of developing applications in those fields. This project will establish and study invariants for higher-dimensional categories which will be tested by examining their viability for producing results in group theory and homotopy theory.

Title: Categorical universal algebra and the foundations of information management
Personnel: Michael Johnson (CI), Kit Dampney (in 2003), Kate Krastev (in 2003), Jason Rennie, Catherine Menon (in 2004).
Summary: Information management depends upon providing structures on data stored in databases, semi-structured documents, formal specifications and libraries. Different structured arrangements of equivalent data frequently lead to apparent incompatibilities and limit the interoperations possible between systems. Categorical universal algebra has confronted this problem of inequivalent specifications of equivalent data in the context of algebraic structures. In preliminary work we have shown how analogous categorical techniques for the mathematical specification and analysis of structured data can be used to obtain data invariants which aid in the development of system interoperations. This project develops those techniques and extends them to semi-structured data and formal specifications.

Title: Operadic techniques in the theory of crossed modules and hypercrossed complexes.
Personnel: Stephen Lack (CI), Simona Paoli.
Summary: Geometry concerns the spatial relationships between objects in the real world. Algebra involves calculations and formal manipulations of symbols; it has been described as a Faustian offer made to the geometer, since it provides powerful tools, but at the risk of eroding geometric intuition. Crossed modules and hypercrossed complexes are examples of such tools. This project represents a strategy to cheat the devil, by developing these tools in a context in which the geometric intuition is retained.

IV. Existing and potential internal and external linkages and collaborative arrangements

Certain linkages are clear from Section I on noting the members, their departments, their institutions, and their visitors. CoACT has significant linkages with researchers in Montréal, Halifax, Milano, Chicago, Riverside, Cambridge (U.K.), Louvain-la-neuve, and San Jose (including Stanford University and some companies).
Our visitor Isar Stubbe commented that "Collaboration between Louvain-la-neuve and Sydney [category theorists] goes back a long way. Notably, for many young Lovanists

like myself the trip to Sydney has had decisive consequences for both the form and content of their PhD theses."

V. Progress in relation to agreed performance indicators (A–G below) specified in the Centre's strategic plan

A. Activity of the Australian Category Seminar

Benchmark At least 40 three-hour seminars per annum.

32 three-hour Seminars were held in 2003. For details of dates, speakers, titles and some abstracts, see <www.maths.usyd.edu.au:8000/u/stevel/auscat/titles-2003.html>.

B. Scholarly publication in international refereed journals

Benchmark Fifteen journal articles per annum.

24 publications have appeared in refereed journals since the end of 2002.
See Section VI for details.

C. Editing of papers submitted to scholarly journals and to special issue volumes

Benchmark One special issue volume per annum.

Lack and Janelidze are Editors for the volume of *Theory and Applications of Categories* dedicated to Professor Aurelio Carboni on his 60th birthday.
Janelidze is an Editor for two volumes arising from the "Workshop on Categorical Structures for Descent and Galois Theory, Hopf Algebras and Semiabelian Categories" on 23–28 September 2002, at the Fields Institute in Toronto. These are special volumes of the journals *Fields Institute Communications* and *Applied Categorical Structures*.
Lack was appointed to the Editorial Board of *Theory and Applications of Categories.*
Street continued on the Editorial Boards of six international journals:
Advances in Mathematics; Applied Categorical Structures; Theory and Applications of Categories; Homology, Homotopy and Applications; Bulletin of the Australian Mathematical Society; Cahiers de topologie et géométrie différentielle catégoriques
Kelly continued on the Editorial Boards of: *Applied Categorical Structures; Theory and Applications of Categories.*

D. International plenary addresses and membership of conference scientific steering committees

Benchmark One international plenary address or one conference steering committee per annum.

Batanin was a principal invited speaker at the workshop in Nice (May 2003) on *n-Categorical structures in algebraic geometry*. He spent two months in North America giving several lectures on n-categories and n-fold loop spaces at the University of Chicago, Northwestern University, McGill University and Universite de Montpellier.
Street was a principal invited speaker at the conference in honour of the 60th birthday of Emeritus Professor André Joyal, organized by Centre interuniversitaire de recherche en géométrie et topologie, Laboratoire de combinatoire et d'informatique mathématique, and Centre de recherches mathématiques in Montréal's universities and taking place 11–13 April 2003 in Montréal. Street's lecture was entitled: *Quantum categories and quantum groupoids.*

Johnson is a member of the Steering Committee for *Computing: The Australiasian Theory Symposium* (CATS) and chairs the Steering Committee for *Algebraic Methodology and Software Technology* (AMAST).
The Fifth International Congress on Industrial and Applied Mathematics (ICIAM 2003) was held at Darling Harbour in Sydney (7–11 July 2003); it was the most important conference in the field, worldwide, over a four-year period. Ross Street organized an embedded minisymposium entitled: *Category Theory and its Applications* with the program:

11am	Street:	Categorical and combinatorial aspects of descent theory
11:30am	Stevenson:	Gerbes in Geometry and Physics
Noon	Batanin:	The combinatorics of iterated loop spaces
12:30pm	Lack:	Quillen model bicategories

E. EFTSU attracted and completion rates, especially for postgraduate students
Benchmark Ten postgraduate EFTSU and two PhD completions per annum.

Lee Flax graduated PhD in 2003 with the Vice-Chancellor's Commendation. His dissertation was runner-up for the Most Distinguished Australasian Doctoral Dissertation in Computer Science, and nominated for the EW Beth Dissertation Award.
Margaret Mitchell and Daniel Steffen are currently enrolled for PhD in their final year while Catherine Menon and Elango Panchadcharam are new PhD students.

F. Funding attracted through grant applications and other sources
Benchmark $300000 in external funding per annum.

Close to benchmark. See VII below.

G. Visibility in the scientific review literature
Benchmark 20 reviews written by CoACT members appearing in Mathematical Reviews, Zentralblatt für Mathematik, or other influential mathematical and computing reviewing journals.

At least 34 articles were reviewed for Math. Reviews and Zentralblatt; see the Appendix for more detail.

VI. List of Centre publications, materials submitted for publication, provisional patents and other forms of commercialisation, and other measures of research output, including evidence of impact (e.g. citations, uptake of research developments by other groups, media reports, etc).

It has been said that Street is a founder of the theory of higher dimensional categories and the subject forms a central thread for the work of CoACT. Therefore, significant recognition of our work is the successful application for a Workshop on "n-Categories: Foundations and Applications" from 7 June to 18 June 2004 at the Institute for Mathematics and its Applications (IMA at University of Minnesota, Minneapolis, MN 55455). The application was made by Professor John Baez (a high-profile Mathematical Physicist from the University of California at Riverside) and Professor Peter May (a top world figure in Algebraic Topology from the University of Chicago).

Documented Research Activity since early 2003 follows.

Published

1. Brian Day and Ross Street, Lax monoids, pseudo-operads, and convolution, in: "Diagrammatic Morphisms and Applications", *Contemporary Mathematics* **318** (AMS; ISBN 0-8218-2794-4; April 2003) 75-96.
2. Julien Bichon and Ross Street, Militaru's D-equation in monoidal categories, *Applied Categorical Structures* **11** (2003) 337-357.
3. Ross Street, Functorial calculus in monoidal bicategories, *Applied Categorical Structures* **11** (2003) 219-227.
4. Brian Day, Paddy McCrudden and Ross Street, Dualizations and antipodes, *Applied Categorical Structures* **11** (2003) 229-260.
5. Ross Street, Weak omega-categories, in: "Diagrammatic Morphisms and Applications", *Contemporary Mathematics* **318** (American Math. Soc.; ISBN 0-8218-2794-4; April 2003) 207-213.
6. Brian Day and Ross Street, Abstract substitution in enriched categories, *J. Pure Appl. Algebra* **179** (2003) 49-63.
7. Brian Day, Quantum categories, star autonomy, and quantum groupoids, in "Galois Theory, Hopf Algebras, and Semiabelian Categories", *Fields Institute Communications* **43** (American Math. Soc. 2004) 193-231.
8. Ross Street, Cauchy characterization of enriched categories, *Reprints in Theory and Applications of Categories* **4** (2004) 1-16.
9. J.R.B. Cockett and S. Lack, Restriction categories II: partial map classification, *Theoretical Computer Science* **294** (2003) 61-102.
10. Stephen Lack and Marta Bunge, Van Kampen theorems for toposes, Advances in Math. **179** (2003) 291-317.
11. Stephen Lack and Pawel Sobocinski, Adhesive categories, Foundations of Software Science and Computation Structures: Proceedings of the international conference FOSSACS04 *Lecture Notes in Computer Science* **2987** (Springer, 2004) 273–288.
12. Michael Johnson and Robert Rosebrugh, Database Interoperability Through State Based Logical Data Independence, *International Journal of Computer Applications in Technology* **16** (2003) 97-102. © Inderscience
13. Michael Johnson and Rosebert Rosebrugh. Three approaches to partiality in the sketch data model, ENTCS, Volume **78** (2003) 1-18. © Elsevier Science
14. William P. Joyce, Quark state confinement as a consequence of the extension of the Bose-Fermi recoupling to $\rm SU(3)$ colour. *J. Physics* A **36** (2003) 12329-12341.
15. W. Joyce, Braided premonoidal Mac Lane coherence, *J. Pure Appl. Algebra* **190** (2004) 155–176.
16. Marco Grandis and George Janelidze, Galois theory of simplicial complexes. *Topology Appl.* **132** (2003) 281–289.
17. Aurelio Carboni and George Janelidze, Smash product of pointed objects in lextensive categories. *J. Pure Appl. Algebra* **183** (2003) 27–43.
18. George Janelidze, Internal crossed modules. *Georgian Math. J.* **10** (2003) 99–114.
19. Dominique Bourn and George Janelidze, Characterization of protomodular varieties of universal algebras. *Theory Appl. Categ.* **11** (2003) 143–147.

20. George Janelidze and László Márki, Kurosh-Amitsur radicals via a weakened Galois connection, *Comm. Algebra* **31** (2003) 241–258.
21. C.N.G. Dampney and Michael Johnson, Experience in developing interoperations among legacy information systems using partial reverse engineering, *Proceedings of ICSM* (IEEE Publications, 2003) 369–372.
22. P.H. Butler, W.P. Joyce, L.F. McAven and B.G. Searle, Recursive calculation of non-primitive coupling and recoupling brakets, *Canadian Journal of Physics* **80(8)** (2003) 1051-1066.
23. W. Joyce, P. Butler and H. Ross, The Racah Wigner Category Canadian J. Phys. 80 (6) (2002) 613-632.
24. W. P. Joyce, The Boson/Fermion Statistic for SU(3) Colour requires Quark Confinement, *Proceedings of the XXIV International Colloquium on Group Theoretical Methods in Physics, Paris 2002* (2003).

Accepted for publication

25. M. Batanin, The Eckmann-Hilton argument, higher operads and E_n-spaces, *Advances in Math.* (to appear).
26. Ross Street, Categorical and combinatorial aspects of descent theory, *Applied Categorical Structures* (to appear; March 2003 preprint at math.CT/0303175).
27. Alexei A. Davydov, Braids and linear algebra, *J. Algebra* (in press, 2004).
28. Ross Street, The monoidal centre as a limit, *Theory and Applications of Categories* (to appear in an issue dedicated to Aurelio Carboni for his 60th birthday; preprint at math.CT/0304053).
29. G.M. Kelly and S. Lack, Monoidal functors generated by adjunctions, with applications to transport of structure, *Fields Institute Communications* (to appear).
30. Stephen Lack, Composing PROPs, *Theory and Applications of Categories* (to appear).
31. William Joyce, Natural Associativity without the Pentagon condition, *Theory and Applications of Categories* (to appear).

Submitted for publication

32. Ross Street, Frobenius monads and pseudomonoids (February 2004; submitted to *Journal of Mathematical Physics*).
33. F. Borceux, G. Janelidze, and G.M. Kelly, Internal object actions (submitted to *Communicationes Mathematicae Universitatis Carolinae* in Prague).
34. Stephen Lack, A Quillen model structure for bicategories, submitted.
35. M. Batanin, Computads and slices of operads, math.CT/0209035; submitted to *Theory and Appl. of Categories.*
36. M. Batanin, The combinatorics of iterated loop spaces, math.CT/0301221; submitted to *Topology and its Appl.*
37. William Joyce, Recoupling Lie Algebra and Universal omega algebra, (submitted to *Journal of Mathematical Physics*).

In Preparation

38. J.R.B. Cockett and Stephen Lack, Restriction categories III.
39. G.M. Kelly, S. Lack and A.J. Power, Flexibility for 2-monads.
40. F. Borceux, G. Janelidze, and G.M. Kelly, On the representability of actions.
41. Stephen Lack and Pawel Sobocinski, Adhesive and quasiadhesive categories.
42. Stephen Lack and Simona Paoli, An operadic treatment of internal categorical structures.

43. A. Carboni, G. Janelidze, G.M. Kelly and Stephen Lack, Pointing a category .
44. G. Janelidze, G.M. Kelly and Stephen Lack, Factorization systems and Galois theory in the 2-dimensional context.
45. B.J. Day and Stephen Lack, Limits of small functors.
46. Michael Batanin and Mark Weber, Multitensors and higher dimensional operads.
47. Michael Batanin, Coherence, cooperative games and shuffle polytopes.
48. Michael Batanin, Brian Day and Ross Street, Lax globular monoidal functors out of **W**..
49. Michael Batanin, Clemens Berger, and Sjoerd Crans, Contractibility of the operad for Crans' 4-categories.
50. Alexei Davydov, Nuclei for pseudo-monoidal categories.
51. Alexei Davydov, Gerstenhaber structures on extensions.
52. Alexei Davydov, **A**. -structures and Hochschild cohomology.
53. Michael Johnson, Rewriting techniques and coherence theorems.
54. Michael Johnson, David Naumann and John Power, Category Theoretic Models of Data Refinement.
55. Michael Johnson and Robert Rosebrugh, Universal view updatability.
56. G.M. Kelly and M.-C. Pedicchio, On one-sortedness of algebraic categories.
57. G.M. Kelly and A.J. Power, Enrichment for monads on the category of categories.
58. F. Borceux and G.M. Kelly, On accessibility for enriched categories.
59. B.J. Day and G.M. Kelly, On categories with a distributive law.
60. G.M. Kelly and B. Mesablishvili, On enriched monads of descent type and of effective descent type (28 page working note, 2002).
61. R. Buchweitz, A. Davydov, R. Street, Gerstenhaber homotopy as a braiding in a monoidal category.
62. Alexei Davydov, Quasi-commutative monoids.
63. Alexei Davydov, Generators and relations for categories of representations of symmetric groups.
64. William Joyce, Omega monoidal category theory.

VII. A financial summary for the year, including details of external grants and contracts, and projected cash flow and budget for the following year.

Financial Summary 2003:

EXTERNAL Grants and Contracts Income		
SRJ Fellowship interest	75946.42	(4.77% return)
Street-Kelly-Johnson ARC	85601.00	
Street ARC	92128.00	
Johnson ARC (small)	11000.00	
Morgan Phoa donation	9569.98	
Lack UWS International Research	6700.00	
TOTAL	**280945.40**	(94% of benchmark)

Proposed Budget for 2004:

INCOME		
SRJ Fellowship interest (est)	80000	
Street-Kelly-Johnson-Lack ARC	71638	
Street ARC	62856	
Corbett MURF (est)	60000	
TOTAL		274494
PLUS funds carried forward		
Operating acct	2047.76	
SRJ fellowship	85837.36	
S-K-J ARC	65277.32	
Street ARC	53110.31	
Johnson ARC (small)	8198.71	
TOTAL		214471.46
FUNDS AVAILABLE		488965
LESS projected expenditure		
SRJ Fellow (Batanin)	90582	
SRJ Fellow (est)	60000	
MURF (est)	30000	
SRJ Scholar	15000	
Res Fellow (Davydov)	69757	
Res Fellow (Day)	26043	
Res Ass't (Rennie)	8199	
Visitors	20000	
Travel	30000	
Outstanding comm'ts	10000	
Equipment	10000	
		369581
PROJECTED C/F to 2005		**119384**

Because of our strong financial position there is no need to for more detailed cashflow analysis for 2004.

VIII. The status of implementation of the recommendations in the latest review of the Centre.

As yet there has been no review.

IX. Proposed activities for the coming year, and related performance indicators.

A. The new SRJ Fellow should arrive. Also, Dr Frankie Valckenborgh will arrive in mid year 2004 to work with Corbett.

B. There will be visits by Joyce, Paoli, Wood, Rosebrugh, and Cockett. Davydov will participate in the "Tensor categories in Mathematics and Physics" program in the Erwin Schrödinger Institute (Vienna, Austria) in June–July 2004 and the "Non-commutative Geometry and Representation Theory in Mathematical Physics" conference (Karlstad University, Sweden) from 5 to 10 July 2004.

C. Street will be an editor for the CT04 Proceedings likely to be published in TAC.

D. Street, Johnson, Lack, Batanin, Davydov will participate in the Workshop on "n-Categories: Foundations and Applications" from 7 June to 18 June 2004 at the Institute for Mathematics and its Applications (IMA at University of Minnesota, Minneapolis, MN 55455). The workshop is being organized by John Baez (University of California at Riverside) and Peter May (University of Chicago). Street and Johnson are on the Advisory Committee for the International Category Theory meeting (CT04) to be held in Vancouver from 18 July to 24 July 2004. Johnson and Lack will participate in CT04. During the week before CT04 Johnson will attend AMAST in Stirling; see <http://www.cs.stir.ac.uk/events/amast2004/>.

E. Street has the prospect of two new international PhD students; one has been offered an iMURS but is being tempted by Cambridge.

F. Street and Corbett are involved in the ARC Network Proposal *Mathematics in Science and Society* (see <http://scg.levels.unisa.edu.au/mass/>). M. Johnson is involved in the ARC Network Proposal *Intelligent Applications through the Semantic Web* (see <http://semantic.mq.edu.au>). Street will most likely apply for a 2005 Discovery Grant.

G. Reviewing is expected to continue at the same rate.

Appendix: Detail on Section V Item D

Papers reviewed by Ross Street for Math. Reviews and Zentralblatt für Math.

1. MR1994345 (2004d:18001) Dawson, Robert; Paré, Robert; Pronk, Dorette Adjoining adjoints. Adv. Math. 178 (2003), no. 1, 99–140.
1. MR1988395 (2004e:18009) Métayer, François Resolutions by polygraphs. Theory Appl. Categ. 11 (2003), 148–184.
2. MR1954329 (2003j:18009) Bourn, Dominique The denormalized 3×3 lemma. J. Pure Appl. Algebra 177 (2003), no. 2, 113–129.
3. MR1936883 (2003i:18016) Bourn, Dominique Intrinsic centrality and associated classifying properties. J. Algebra 256 (2002), no. 1, 126–145.
4. MR1935970 (2003i:18006) Adámek, Jirí; Borceux, Francis; Lack, Stephen; Rosicky, Jirí A classification of accessible categories. Special volume celebrating the 70th birthday of Professor Max Kelly. J. Pure Appl. Algebra 175 (2002), no. 1-3, 7–30.
5. MR1935420 (2003i:18011) Phùng Ho Hái On a theorem of Deligne on characterization of Tannakian categories. Arithmetic fundamental groups and noncommutative algebra (Berkeley, CA, 1999), 517–531, Proc. Sympos. Pure Math., 70, Amer. Math. Soc., Providence, RI, 2002.
6. MR1925933 (2003i:18014) Lawvere, F. William Metric spaces, generalized logic, and closed categories [Rend. Sem. Mat. Fis. Milano 43 (1973), 135–166 (1974); MR 50 #4701]. With an author commentary: Enriched categories in the logic of geometry and analysis. Repr. Theory Appl. Categ. No. 1 (2002), 1–37.
7. MR1905224 (2003g:18002) Power, John; Watanabe, Hiroshi Combining a monad and a comonad. Coalgebraic methods in computer science (Amsterdam, 1999). Theoret. Comput. Sci. 280 (2002), no. 1-2, 137–162.
8. MR1904227 (2003g:18003) Batanin, M. A. On the Penon method of weakening algebraic structures. J. Pure Appl. Algebra 172 (2002), no. 1, 1–23.
9. MR1895515 (2003d:18016) Labella, Anna; Schmitt, Vincent Change of base, Cauchy completeness and reversibility. Theory Appl. Categ. 10 (2002), No. 10, 187–219.
10. MR1887163 (2002m:18006) Crans, Sjoerd E. Higher-dimensional Mac Lane's pentagon and Zamolodchikov equations. Category theory 1999 (Coimbra). J. Pure Appl. Algebra 168 (2002), no. 2-3, 347–365.
11. MR1879933 (2002k:18003) Velebil, Jirí; Adámek, Jirí A remark on conservative cocompletions of categories. J. Pure Appl. Algebra 168 (2002), no. 1, 107–124.
12. MR1879929 (2002m:18007) Hardie, K. A.; Kamps, K. H.; Kieboom, R. W. Fibrations of bigroupoids. J. Pure Appl. Algebra 168 (2002), no. 1, 35–43.
13. MR1879928 (2002k:18008) Dawson, Robert; Paré, Robert What is a free double category like? J. Pure Appl. Algebra 168 (2002), no. 1, 19–34.
14. MR1864928 (2002j:18008) Yamagami, Shigeru Polygonal presentations of semisimple tensor categories. J. Math. Soc. Japan 54 (2002), no. 1, 61–88.
15. Zbl 1026.18003 Lyubashenko, Volodymyr Category of A_∞-categories. Homology Homotopy Appl. 5, No.1, 1-48 (2003).
16. Zbl 1022.18006 Cockett, J.R.B.; Koslowski, J.; Seely, R.A.G. Morphisms and modules for poly-bicategories, Theory Appl. Categ. 11, 1-15, electronic only (2003).
17. Zbl 1022.18009 Grandis, Marco; Mauri, Luca Cubical sets and their site. Theory Appl. Categ. 11, 85-211, electronic only (2003).
18. Zbl 1020.18001 Métayer, François Resolutions by Polygraphs. Theory Appl. Categ. 11, 148-184, electronic only (2003).
19. Zbl 1013.18004 Vitale, Enrico M. On the categorical structure of H^{2}. J. Pure Appl. Algebra 177, No.3, 303-308 (2003).

20. Zbl pre01901791 Müger, Michael From subfactors to categories and topology. I: Frobenius algebras in and Morita equivalence of tensor categories. J. Pure Appl. Algebra 180, No.1-2, 81-157 (2003).
21. Zbl pre01901790 Müger, Michael From subfactors to categories and topology. II: The quantum double of tensor categories and subfactors. J. Pure Appl. Algebra 180, No.1-2, 159-219 (2003).
22. Zbl pre01985396 Siehler, Jacob Near-group categories. Algebr. Geom. Topol. 3, 719-775 (2003).
23. Zbl 1026.18002 Higuchi, Akira; Miyoshi, Hiroyuki; Tsujishita, Toru Strict n-hypercategories. Hokkaido Math. J. 31, No.3, 469-511 (2002).
24. Zbl 1020.18003 Phùng Hô Hài On a theorem of Deligne on characterization of Tannakian categories. Fried, Michael D. (ed.) et al., Arithmetic fundamental groups and noncommutative algebra. Proceedings of the 1999 von Neumann conference, Berkeley, CA, USA, August 16-27, 1999. Providence, RI: American Mathematical Society (AMS). Proc. Symp. Pure Math. 70, 517-531 (2002).
25. Zbl 1013.18001 Rosick‡, Jirí; Tholen, Walter Lax factorization algebras. J. Pure Appl. Algebra 175, No.1-3, 355-382 (2002).
26. Zbl 1013.18003 Al-Agl, Fahd Ali; Brown, Ronald; Steiner, Richard Multiple categories: The equivalence of a globular and a cubical approach. Adv. Math. 170, No.1, 71-118 (2002).
27. Zbl 1009.18003 Hyland, Martin; Power, John Pseudo-commutative monads and pseudo-closed 2-categories. J. Pure Appl. Algebra 175, No.1-3, 141-185 (2002).
28. Zbl 1009.18006 Leinster, Tom Generalized enrichment of categories. J. Pure Appl. Algebra 168, No.2-3, 391-406 (2002).
29. Zbl 1003.18010 Batanin, M.A. On the Penon method of weakening algebraic structures. J. Pure Appl. Algebra 172, No.1, 1-23 (2002).

Papers reviewed by Stephen Lack for Math. Reviews

30. MR1941618-C Rosebrugh, Robert; Wood, R.J.; Distributive laws and factorization . J. Pure Appl. Alg. 175(2002), no.1-3, 327-353.
31. MR1942328 McCrudden, Paddy Opmonoidal monads Theory Appl. Cat. 10(2002), No. 19, 469-485.
33. MR1983014 Bourn, D.; Vitale, E.M. Extensions of symmetric cat-groups. Homology Homotopy Appl. 4(2002), no 1, 103-162.
34. MR1990690 Janelidze, George Internal crossed modules, Georgian Math J 10(2003), 99-114.