

WALTER JOHN WHITELEY**April 2001**

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PERSONAL DATA**TEACHING AND RESEARCH EXPERIENCE**

- York University, Department of Mathematics and Statistics:
 - Full Professor (with tenure), 1994-present;
 - Associate Professor, 1992-94;
 - Director of the MA in Mathematics for Teachers, 1998 -present.
 - member of the Pure Mathematics section.
 - member of the Applied Mathematics Section.
 - member of the Graduate Program, Mathematics and Statistics.
 - member of the Graduate Program, Computer Science (1995 -present).
 - recommended for membership, Graduate Program in Education (Spring 2001).
- Ontario Institute for Studies in Education (U of T):
 - Associate Member, graduate faculty, Department of Curriculum, Teaching and Learning (January 2000 -) ;
- Champlain Regional College, St. Lambert Campus,
 - Department of Mathematics: Permanent Instructor, 1972-1994;
 - Department of Humanities: Permanent Instructor, 1972-1978
- Université de Montréal, Centre de recherches mathématiques:
 - chercheur invité, 1976-82
 - membre associé, 1982-94.
- Université de Québec à Montréal, LACIM:
 - membre associé, 1991-92
- McGill University, Department of Mathematics:
 - Visiting Associate Professor (1/2 time 1983-85);
 - Visiting Assistant Professor (1/2 time 1982-83);
- Cornell University, Department of Mathematics:
 - Visiting Assistant Professor, Spring 1981;
- Trent University, Department of Mathematics:
 - Visiting Summer School Teacher, 1972, 1975;
- Lakehead University, Department of Mathematical Sciences:
 - Visiting Assistant Professor, 1971-72;

EDUCATION

- PhD. in mathematics, Massachusetts Institute of Technology, June 1971;
 - Thesis: "Logic and Invariant Theory"; supervisor: Prof. G-C. Rota.
- B.Sc. (Hon.) in math. and physics, Queen's University at Kingston, 1966.
 Medal in Mathematics 1966.
- Woodrow Wilson Fellow 1966

RESEARCH

Publications in Refereed Journals

- A homological approach to skeletal rigidity; with Tiong-Seng Tay, *Advances in Applied Mathematics* 25 (2000), 102-151.
- Constraining Plane Configurations in CAD: combinatorics of lengths and directions; with Brigitte Servatius; *SIAM Journal on Discrete Mathematics*, Vol. 12 (1999), 136—153.
- Second-order rigidity and pre-stress stability for tensegrity frameworks; with Robert Connelly, *SIAM J. on Discrete Methods* 9 (1996), 453-492.
- Skeletal rigidity of simplicial complexes: I; with Tiong-Seng Tay and Neil White, *European J. of Combinatorics* 16 (1995), 381-403
- Skeletal rigidity of simplicial complexes: II; with Tiong-Seng Tay and Neil White, *European J. of Combinatorics* 16 (1995), 503-523
- Spaces of stresses, projections, and parallel drawings for spherical polyhedra, with H. Crapo, *Beitraege zur Algebra und Geometrie / Contributions to Algebra and Geometry* 35 (1994), 259-281.
- How to design or describe a polyhedron, *J. of Intelligent and Robotic Systems* 11 (1994), 135-160.
- The generic dimension of the space of C^1 splines of degree $d \geq 8$ on tetrahedral decompositions, with Peter Alfeld and Larry Schumaker, *SIAM J. Numerical Analysis* (1993), 889-920.
- Plane stresses and projected polyhedra I: the basic pattern, with H. Crapo, *Structural Topology* 20 (1993), 55-68.
- The stability of tensegrity frameworks, with R. Connelly, *J. Space Structures* 7 (1992), 153-163.
- Weaving, sections and projections of polyhedra, *Discrete Applied Math.* 32 (1991), 275-294.
- Synthetic factoring of invariant computations; with Bernd Sturmfels, *J. Symbolic Computation* 11 (1991), 439-453.
- Invariant theory and computations in symbolic analytic geometry, *J. Symbolic Computation* 11 (1991), 549-578.
- A matrix for splines; in "Progress in Approximation Theory" (Nevai and Pinkus eds.), Academic Press (extracted backlog from the *J. Approximation Theory*), (1991), 821-828.
- Vertex splitting in isostatic frameworks; *Structural Topology* 16 (1991), 23-30.
- Rigidity and polarity II: weaving lines and plane tensegrity frameworks; *Geometriae Dedicata* **30** (1989), 255-279.
- Infinitesimally rigid polyhedra II: modified spherical frameworks; *Trans. AMS* 306 (1988), 115-139.
- A matroid on hypergraphs, with applications in scene analysis and geometry, *Disc. and Comp. Geometry* 4 (1988), 75-95.
- The union of matroids and the rigidity of frameworks; *SIAM J. Disc. Meth.* 1 (1988), 237-255.
- Rigidity and polarity I: statics of sheetworks; *Geometriae Dedicata* 22 (1987), 329-362.
- The algebraic geometry of motions of bar and body frameworks, with Neil White, *SIAM J. Alg. Disc. Meth.* 8 (1987), 1-32.
- Generating isostatic frameworks; with T-S. Tay, *Structural Topology* 11 (1985), 20-69.
- A correspondence between scene analysis and motions of frameworks; *J. Disc. Appl. Math.* 9 (1984), 269-295.
- Infinitesimally rigid polyhedra I: statics of frameworks; *Trans. AMS* 285 (1984), 431-465.
- Recent progress in the rigidity of frameworks; with Tiong-Seng Tay, *Structural Topology* 9 (1984), 31-38.
- Infinitesimal motions of a bipartite framework; *Pac. J. Math.* 110 (1984), 233-255.
- Algebraic geometry of stresses in frameworks; with Neil White, *SIAM J. Alg. Disc. Meth.* 4(1983), 53-70.

- Cones infinity and one-story buildings; *Structural Topology* 8 (1983), 53–70.
- Motions stresses and projected polyhedra; *Structural Topology* 7 (1982), 13–38.
- Statics of frameworks and motions of panel structures: a projective geometric introduction, with Henry Crapo, *Structural Topology* 6 (1982), 43–82.
- Tensegrity frameworks; with Ben Roth, *Trans. AMS* 177 (1981), 419–446.
- Realizability of polyhedra; *Structural Topology* 1 (1979), 46–58.
- Logic and Invariant theory IV: invariants and syzygies in combinatorial geometry; *J. Comb. Theory B* (1979), 251–267.
- Logic and Invariant theory III: axiom systems and syzygies; *J. Lond. Math Soc.* (2) 15 (1977), 1–15.
- Logic and Invariant theory II: homogeneous coordinates, the introduction of higher quantities, and structural geometry; *J. Algebra* 50 (1978), 380–394.
- Logic and Invariant theory I: invariant theory of projective geometry; *Trans. AMS* 177 (1973), 121–139.
- Homogeneous formulas and homogeneous sets; *Rend. Math.* 6 (1973), 1–12.

Collective Works (refereed):

- Rigidity and Scene Analysis; for *Handbook of Discrete and Computational Geometry*, J. Goodman and J. O'Rourke (eds.), CRC Press, 1997, 893–916.
- Matroids and rigidity; in *Applications of Matroid Theory*, Neil White (ed.), Encyclopedia of Mathematics, Cambridge University Press 1992, 1–53.
- The combinatorics of bivariate splines, in *Applied Geometry and Discrete Mathematics, the Victor Klee Festschrift* (P. Gritzmann and B. Sturmfels (eds.)), A.M.S. DIMACS Series 1991, 587–608.

Conference Proceedings (refereed):

- Rigidity of molecular structures: generic and geometric analysis, in *Rigidity and Applications*; P. Duxbury and M. Thorpe (eds.) Academic/Kluwer 1999.
- An analogy in geometric homology: rigidity and cofactors on geometric graphs, in *Mathematical Essays in Honor of Gian-Carlo Rota*, B. Sagan and R. Stanley (eds) Birkhauser Boston, 1998, 413–437.
- Matroids from Discrete Geometry, in *Matroid Theory*, J. Bonin, J. Oxley and B. Servatius (eds.), AMS Contemporary Mathematics, 1996, 171–313.
- Representing geometric objects, *Learning and Geometry: Computational Approaches*, D. Kueker and C. Smith (eds.), Birkhauser 1996, 143–178.
- Analytic vs synthetic geometry for computers, *Learning and Geometry: Computational Approaches*, D. Kueker and C. Smith (eds.), Birkhauser 1996, 121–141.
- Applications of the Geometry of Rigid Structures, in the *Proceedings of the INRIA Conference on Computer-Aided Geometric Reasoning*, 217–254.
- Convex polyhedra, Dirichlet tessellations and spider webs; with Peter Ash, Ethan Bolker and Henry Crapo, in *Shaping Space: A Polyhedral Approach*, (M. Senechal and G. Fleck eds.), Birkhauser, Boston, 1988, 231–250.
- Problems on the realizability and rigidity of polyhedra; in *Shaping Space: A Polyhedral Approach*, (M. Senechal and G. Fleck eds.), Birkhauser, Boston, 1988, 256–258.
- Two Algorithms for Polyhedral Pictures; *Proceedings 2nd ACM Conference on Computational Geometry*, 1986, 142–149.
- The projective geometry of rigid buildings; in *Finite Geometries*, C. Baker and L. Batten, eds., Marcel Dekker 1985, 353–370.

Submitted Papers:

- Constraining Plane Configurations in CAD: Circles, Lines and Angles in the Plane, with F. Saliola; (40 pages) submitted SIAM J. Disc. Math, 2000.
- Constraining Plane Configurations in CAD: geometry of lengths and directions; (33 pages), submitted SIAM J. Disc. Math, .

Work in Progress (Preprints)

- Extending Basis and Circuits for 2-Rigidity via Tree Coverings, with Laura Chavez; (25 pages) 2000.
- Rigidity of Frameworks: Euclidean, Spherical and Hyperbolic and Projective, with F. Saliola; (30 pages) 2000
- Constraining Plane Configurations in CAD: angles, with M. Bousfield, K. Caldwell, L. Duong, and D. Moskovitz; (20 pages) 1995-2000.
- Spherical determination (1987-99).
- Tensegrity frameworks; prepared for "The Geometry of Rigid Frameworks", H. Crapo and W. Whiteley (eds.) (drafts 1986,88).
- Generic rigidity; with J. Graver, prepared for "The Geometry of Rigid Frameworks", H. Crapo and W. Whiteley (eds.) (drafts 1987-92).
- More generic rigidity; with J. Graver, T-S Tay, prepared for "The Geometry of Rigid Frameworks", H. Crapo and W. Whiteley (eds.) (drafts 1987-92).
- Rigidity of grids; with A. Recski, prepared for "The Geometry of Rigid Frameworks", H. Crapo and W. Whiteley (eds.) (draft 1990).
- Generic rigidity of triangular surfaces; prepared for "The Geometry of Rigid Frameworks", H. Crapo and W. Whiteley (eds.) (drafts 1990-92).

Recent Invited Talks

- *First-order and Convex Rigidity of Polyhedra in Euclidean I, II*; Franco Saliola and Walter Whiteley (two companion talks) Abstracts 964-52-219 and 964-52-219, AMS Special Session on Polytopes, Lawrence Kansas, March 31, 2001.
- *Rigidity of Molecular Structures*; in Frontiers of Science Lecture Series, Michigan State University, January, 2001.
- *First-Order Rigidity in Cayley-Klein Geometries*; (presented by co-author Franco Saliola) Abstract 957-52-290 , AMS Special Session on Discrete and Applied Geometry, Toronto, September 23-24, 2000.
- *Constraining plane configurations in CAD: circles, lines and angles*; (presented by co-author Franco Saliola) Abstract 952-52-156, AMS Special Session on Discrete Geometry, Lowell, Mass March 31-April 1, 2000.
- *Plane geometric constraints: angles on lines* (coauthors, Melissa Bousfield, Katie Caldwell, Linh Duong and David Moscovitz) Special Session on Discrete Geometry, American Mathematics Society sectional meeting, Lowell Mass, April 2000.
- *Analogies and Correspondences: Matroids on Graphs for $3|V|-6$* , Special Session in honour of Gian-Carlo Rota, American Mathematics Society winter meeting, Washington, D.C, January 2000.
- *Rigidity of Frameworks: Euclidean, Spherical, Hyperbolic*, co-authors Franco Saliola and Lily Bernchtein, Conference on Discrete Geometry, Budapest Hungary, November 1999.

- *Constraining a Spherical Polyhedron with Dihedral Angles*, CMS Special Session on Geometry, Kingston December 1998.
- *Old Questions - New Answers: geometry for computers*, American Association for the Advancement of Science, Philadelphia February 1998.
- *Geometric Constraints in Plane CAD*, AMS Special Session on Discrete Geometry, Montreal September 1997.
- *Kinematics of Hinge Structures and Models of Flexible Glasses*, Workshop on Behaviour of Aggregate Materials, DIMACS, Rutgers University May 1997.
- *All simple diagrams are diagrams*, Convex and Affine Geometry, July 1996, Halifax.
- *Two Families of Matroids from Geometric Homology: an analogy, with digressions* RotaFest, April 1996, MIT, Cambridge Mass.
- *Spider Webs, the Eiffel Tower and Multivariate Splines*, CRM Workshop on Splines and CAGD, Université de Montréal, January 1996.
- *Angles in Plane CAD*, AMS special session on Discrete Geometry, Boston, November 1995.
- *Matroids arising in Discrete Applied Geometry*, two invited talks, AMS Conference on Matroid Theory, Seattle, Washington, June 1995.
- *The geometry of splines*, Special Session on Approximation Theory, CMS Summer Meeting Edmonton, June 1994.
- *Geometry and CAD*, AMS special session on Discrete Geometry, New York, April 1994.

SELECTED SMALL WORKSHOPS (speaker and participant)

- Workshop on Rigidity, Fields Institute of Mathematical Science, September 22, 2000, organizer and speaker: *Geometric Constraints: rigidity, angles, and applications*.
- Workshop on Protein Folding, (organized by physicists and biochemists) Traverse City, Michigan, (August 2000). *Generic Rigidity of Protein Frameworks*, (co-authors Joy Abramson, Marcus Emmanuel Barnes and Lisa Young), poster presentation Traverse City Workshop on Protein Flexibility and Folding August 2000, (refereed abstract to in Journal of Molecular Graphics and Modeling, issue1, 2001 and concurrently in Protein Flexibility and Folding (eds. L.A. Kuhn and M.F. Thorpe) Biological Modeling series, Elsevier, 2001.
- Workshop on Diskrete Geometry, Oberwolfach (Germany), (May 2000), invited participant. *Rigidity: Euclidean, spherical, hyperbolic and projective*; (co-author Franco Saliola) poster presentation.
- Workshop on Rigidity Theory and Applications, (organized by physicists) Traverse City, Michigan, (June 1998). *Rigidity of molecular structures: generic and geometric analysis*, talk published in the proceedings (see above).
- AAI Fall 1997 Symposium: Reasoning with Diagrammatic Representations II, MIT (November 1997), invited participant and commentator.
- Workshop on Diskrete Geometry, Oberwolfach (Germany), (May 1997), invited participant.
- Workshop on Thinking with Diagrams, Portsmouth University, (January 1997), invited participant in working groups.
- Workshop on Splines and Computer Aided Geometric Design, Université de Montréal, (one week January 1996), talk on 'Eiffel Tower, Splines and Spheres'.

Professional Memberships (Research Oriented)

- Canadian Mathematical Society.
- Mathematical Association of America

Research Grants

- NSERC: Individual operating grants:
 - Discrete applied geometry (2001-2005) 21,000/yr.
 - Discrete applied geometry (1998-2001) 18,000/yr (now \$19,500 /yr).
 - Discrete applied geometry (1997) 16,500/yr.
 - Geometry of rigid structures and its applications (1994-97) 15,000/yr.
 - Geometry of rigid structures and its applications (1991-94) 12,000/yr.
 - Geometry of rigid structures and its applications (1988-91) 10,900/yr.
 - Geometry of rigid structures (1985-88) 11,000/yr.
 - Geometry of rigid structures (1979-85) \$4,000 - \$10,000/yr.
 - Logic and Invariant Theory (1971-72) \$2,500.
- NSERC: Equipment grant (2002-2003): Huang, van Rensburg, adras, Salisbury, Wu, Liang, Muldoon and Whiteley: Mathematical modeling and scientific computing - \$18,000 (partial funding of workstation).
- York: Faculty of Arts grants:
 - Undergraduate Research Project on Geometric Constraints (1999) \$2,500.
 - Formal Power Series and Algebraic Combinatorics Conference (1997) \$3,000.
 - Undergraduate Research: Thinking with diagrams (1997) \$500.
- York: Departmental Academic Initiative Funds:
 - Workshop on Rigidity of Frameworks (at Fields) \$500.
- SSHRC Conference Travel: Travel to the International Congress of Mathematics Education, July 2000 \$1,500.
- FCAR (Québec): grants with release time:
 - 1993-94: grant as membre, Centre de recherches mathématiques, U. de Montreal: program <centres> (individual grant and release time declined);
 - 1992-93: grant as membre, Centre de recherches mathématiques, U. de M.: program <centres>, \$7,000 (plus 50% release time, declined);
 - 1991-92: individual grant, as collegial researcher (ACC), \$4,500 plus 60% release time (equivalent to \$36,000).
 - 1984-91: grant as member of team at U. de M, program <equipes> \$25,000 plus 50% - 80% release time (equivalent to \$30,000-40,000 per year).
 - 1982-83: individual grant, as collegial researcher (ACSAIR), \$1,000 plus 50% release time (equivalent to \$25,000).
- FCAR (Québec): ◦ grants for the Journal *Topologie Structurale*:
 - program <revus>, \$10,000 - \$15,000/yr 1985-93
 - member of the board of directors and editorial board (chair 1988-91)

TEACHING, PEDAGOGY and MATHEMATICS EDUCATION**Courses Taught: York University****Graduate Courses**

- Mathematics 5450.06 Geometry for Teachers (Summer 2000).
- Mathematics 5500 6.0 Reading Course on Topics in Mathematics for Teachers (Winter/Spring 99)
- Mathematics 6003 3.0 Reading Course on Combinatorial Rigidity (Winter 99)
- Mathematics 5450.06 Geometry for Teachers (W 98).
- Mathematics 6003.03 Reading Course on Matroid Theory (Winter 97)
- Mathematics 5500.06 Reading Course on Topics in Geometry and Topology (F/W 96).
- Mathematics 6051.03 Reading Course in Graph Theory (Summer 96).
- Mathematics 5450.06 Geometry for Teachers (F/W 94-95).
- Mathematics 6003.03 Reading course on Advanced Linear Algebra (S 94).
- Mathematics 6003.03/4160.03 Combinatorics (Winter 94).
- Mathematics 6003.03/4150.03 Discrete Applied Geometry (Fall 93).

External Graduate Courses

- Klein's Hierarchy, Invariants and Discrete Applied Geometry**, Erasmus Common Program:
Mathematical Methods of Robotics, UIA, Antwerp,
15 hour course, May 1993. 21 hour course, May 1992.

Undergraduate Courses**York University**

- Mathematics 3050.06 Introduction to Geometries (F/W 00-01).
- Bethune College Course SC/BC 1800B 3.0: In the Mind's Eye: information in visual form (F/W 00-01).
- Mathematics 4000 6.0 Special Project: Mathematics Education – assessment and integration of technology (F/W 99-00).
- Bethune College Course SC/BC 1800H 3.0: In the Mind's Eye: information in visual form (F/W 99-00).
- Mathematics 4000 3.0 Special Project: Visualization (W 99).
- Mathematics 4000 6.0 Special Project: Geometry and Learning (F/W 98-99).
- Mathematics 4000.06 Special Project: Applied Geometry (F/W 98-99).
- Mathematics 4000.03 Special Project: Geometry (F 98).
- Mathematics 3050.06 Introduction to Geometries (F/W 98-99).
- Mathematics 4000.06 Special Project: Visualization and Music (F/W 96-97).
- Mathematics 4000.03 Special Projects: Geometry (F 97).
- Mathematics 3050.06 Introduction to Geometries (F/W 96-97).
- Mathematics 2090.03 Introduction to Logic (W 97).
- Mathematics 2320.03 Discrete Mathematics (F 97).
- Mathematics 2090.03 Introduction to Logic (W 95).
- Mathematics 4300.03 Reading Course in Geometry (W 95).
- Mathematics 2090.03 Introduction to Logic (W 95).

- Mathematics 2220.03 Linear Algebra with Applications II (F 93, F94).
- Mathematics 4200.03 Geometry and Thinking (F 94).
- Mathematics 2090.03 Introduction to Logic (W 93, W94).
- Mathematics 4300.03 Reading Course in Combinatorics (S 93).
- Mathematics 4300.03 Reading Course in Geometry of Crystals (S 93).
- Mathematics 4300.03 Reading Course in Combinatorics (W 93).
- Mathematics 3120.06 Introduction to Abstract Algebra (F/W 93-94).
- Mathematics 4150.03 Topics in Geometry (F 92).

Pedagogical Materials

- Web Pages*, Course related pages for Geometry, with links of resources.
- Discrete Applied Geometry*, Course Notes 1992, revised 1993 (165 pages) used for the Erasmus Program Courses mentioned above. Portions used by Robert Connelly in a graduate Geometry Course at Cornell University.
- The Geometry of Rigid Frameworks*, (with Henry Crapo (Paris), Robert Connelly (Cornell), Ben Roth (Wyoming), Jack Graver (Syracuse), Andras Recski (Eötvös, Budapest), Tiong-Seng Tay (Singapore)), coedited with Henry Crapo; Draft Graduate Text (450 pages). Some of these, and draft materials for two other volumes, were used for York Course 6003.03/4150.03 Discrete Applied Geometry, Fall 1993.
- Geometria, Structures* Two pieces of Macintosh software, developed by Janos Baracs, with my partial support of programming costs. Portions used in York course 6003.03/4150.03 Discrete Applied Geometry, Fall 1993.
- Shaping Space: a Polyhedral Approach*. A volume of resources and survey articles for geometry courses exploring polyhedra. I was a contributor, and use the book as a supplemental resource for 4150.03: Topics in Geometry; 3050.06 Introduction to Geometries; and 5450.06 Geometry for Teachers.
- consultant for Cornell University project: *A Pilot project for an Introductory Level Geometry Course* (directed by Maria Terrell).
- scholar in residence and consultant for Key Curriculum Press (high school mathematics publishing and software development) March 1996.

Thesis Involvement

External Examiner, Ph.D. (1999) Konstantin Rybnikov, Queen's University at Kingston; Polyhedral Partitions and Stresses.

Jury member, Ph.D. exam (1992): Rudi Penne, Department Wiskunde en Informatica, Universitaire Instelling Antwerpen;
Lines in 3-space: Isotopy, Chirality and Weavings.

Served on six Masters Thesis Examining committees in computer science at York (September 1994, April 1995, August 1996, October 1998, June 2000, April 2001)

Graduate Student Supervision

Supervising Ph.D. students

- Camille Mittermeier (né Cooper) 1995- :
completed Dissertation Subject Oral (May 1998)
- Laura Chavez - 1998-99 (transferred to Simon Fraser).

Member of Ph.D Supervisory Committee:

Achan Lin - (1998 -)

Mark Defazio (1996- 01) Ph.D. completed August 2001

Stefan Mykejik (1997 -)

David Erskine-Kelly (1999 -)

Member of Ph.D Supervisory Committee OISE/UT

Margaret Sinclair (00 -01) Completed June 2001, hired as Assistant Professor in the Faculty of Education, York University.

Supervised three masters students (seminars and reading courses) 1994,96,99.

Epsilon (now M.Sc. Student, Computer Science, U. of Saskatchewan

Chris Henville (High School Teacher)

Steve Johnson (High School Teacher)

Supervised three masters students 1993-95, 99 (seminars, advising)

Mathew Lella (working as an architect).

Camille Cooper (admitted to the PhD program, January 1995)

Jae Jong (Ph.D Student, Waterloo) 1998

Research Assistant:

Lily Berenchtein : Trees and Rigidity Winter 2002.

Undergraduate Student Supervision

Supervising York Science Undergraduate Research Award students,

Showkat Yazdanian: Modeling Proteins, Summer2001.

Lisa Young: Modeling Proteins, Summer2000.

Franco Saliola: Rigidity of polyhedra Summer 2000.

"Thinking with diagrams" Summer 1998 [Graduated, proceeding to Ph.D. in Mathematics at Cornell, with a fellowship.]

Maxim Garber: Thinking with diagrams, Summer1998 [Graduated, doing Ph.D. in Computer Science at U.N.C.]

Lily Berenchtein : Thinking with diagrams, Summer1998 (Graduated, proceeding to U of T, MA in Math, Fall 2002)..

Katherine Caldwell : Thinking with diagrams, Summer1997.

(Graduated - Currently working as high-school teacher, Vaughan).

Melissa Bousfield: project 'Angles in CAD and Java Based Displays', Summer 1996 [Graduated: working for IBM].

Jonathan Slater: project 'Dynamic Geometry' Summer 1996.

(Graduated - currently pursuing graduate education in Theology)

Supervising Summer NSERC Research students,

Joe Aiken: Protein Flexibility, Summer2002.

Lisa Young: Protein Rigidity and Symmetry, Summer2001.

Shirin Yazdanian: Protein Rigidity and Symmetry, Summer2001 (Graduating, proceeding to MA in Statistics, U of T, Fall 2002).

Joy Abramson: Modeling Proteins, Summer2000.

Marcus Barnes: Modeling Proteins, Summer2000.

Lily Berenchein : Rigidity in hyperbolic space, Summer1999.

Franco Saliola: Hyperbolic and elliptic geometry Summer 1999.

Katherine Caldwell (Targeted Award): worked on a project on 'Angles in CAD', Summer1994.

Melissa Bousfield (Targeted Award): worked on a project on 'Angles in CAD', Summer 1995.

David Moskovitz: worked on a projects on 'Angles in CAD', and 'Maple for rigidity', Summer 1995.
[Graduate, U of T Medical School].

Patrick Scotto di Luzio: worked on a project on 'Visual Reasoning', Summer1995. [Graduate PhD in Philosophy, Stanford University, SSHRC Doctoral Fellowship, continuing in this area research.]

Supervising Work/Study Research student,

Lily Berenchein : Introduction to Structural Topology, Fall/Winter 98-99.

Direct hiring of undergraduate researchers:

Kelvin Chan: 4 months on Protein Flexibility Summer 2002.

Chin Trinh: 2 1/2 months on 'Thinking with diagrams" Summer 1997 (Graduated, teaching Mathematics, York Region).

Michel Kirejczyk: 3 months on 'Thinking with diagrams" Summer 1997.

Jonathan Slater: 2 1/2 months on 'Transformations in Geometer's Sketchpad', Summer 1995.

Eliana Karoly: 3 months, 'Visualization', Summer 1996.

Katherine Caldwell, 6 weeks 'Angles in CAD' Summer 1996.

Supervised about ten student presentations at Canadian Undergraduate Mathematics Conferences, Seaway MAA meeting, and Math Assoc. of America winter meetings.

Publications and Talks on Geometry, Teaching and Visualization:

- *To See Like a Mathematician.* Invited plenary talk on Mathematics Education, Canadian Mathematics Society, Ottawa, December 2002.
- *Geometry with Eye and Hand.* Invited talk, Mathematics Education Session, Canadian Mathematics Society, Laval, June 2002.
- *To See Like a Mathematician.* Invited plenary talk, York4MA (local chapter of OAME), Thornhill, March 2002.
- *A Mathematician Sees: thinking, Learning and Teaching Visually.* Invited one hour talk, American Mathematical Association of Two Year Colleges, Toronto, November 2001.
- *Geometry is alive and applied.* Two hour workshop, American Mathematical Association of Two Year Colleges, Toronto, November 2001.
- *Visualizing Mathematics: learning to 'see mathematically'* Invited plenary, Ontario College Mathematics Teachers Conference, May 2001.
- *"Seeing Mathematically": learning and teaching* Invited workshop, Lancaster England, April 2001. Short (1000 word) summary article London Times Educational Supplement, Curriculum Special, January 18, 2002, as "Look at it another way".
- *"Mathematicians see ..."* Invited one hour lecture, SketchMelt Conference, Queen's University at Kingston, January 2001.
- *Visual Forms and Mathematics: thinking, communicating, learning,* Invited one hour talk, International Congress of Mathematical Education, Tokyo, Japan, July 2000. 15 page summary to appear in the proceedings.
- *Dynamic Geometry and the Practice of Geometry,* Contributed talk , International Congress of Mathematical Education, Tokyo, Japan, July 2000. 15 page summary circulated.

- *Mathematics and Visual Forms*, Invited Theme Talk, Simon Fraser University, one day workshop for Elementary and High School Teachers, April 2000.
- Queen's University Education Seminar, invited talk on Teaching Geometry, April 2000.
- *A course on Visualization*, Ad Hoc Presentation, Canadian Mathematics Education Study Group, Brock, June 1999 (One Page Summary to be published).
- *The decline and rise of geometry in the 20th century*, invited plenary speaker, Canadian Mathematics Education Study Group, Brock, June 1999 (Proceedings, 1999).
- *Geometry as Applied Mathematics*, Invited talk at the special session on Geometry Education, Mathematical Association of America Winter meeting, January 1999, San Antonio.
- *Cauchy's Theorem*, Invited talk at the special session on Great Theorem's of Mathematics, Mathematical Association of America Mathfest 98, July 1998, Toronto.
- *Discrete Geometry: Applicable and Applied*, Mathematical Association of America, Seaway Section Plenary Lecture, York University, April 1998.
- *Geometry for CAD: Old Question-New Answers*, Special Session on 'Geometry is Alive', American Association for the Advancement of Science, Philadelphia, February 1998.
- *The 'geometry' in applied geometry*, Special Session on Applied Geometry in Undergraduate Geometry Curriculum, MAA Winter Meeting, Cincinnati, January 1994.

Talks on Teacher Preparation:

- *Programs for teachers that work*, with Pat Rogers (York), Invited Talk CMS meeting, Education Session, June 2000, McMaster.
- *Recruitment and Preparation of Mathematics Teachers in Ontario*, with Eric Muller (Brock), Contributed Talk Mathematical Association of America Winter meeting, January 2000, Washington, DC.

Educational Liaison:

- Member, Planning committee: SketchMelt program (Ad Hoc group planning a set of one week in-service programs to support the use of dynamic geometry in Ontario schools).
- Member, Advisory Board: SketchMad program (Queen's University support system for use of dynamic geometry in Ontario schools - funded by \$1,000,000 grant from Imperial Oil).
- Mathematics Education Forum (Fields Institute), forum on high school and elementary school mathematics programs. Participant: (98).
 York Representative, 1998-00
 Co-Chair (with Eric Muller, Brock) - Ad hoc group on preservice preparation of math teachers (April 1999 -)
 Organizing a one-day event on the recruitment and preparation of teachers of mathematics (April 28, 2000).
 Organizing a one-day meeting on the preparation of teachers of mathematics in mathematics departments (September 30, 2000).
- Active participant: e-mail teaching related lists and projects:
 - Teaching Geometry List (Cornell University project on Enhancing Undergraduate Faculty);
 - geometry-pre-college@forum.swarthmore.edu (list for K-12 teachers);
 - geometry-dynamic@forum.swarthmore.edu (list for users of dynamic geometry programs in teaching);

- electronic mentoring project between York undergraduates and a high school class in Oregon, USA (1997).
- Teacher Talk: (list from Math Central)
- Diagrams list (diagrams@csl.stanford.edu) basic communication among an interdisciplinary group of researchers and teachers on the use of diagrammatic forms.
- FOM list (fom@math.psu.edu) - foundations of mathematics, including the role of diagrammatic reasoning.:
- STLHE list (Society for Teaching and Learning in Higher Education);
- contributing responder to: Questions and Queries: Math Central, University of Saskatchewan
- Supervisor: summer research apprenticeships of two high school students (summer1996);
- member Innovators in the Schools Network, 1994- (occasional events in local schools)
- Philip Pocock S.S. - grade 9 class on Spherical Geometry (F 99)
- mentored an accelerated High School Student in geometry (W 95)
- member of Geometry Working Group, of the Mathematics Education Forum (1994)
- member of the Langstaff Secondary School Parent's Liaison Committee (1993-95)
- participated in many meetings and discussions about transition between college (CEGEP) and university mathematics courses and the transition between high school and CEGEP.
- member of McGill Mathematics Department committee to review first year curriculum and coordination with CEGEP curriculum.
- Member, study commission on English Language Nursing Education in Montreal (1974-75).

Professional Development Activities.

While at York University

- Department of Mathematics and Statistics:
 - Teaching and Learning Committee (1996-98)
 - Supervising work-study students for committee, FW 96-98
 - Project 1: updating binder on 'Applying to Graduate School', creating departmental web pages and assisting with departmental 'audit'.
 - Project 2: updating Career Options binder creating departmental web pages and assisting with departmental 'audit'.
 - Co-Supervising two additional work-study students for committee:
 - Project 1: Working with data and recommendations from Audit of Departmental Programs.
 - Project 2: Working with data and recommendations from Transitions Project.
- Writing proposal and hiring of Departmental Web Assistant (Work study project) (96-97).
- Expanding Horizon's Project, FW 95-96
- Teaching and Learning Committee (1992-98), Chair 1993-95.
 - Supervising two work-study students for committee, FW 94-95
 - Project 1: preparing booklet on 'Applying to Graduate School', and updating Career Options book (math).
 - Project 2: updating Career Options book (statistics) and assisting with departmental 'audit'.
- Supervisor for the Departmental Graduate Teaching Associate, FW 94-95 (including organizing Departmental TA training

- sessions)
 co-supervisor of TDGA's with Pat Rogers: 1996-98.
- Restructuring Committee (1995-96).
 - Faculty contact for student clubs (1994-95, 96-98).
 - Restructuring Committee (1995-96).
 - York Mathematics Department Councilor for the York⁴ Mathematics Association (1993-94)
 - Curriculum committee for the Pure Mathematics Section (1992-94,99-).
 - SCOTL Pedagogical Development Grant: *Information in Visual Form* \$3,000, 2000-2001.
 - Ontario Association of Mathematics Educators , invited workshop presenter, Toronto, May 1999.
 - Ontario Mathematics Educators Association, invited workshop presenter, Toronto, May 1997.
 - U. of T. Summer program for high school teachers: Invited presenter (with four York undergraduates and a graduate student) July 1997.
 - Canadian Mathematical Society, survey of undergraduate research programs (replacement programs for summer NSERC) (1996).
 presentation at Education Session, London, Dec 1996:
Undergraduate employees for departmental innovations.
 - NSF Undergraduate Faculty Enhancement workshop on Teaching Undergraduate Geometry, Cornell University June 1996.
 - CST workshop with Pat Rogers, on 'Creating Study Groups', 1996.
 - CST TA workshop on 'Teaching Mathematics to Undergraduates', 2001.
 - CST TA Days workshop on 'Teaching Mathematics to Undergraduates', 2001.
 - Mathematics Education Study Group (workshop leader, with Pat Rogers, on 'Liaison between High School and University'), May 1995.
 - York Assessment Forum
 - working group on 'Independent Learning';
 - working group on 'Encouraging Diversity in Graduate Programs' (1999- 2000);
 - Pedagogical workshop: *What can you do with Maple?*, York⁴ Mathematics Association workshop with high school teachers, November 1993.
 - Faculty of Graduate Studies: support for Camille Cooper: mentoring undergraduate summer researchers: \$1,500, summer 1995, \$1500, summer1996.
 - SCOTL Pedagogical Development Grant, with Pat Rogers: *Collaborative Learning in Mathematics* \$3,000, 96-97.
 - Follow-up on: *Collaborative Learning in Mathematics* : One work-study student (F/W 98-99) and three Service Bursary students. One work-study student (F/W 97-98) four Service Bursary Students: forming study groups for first year math students (with Pat Rogers and support from Faculty of Science Judy Libman); and Summer Work Study Project (summer 98).
 - SCOTL Pedagogical Development Grant: *Dynamic Geometry Programs*, \$1800, 94-95 (report available on Web Pages).

Educational Memberships

- Mathematical Association of America.
- Geometry Forum (electronic newsgroup).
- Canadian Mathematics Study Group: 95, 99.
- Ontario Association for Mathematics Education (York⁴ Mathematics Association) 1996-97, 99-00.

SERVICE (Shortened)**York University**

- Department of Mathematics and Statistics:
 - Member of the Executive Committee (1996-97, 2000-01)
 - Faculty contact for student clubs (1996-98, 99-01)
 - continuing development of undergraduate mathematics lounge.
 - Ad hoc working group on pre-service and in-service preparation of math teachers (with Atkinson College) (1999)
 - Summer Undergraduate Research Coordinator (95-01)
 - Ad hoc working group on pre-service and in-service preparation of math teachers (with Atkinson College) (1999)
 - Curriculum Review Committee (Chair) (2000-02)
 - planning responses to changing high school curriculum and the double cohort.
 - Pure Mathematics Curriculum Committee (1992-94, 1999-01)
 - Applied Mathematics Curriculum Committee (1997-99)
 - Faculty liaison with coordinators of MathStat Tutorial Lab (1996-97)
 - work with two coordinators, and completed arrangements for major renovations of the lab (approved and scheduled for April 1997)
 - Coordinator - Ad Hoc committee on Service Courses for Computer Science Students (1997);
 - Coordinator - recruitment of students for York Summer Research Awards (1995-98);
 - Ad hoc committee to coordinate logic courses: mathematics and philosophy;
 - member: Tenure and Promotion File Preparation Committees (1995-97)
 - (preparing 1/3 of file for 3 individuals seeking promotion)
 - International Mathematical Olympiad 1995, local organizing committee (1993-95)
 - Organizer for the Applied Mathematics Seminar (1993-94)
 - Committee on Equity and Access (1993-94)
 - Arts Council Delegate (1993-94)
 - Discrete Mathematics hiring committee(1993-94)
 - Computer Users Committee (1992-94), including subcommittees on:
 - Computing Needs for Research and Graduate students
 - Undergraduate Microcomputer Labs (1992-94) chair 1993-94.
 - representative to CCS steering committee for Steacie Microcomputer Labs.
 - Ad Hoc Committee for Fields Institute Proposal (1993)
 - (see also Departmental Activities under Teaching)
- Graduate Program in Mathematics and Statistics
 - Director of Masters of Arts in Mathematics for Teachers program (1998-01)
 - Member of Graduate Program Executive Committee (1998-01)
 - PhD committee - member (1996-99)
 - Subcommittee on the Discrete Applied Mathematics Stream (1994)
- Faculty of Arts:
 - member of the Committee on Curriculum Development (1993-95);

- Faculty of Science:
 - Participant in Orientation panels and other activities (1996-98);
 - Research Committee (1996-99);
- Atkinson College Sociology Department: Chair of committee assembling a file for promotion to full professor.
- Faculty of Graduate Studies:
 - Ad Hoc Committee on Fee Structures (1997-98);
 - Program representative to Faculty Council, 1994-95, 96-98.
- Senate Committee on Tenure and Promotion: member (1996 - 99).
- Bethune College: Fellow (1996 -).
 - session on "Should I apply to Graduate School" (1995);
 - math department/Bethune session on careers in mathematics (1995);
 - Tuesday Latte on forming study groups (1996);
 - member College Academic Committee (1996-).
- Center for the Support of Teaching:
 - Advisory Board (1997-01);
 - Organizing committee and presenter: New Faculty program (1999, and 2000).
 - Presenter: New Faculty program 01.
 - Working Group on research in teaching /York Assessment Forum.
 - Working Group on Diversity in Graduate Programs /York Assessment Forum (1999-01)
- Center for Practical Ethics: member of the board (2000-).
- York SCM: member of advisory board (1996-).
- Organizer: Workshop on Rigidity of Frameworks: a one day workshop to be held at the Fields Institute, (September 2000)
- Organizing Committee, Special Session on Discrete Geometry, AMS Sectional Meeting, Toronto, (September 2000)
- Program Committee: The Third International Workshop on Automated Deduction in Geometry (Zurich, Switzerland, September 25-27, 2000)
- Organizing Committee, Special Session on Discrete Geometry, AMS Sectional Meeting, Lowell Mass, (April 2000)
- Local Organizing Committee: International conference on Formal Power Series and Algebraic Combinatorics (Toronto, 1998).
- Local Organizing Committee: MAA Seaway Section meeting (York University, April 1998).
- Advisory committee for the Workshop on Rigidity Theory and Applications, Traverse City, Michigan, (June 1998).
- Organizing Committee, Special Session on Geometry, CMS Winter Meeting, Queen's University, December 1998
- York University Faculty Association:
 - Arts Chief Steward, Contract and Grievance Committee (1997-02)
 - Co-Chair, Contract and Grievance Committee (1997-01) and officer handling grievances (1997-01).
 - CUPE/YUFA coordinating committee (1998-99)
 - Executive representative from Contract and Grievance Committee (1997-98, 99-00)
 - Clearing Committee member (1997-98, 99-00)
 - Contract Review Committee, 2000-2001.

WALTER JOHN WHITELEY**April 2001**

Special working group on revising the negotiating process, 1999-2000.

Member Tripartite Committee (YUFA, CUPE, Employer) for Special Renewable Contracts.

YUFA Trustee, York Pension Plan 2000-

Trsutees Ad Hoc Subcommittee on Proxy Voting.

Member YUFA working group on revising Tenure and Promotion Processes.

Panels on T&P processes: New Faculty Day (1997,98), School for academic administrators and CST/NFTY sessions.

Member, Joint Committee on Affirmative Action (1997-99)

Member, Joint Committee on Application of the Agreement
(1998-01)

YUFA Co-Chair, JOCAA (1999-00), including several special ad-hoc working groups.

Working Group on adapting Tenure & Promotions procedures to effects of the strike. (1997).

Tripartite YUFA/CUPE/Administration Committee on Renewal of SRC appointments. (2001).