

November 22, 2006

**Topology Collaborative Research Group
Pacific Institute for the Mathematical Sciences**

The PIMS Topology CRG enjoyed a period of intense activity during the years of concentration, 2004 and 2005, with continued activity to the present. Besides fostering closer collaboration among the PIMS topology community, these activities have attracted noted international scholars to our affiliated universities. They have also been instrumental in recruiting outstanding faculty and research associates.

Faculty recruitments in topology include **Kristine Bauer** at U. Calgary and **Alejandro Ádem** (who is also Deputy Director of PIMS) and **Jeff Smith** at UBC. The University of Regina has recently joined the PIMS family, and their new faculty member, **Don Stanley**, is their Topology CRG representative. The gifted Russian topologist, **Elena Kudryavtseva**, has been supported as a CRG research associate at U. Calgary. Postdoctoral researchers supported in part through the Topology CRG include **Antonio Ramirez**, **Gabriel Indurskis** and **Melissa Macasieb**, all at UBC. These additions to our Topology community have greatly enhanced our research activity and made the PIMS universities a strong centre for topology, which is recognized worldwide.

Topology CRG activities: Support of PIMS has been crucial in the following programs of the Topology CRG:

- BIRS workshop: Topology of Manifolds and Homotopy Theory (March 20 - 25, 2004)
- BIRS workshop: Knots and their manifold stories (May 8-13, 2004)
- MSRI-PIMS Summer School in Knot Theory and 3-manifolds (July 7 - 20, 2004) at UBC
- Knots in Vancouver (July 19-23, 2004) at UBC
- BIRS workshop: Braid Groups and Applications (November 16-21, 2004)
- BIRS workshop: Workshop in Homotopical Localization and the Calculus of Functors (April 2-7, 2005)
- Cascade topology seminars, held twice annually at rotating venues, including July 14-16, 2005 at BIRS
- Workshop on hyperplane arrangements (August 21-24, 2005) at UBC
- Graduate student summer school in homotopy theory, August 22-26, 2005 at U. Calgary
- BIRS workshop: Topology (August 27 - September 1, 2005)
- BIRS workshop: Homotopy Theory and Group Actions (November 12-17, 2005)

- BIRS workshop: Flavors of Groups (November 17 - 22, 2005)
- Topology Symposium at the Winter CMS meeting (December 10-12, 2005) at Victoria
- Alberta Topology Seminars, held alternately at the Universities of Calgary and Alberta every 2-3 weeks.
- British Columbia Topology Seminars
- Sessions in Topology and Low Dimensional Topology at the First Joint meeting of the Canadian and Mexican Mathematical Societies (September 20-23, 2006) in Guanajuato, Mexico.
- BIRS workshop: The Many Strands of the Braid Groups, April 2007.

Students: Support for student and PDF participation in most of the programs listed above is an important part of the Topology CRG vision. Over 100 students participated in the two graduate summer schools listed above. These programs, as well as our new faculty members, have attracted outstanding graduate students to PIMS universities, roughly doubling the number studying topology. For example, two graduate students from Lausanne were attracted to study at UBC as a direct result of the Summer School in Homotopy Theory.

Distinguished visitors: The Topology CRG has supported extended visits and lecture series by the PIMS Distinguished Chairs **Roger Fenn**, University of Sussex (2004) and **Fred Cohen**, University of Rochester (2005). In addition, the above programs have attracted over 200 researchers in topology to PIMS universities during the past three years. Their presence has been a great stimulus to research and student learning in geometric and algebraic topology.

Grant support: PIMS' support for several of the Topology CGR programs has also attracted grant support from other institutes and granting agencies. Examples: the Summer School in Knot Theory and 3-manifolds had majority support from MSRI; Knots in Vancouver received US\$15,000 support from the US NSF; Cascade Topology Seminars are sponsored by NSF and MSRI, in addition to PIMS support. The BIRS workshops are co-sponsored by NSERC, NSF, CONACYT of Mexico and the Alberta granting agency ASRA.

CRG Members:

U. Alberta: George Peschke, James Timourian

UBC: Alejandro Adem, Jim Bryan, Gabriel Indurskis, Kee Lam, Antonio Ramirez, Dale Rolfsen, Laura Scull, Denis Sjerve, Jeff Smith

U. Calgary: Kristine Bauer, Jens von Bergmann, Elena Kudryavtseva, Kalathoor Varadarajan, Peter Zvengrowski

U. Regina: A. Mare, Don Stanley

U. Washington: Eric Babson, Ethan Devinatz, Michael Freedman, Steve Mitchell, John Palmieri, Jack Segal

Topology CRG: sample publications and graduate supervision:

Alejandro Adem: UBC

Papers:

[1] Toroidal Orbifolds, Gerbes and Group Cohomology, (joint with J.Pan), Trans. Amer. Math. Soc. 358 (2006), 3969-3983.

[2] Lectures on the Cohomology of Finite Groups, Contemporary Mathematics (to appear).

[3] Commuting Elements and Spaces of Homomorphisms (joint with F.Cohen), preprint available at math.AT/0603197.

[4] A Stringy Product on Twisted Orbifold K-theory (joint with Y.Ruan and B.Zhang), preprint available at math.AT/0605534.

Books: [5] Orbifolds and Stringy Topology (joint with J.Leida Y.Ruan), research monograph to appear (Cambridge University Press).

Graduate Students participating in CRG activities: J.Leida (PhD 2006), N.Petrosyan (PhD 2006) E.Torres, J.Cantarero, G.Combariza, A.Duman

Kee Y Lam, UBC

Publications:

[1] With D. Randall: Block bundle obstructions to Kervaire Invariant one, Contemp. Math. vol.407, (2006),p.163-171.

[2] With D. Randall: Vector bundles of low geometric dimension over real projective spaces, Proc. Camb. Phil. Soc. Vol.139 (2005), p.229-241. [3] With N.E. Barufatti, D.Hacon, P.Sankaran and P. Zvengrowski: The order of real line bundles, Bol. Soc. Mat. Mexicana (3), vol.10, (2004), p.149-158.

Graduate students involved in research:

Gladish, Carl, M. Sc. completed Dec.2004, UBC

Xing, Li, M.Sc. completed May 2005, UBC

Rodrigues,Hugo, completed Ph.D at U of Oregon, (supervisor J.Leahy), August 2006

George Peschke: U Alberta

Paper:

The fiber of functors between categories of algebras, (joint with David Blanc). To appear in JPAA

Graduate student participating in CRG-activities:

Elizabeth Powell

Dale Rolfsen, UBC

- [1] Bernard Perron and Dale Rolfsen, Invariant ordering of surface groups and 3-manifolds which fibre over S^1 , Math. Proc. Camb. Phil. Soc., to appear.
- [2] Dale Rolfsen, Mappings of nonzero degree between 3-manifolds: a new obstruction, to appear, Topology and Applications.
- [3] Steve Boyer, Dale Rolfsen and **Bert Wiest**, Orderable 3-manifold groups, Ann. Inst. Fourier 55(2005), 243-288.
- [4] Adam Clay and Dale Rolfsen, Densely ordered braid subgroups, submitted J. Knot Theory and Ramifications.
- [5] Peter A. Linnell, Akbar H. Rhemtulla and Dale Rolfsen, Invariant group orderings and Galois conjugates, submitted, J. Algebra, arXiv: math.GR/0605344
- [6] Jamie Mulholland and Dale Rolfsen, Local indicability and commutator subgroups of Artin groups, arXiv: math.GR/0606116.

Graduate student supervision:

Jamie Mulholland, MSc 2004

Liam Watson, MSc 2004

Adam Clay, MSc 2005, currently PhD student

Ekaterina Yurasovskaya, current PhD student

Laura Scull, UBC

Papers:

- [1] On the equivariant formality of Kahler manifolds with torus group actions (submitted to Math Zeit)
- [2] A model category for equivariant minimal models (submitted to Trans AMS)

Graduate Students:

Izak Grguric (PhD student)

Ana Culibrk (PhD student who has since switched to algebraic geometry)

Denis Sjerve, UBC

Papers:

- [1] Kallel, Sadok; Sjerve, Denis On the group of automorphisms of cyclic covers of the Riemann sphere. Math. Proc. Cambridge Philos. Soc. 138 (2005), no. 2, 267–287.
- [2] Kallel, S.; Sjerve, D.; Song, Y. On cyclic covers of the Riemann sphere and a related class of curves. Advances in topological quantum field theory, 327–353, NATO Sci. Ser. II Math. Phys. Chem., 179, Kluwer Acad. Publ., Dordrecht, 2004.

Elena Kudryavtseva, University of Calgary, PIMS Visiting Research Fellow

Papers:

- [1] Bogopolski, O.; Kudryavtseva, E.; Zieschang, H., Simple curves on surfaces and an analog of a theorem of Magnus for surface groups. *Math. Z.* 247 (2004), 595-609.
- [2] Bogatyı, S.; Gonalves, D.L.; Kudryavtseva, E.; Zieschang, H., Realization of primitive branched coverings over closed surfaces. In: *Advances in Topological Quantum Field Theory*. Ed. J.M.Bryden (Kluwer Academic Publishers, 2004), 297-316.
- [3] Bogatyı, S.A.; Kudryavtseva, E.A.; Zieschang, H., On coincidence points of mappings of the torus into a surface. *Proc. Moscow Math. Inst. Steklov* 247 (2004), 15-34.
- [4] Gonalves, D.L.; Kudryavtseva, E.; Zieschang, H., An algorithm for minimal number of intersection points of curves on surfaces. *Proc. Seminar on Vector and Tensor Analysis* 26 (2005), 139-167.
- [5] Kudryavtseva, E.A.; Saidak, F.; Zvengrowski, P., Riemann and his zeta function. *Morfismos* 9 (2005), no.2, 1-48.
- [6] Kudryavtseva, E.A.; Lakshtanov, E.L., Classification of singularities and bifurcations of critical points of even functions. In: *Topological Methods in the Theory of Integrable Systems*. Eds. A.V.Bolsinov, A.T.Fomenko, A.A.Oshemkov (Cambridge Scientific Publishers, 2006), 173-214
- [7] Kudryavtseva, E.A.; Varadarajan, K.; Zvengrowski, P., Stable inverses of vector bundles with applications to K -theory, 14 pages (submitted to *J. K-Theory*, Springer).
- [8] Bogatyı, S.A.; Fricke, J.; Kudryavtseva, E.A., On multiplicity of mappings between surfaces. In memory of H.Zieschang. 12 pages (submitted to *G.T. Monographs*, Springer).
- [9] Gonalves, D.L.; Kudryavtseva, E.A.; Zieschang, H., Some quadratic equations in free group of rank 2. In memory of H.Zieschang. 60 pages (submitted to *G.T. Monographs*, Springer).

Graduate student co-supervision:

Satoshi Tomoda (PhD 2005, supervisor P.Zvengrowski)