

VITA
David H. Collingwood
May 1, 2012

★= New items since last merit review in Spring 2011

Address _____

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Education _____

Ph.D., University of Utah, 1983
B.S., Wichita State University, 1978

Ph.D. Thesis Title: Harish-Chandra modules with the unique embedding property
Thesis Advisor: Henryk Hecht, Professor, University of Utah

Positions _____

University of Washington, Professor 1994-
Undergraduate Program Director 3/2009-
Sabbatical Leave 2006-2007
Undergraduate Program Director 9/2001-12/2004
Calculus Reform Coordinator 9/2001-12/2004
Sabbatical Leave 1998-99
Graduate Program Director 1994-97
University of Washington, Associate Professor 1990-94
University of Washington, Assistant Professor 1987-90
NSF Postdoctoral Fellowship, 1985-88
University of Washington, Assistant Professor, Winter-Spring 1988
Institute for Advanced Study, Princeton, Member, Fall semester 1987
University of California at San Diego, Visitor, Spring 1987
University of Oregon, Assistant Professor, (on leave 1985-86, S 87), 1985-87
University of Utah, Visiting Scholar, 1985-86
Institute for Advanced Study, Visitor, Princeton, Summer-Fall 1985
Rutgers University, Hill Assistant Professor, New Brunswick, 1984-85
Universidad Nacional de Cordoba, Visiting Professor, Argentina, Summer 1984
Institute for Advanced Study, Member, Princeton, 1983-84
University of Utah, Teaching Fellow, 1978-83

Research specialty _____

Computational Molecular Biology, Harmonic analysis and representation theory for Lie groups.

Items [1]-[37] (except [32]) have all been peer reviewed and published.

- [1] Harish-Chandra modules with the unique embedding property, *Trans. Amer. Math. Soc.* 281, p.1-48, 1984. (Ph.D. Thesis, University of Utah, 1983).
- [2] Category O' , n -homology and the reducibility of generalized principal series representations, *Duke Math. J.* 50, p.1201-1224, 1983.
- [3] Lectures on representations of real rank one Lie groups, *Trabajos de Math.* 2, Univ. Nac. de Cordoba, Argentina, 1984.
- [4] Embeddings of Harish-Chandra modules, n -homology and the composition series problem: The case of real rank one, *Trans. Amer. Math. Soc.* 285, p.565-579, 1984.
- [5] A note on continuous cohomology for semisimple Lie groups, *Math. Zeitschrift* 189, p.65-70, 1985.
- [6] The n -homology of Harish-Chandra modules: generalizing a theorem of Kostant, *Math. Annalen* 272, p.161-187, 1985.
- [7] *Representations of rank one Lie groups*, Research Notes in Mathematics 137, Pitman Publishing Ltd., London, 244 pages, 1985.
- [8] A comparison theory for the structure of induced representations, (with B. Boe), *J. of Algebra* 94, p.511-545, 1985.
- [9] A comparison theory for the structure of induced representations II, (with B. Boe), *Math. Zeit.* 190, p.1-11, 1985.
- [10] A multiplicity one theorem for holomorphically induced representations, (with B. Boe), *Math. Zeit.* 192, p.265-282, 1986.
- [11] Intertwining operators between holomorphically induced representations, (with B. Boe), *Pacific J. Math.* 124, p.73-84, 1986.
- [12] Complex geometry and the asymptotics of Harish-Chandra modules for real reductive Lie groups I, (with L. Casian), *Trans. Amer. Math. Soc.* 300, p.73-107, 1987.
- [13] Complex geometry and the asymptotics of Harish-Chandra modules for real reductive Lie groups II, (with L. Casian), *Inventiones Math.*, vol. 86, p.255-286, 1986.
- [14] Complex geometry and the asymptotics of Harish-Chandra modules for real reductive Lie groups III: estimates on n -homology, (with L. Casian), *J. of Algebra* 116, p.415-456, 1988.
- [15] The Kazhdan-Lusztig conjecture for generalized Verma modules (with L. Casian), *Math. Zeit.* 195, p.581-600, 1987.
- [16] Weight filtrations for induced representations of real reductive Lie groups, (with L. Casian), *Advances in Mathematics* 73, p.79-146, 1989.
- [17] Filtrations on generalized Verma modules for Hermitian symmetric pairs, (with R. Irving, B. Shelton), *J. für die reine und ang. math.* 383, p.54-86, 1988.
- [18] *Representations of rank one Lie groups II: n -cohomology*, *Memoirs Amer. Math. Soc.* 387, 101 pages, July 1988.
- [19] A decomposition theorem for certain self dual representations in the category O (with R. Irving), *Duke Math. J.* 58, p.89-102, 1989.
- [20] Multiplicity free categories of highest weight representations I, (with B. Boe), *Comm. in Algebra*, vol.18, p.947-1032, 1990.
- [21] Multiplicity free categories of highest weight representations II (with B. Boe), *Comm. in Algebra*, vol.18, p.1033-1070, 1990.
- [22] Jacquet modules for semisimple Lie groups having Verma module filtrations, *J. of Algebra*, vol. 136, no. 2, p.353-375, 1991.
- [23] Harish-Chandra modules for semisimple Lie groups with one conjugacy class of Cartan subgroup (with R. Irving), *Contemp. Math.* 139, *Amer. Math. Soc.*, p.75-112, 1992.
- [24] A duality theorem for extensions of induced highest weight modules (with B. Shelton), *Pac. J. Math.*, vol.146, p.227-237, 1990.

- [25] Orbits and characters associated to highest weight representations, Proc. Amer. Math. Soc., vol. 114, no. 4, p.1157-1165, 1992.
- [26] *Enright-Shelton theory and Vogan's problem for generalized principal series* (with B. Boe), Memoirs of the Amer. Math. Soc. no. 486, 107 pages, 1993.
- [27] *Nilpotent Orbits in Semisimple Lie Algebras*, (with W. McGovern), Van Nostrand Reinhold, 186 pages, 1993.
- [28] Whittaker models, nilpotent orbits and the asymptotics of Harish-Chandra modules, Compositio Math. 96: p.1-62, 1995.
- [29] Stretching Pythagoras around the corner: Linking and modeling in Precalculus, (with Marilyn Stor), The Math Teacher (NCTM publication), p.369-379, Vol. 94, no. 5, May 2001.
- [30] Replication dynamics of the yeast genome, (with. M Raghuraman, E. Winzeler, et. al) SCIENCE, vol. 294, pp.115-121, 5 October 2001.
- [31] **Data Supplement (On Line)** Replication dynamics of the yeast genome, (with. M Raghuraman, E. Winzeler, et. al), SCIENCE, vol. 294, pp.115-121, 5 October 2001.
<http://www.sciencemag.org/feature/data/raghu1064351/dasupplement.html>
- [32] Normalization of Microarray data in yeast replication studies, unpublished manuscript.
- [33] Genomic mapping of single-stranded DNA in hydroxyurea-challenged yeasts identifies origins of replication. (with. Wenyi Feng, et. al), NATURE Cell Biology, vol. 8, pp.148-155, February 2006.
<http://www.nature.com/ncb/journal/v8/n2/abs/ncb1358.html>
- [34] Replication in Hydroxyurea:It's a matter of time. (with. Gina Alvino, et. al), Molecular and Cellular Biology 2007,27:6396-6406.
<http://mcb.asm.org/cgi/content/abstract/27/18/6396>
- [35] The temporal program of chromosome replication: Genome-wide replication in *clb5Δ* *Saccharomyces cerevisiae* (with. Heather McCune, et. al), GENETICS 2008, vol.180,p. p.1833-1847.
<http://http://www.genetics.org/cgi/content/abstract/180/4/1833>
- [36] Fragile Genomic Sites are Associated with Origins of Replication. (with. Sara C. DeRienzi, et. al), Genome Biol. Evol.(2009) vol.2009,p.350-363.
<http://gbe.oxfordjournals.org/cgi/content/short/evp034v1>
- [37] Centromere Replication Timing Determines Different Forms of Genomic Instability in *Saccharomyces cerevisiae* Checkpoint Mutants During Replication Stress. (with. Wenyi Feng, et. al), GENETICS 2009, vol.183,p.1249-1260.
<http://www.genetics.org/cgi/content/full/genetics.109.107508/DC1>
- [38] The effect of Ku on telomere replication time is mediated by telomere length but is independent of histone tail acetylation. (with. Lian H.Y., et. al), Mol Bio Cell, published online March 25, 2011, 10.1091/mbc.mbc.E10-06-0549.

Other Publications _____

These items have not been peer reviewed.

Software:

- [1] DNA replication microarray analysis software, Mathematica Notebook program, 2002-03. This item can be viewed by downloading the Mathematica notebook at this link and using Mathematica Reader:
<http://www.math.washington.edu/~colling/Research/Labwork/>

Graduate Level Materials:

1. Cohomological Methods in Representation Theory: The Borel-Weil-Bott Theorem, Course Notes, Univ. of Washington, 1989.
2. Real Reductive Groups I, by Nolan Wallach, (book review) Bull. Amer. Math. Soc.,

vol.22, p.183-198, 1990.

3. Introduction to Lie Group Representations, Seminar Notes, Univ. of Washington, 1992.

Undergraduate Level Materials:

[1] Precalculus: A first course in problem solving, Univ. of Washington, 352 pages, 1995-2011.
(Co-authored with D.Prince (MSEP), beginning 2001-02.) This item is in my teaching file.

Invited Talks and Lectures

1. Embeddings of Harish-Chandra modules, special year on group representations, University of Maryland, February 1983.
2. A comparison theory for the structure of induced representations, San Diego conference on representations of real reductive Lie groups, Aug. 1983.
3. A new proof of the Speh-Vogan theorem, Institute for Advanced Study, Princeton, November 1983.
4. Vogan's unitarity theorem, (with H. Schlichtkrull and B. Speh), representation theory seminar, The Institute for Advanced Study, Princeton, February 1984.
5. Lectures on representations of real rank one Lie groups, Univ. Nac. de Cordoba, Argentina, Aug. 1984.
6. Understanding the Euler characteristic of a Harish-Chandra module, conference on semisimple Lie algebras, Enveloping algebras of semisimple Lie algebras and differential operators, Oberwolfach, Germany, February 1985.
7. An introduction to the theory of Lie group representations, Univ. of Colorado, February 1985.
8. Complex geometry and the asymptotics of Harish-Chandra modules, Univ. of Washington, March 1985.
9. The n -homology of Harish-Chandra modules, AMS special session on representations of reductive Lie groups, University of Massachusetts, Amherst, October 1985.
10. From Weyl to Weil in fifty minutes, departmental colloquium, Univ. of Utah, April 1986.
11. Filtered character theory and applications, AMS joint summer conference on representations of Lie groups, Univ. of California, Santa Cruz, August 1986.
12. Complex geometry and harmonic analysis on Lie groups, colloquium, Oregon State Univ., January 1987.
13. The Fourier transform on a simple Lie group, colloquium, UCSD, February 1987.
14. Connections between geometry, algebra and analysis on Lie groups, colloquium, Dartmouth College, February 1987.
15. Harish-Chandra modules with sparse cohomology, Representations of reductive Lie groups and automorphic forms, Oberwolfach, Germany, July 1987.
16. Highest Weight Modules in the Hermitian Symmetric Setting, Enveloping Algebras Conference, Oberwolfach, Germany (Reported by co-author B. Boe), July 1987.
17. Posets and principal series representations, Lie algebra seminar, University of Massachusetts, Amherst, October 1987.
18. Posets and principal series representations, Lie groups seminar, Yale University, October 1987.
19. The structure of induced representations, Lie groups seminar, Cornell University, November 1987.
20. From Weyl to Weil in fifty minutes, colloquium, University of Georgia, December 1987.
21. Fine structure of principal series representations, Lie groups seminar, University of Maryland, December 1987.
22. Invariant forms and certain self-dual modules, Math. Sciences Research Institute, Berkeley, April 1988.
23. Towards Vogan's problem #3, Lie groups seminar, UCSD, February 1989.
24. On the image of the Jacquet functor, AMS special session on Kazhdan-Lusztig theory, Chicago, May 1989.
25. Nilpotent orbits and asymptotics, Lie theory seminar, University of Oregon, November 1989.
26. An introduction to the Kawanaka-Matsumoto conjecture, Lie groups seminar, Oklahoma State University, September 1990.
27. Finite Coxeter groups, homogeneous vector bundles and representation theory, Dept. Colloquium, Oklahoma State University, September 1990.
28. Introduction to Nilpotent Orbits, Lie groups seminar, Oklahoma State University, May 1992

29. Introduction to Representation Theory, Dept. Colloquium, University of Iowa, September 1992.
30. Vogan's problem #3 and Whittaker models, Lie groups seminar, UCSD, May 1993.
31. Progress on Matumoto's conjecture, AMS special session in Representation Theory, Oklahoma State Univ., October 1994.
32. The DNA microchip array project, Fangman-Brewer research group, Genetics Department, University of Washington, Seattle, April 1998.
33. Whole genome analysis of chromosome replication in yeast, poster session, FASEB meeting, Snowmass, CO, August 1998 (co-presented with R. Raghuraman).
34. Modeling in teaching precalculus, NCTM Annual Meeting Workshop, San Francisco, CA, April 1999 (co-presented with Marilyn Stor, Colorado High School Teacher).
35. Whole genome analysis of chromosome replication in yeast, invited talk, Yeast Genetics Meeting, Cold Spring Harbor Laboratory, (presented by co-author R. Raghuraman), September 1999.
36. Sex, Drugs and Rock n' Roll: Hormone Modeling using Precalculus, NCTM Annual Meeting Workshop, Chicago, IL, April 2000 (co-presented with Marilyn Stor, Colorado High School Teacher).
See online handout at
<http://www.math.washington.edu/colling/NCTM2000/hdout.html>
37. The topography of chromosome replication in yeast, Salk Institute Conference on Eukaryotic DNA Replication, Sept. 2000. See online talk at
<http://www.math.washington.edu/~colling/Research/Biology/Salk2000/salk2000.html>

Invited Conferences Attended

1. Special Year on Group Representations, University of Maryland, February 1983.
2. UC San Diego Lie Groups Conference, August 1983.
3. Enveloping Algebras Conference, Oberwolfach, Germany, February 1985.
4. AMS Special Session on Lie Theory, Univ. Mass., Amherst, October 1985.
5. AMS Joint Summer Conference on Representations of Lie Groups, UC Santa Cruz, August 1986.
6. AMS Special Session on Lie Theory, Utah State Univ, October 1986.
7. Representations of Reductive Groups, Oberwolfach, Germany, July 1987.
8. Enveloping Algebras Conference, Oberwolfach, Germany, July 1987.
9. Special Year in Lie Group Representations, Math. Sciences Research Institute, Berkeley, April 1988.
10. AMS Special session on Kazhdan-Lusztig Theory, Chicago, May 1989.
11. Harmonic Analysis on Reductive Groups, Bowdoin College, August 1989.
12. Enveloping Algebras Conference, Oberwolfach, Germany, April, 1990.
13. Lie Group Representations Conference, UC San Diego, February, 1992.
14. Fourth annual P-adic Representation Theory Conference, University of Iowa, March 1994
15. Representation Theory, AMS special session, Oklahoma State University, Stillwater, October 1994.
16. The Future of Mathematical Communication, Math. Sciences Research Inst., December 1994.
17. Representation theory of real and p-adic reductive groups, Seattle, July 1997.
18. Yeast chromosome structure, replication and segregation, Snowmass, CO, August 1998.
19. NCTM Annual Meeting, San Francisco, CA, April 1999.
20. Yeast Genetics, Cold Spring Harbor Laboratory, September 1999.
21. Making and using DNA microarrays workshop, Cold Spring Harbor Laboratory, November 1999.
22. NCTM Annual Meeting, Chicago, IL, April 2000.
23. Salk Institute Conference on Eukaryotic DNA Replication, Sept. 2000.

Awards

1. Institute for Advanced Study, Member, 1983-84.
2. NSF Postdoctoral Fellowship, 1985-88.

3. Institute for Advanced Study, Member, Fall 1987
4. Half-year postdoctoral Fellowship, Math. Sciences Research Institute, 1988, (declined).
5. Honored Faculty, Minority Science and Engineering Program, 1997.
6. University Distinguished Teaching Award, University of Washington, 1998-99.

Outreach Activity

- ★ 1. UW Math in High Schools program, UW consultant to twenty Washington high school teachers participating in the program; compensation through UW Extension. High Schools are located in Burien, Chelan, Cashmere, Deer Park, Gig Harbor, Lopez Island, Mercer Island, Montesano, Port Orchard, Spokane. The 2011-12 academic year is my twelfth year of involvement with the program.
2. Guest Panelist, Televised CCML symposium, University of Washington., May 2002.

Grants

1. NSF Postdoctoral Research Fellowship 1985-88, DMS-8511467
2. NSF Research Grant 1986-87 (computer grant), DMS-6801577
3. NSF Research Grant 1988-89 (24 month), DMS-8800384
4. NSA Research Grant 1990-93 (3 year continuing grant), MDA904-90-H-4041
5. GSRF grant, University of Washington, 1990-91.
6. NSF Research Grant 1993-95 (24 month), DMS-9300712
7. NSA Research Grant 1993-97 (48 month), MDA 904-93-H-3030
8. NSF Research Grant 1995-99 (48 month), DMS-9424053.
9. RRF Award, University of Washington, Summer 1999.
10. NIGMS (National Institute of General Medical Sciences) Supplementary Collaboration Grant for Complex Biological Systems Study, attached to the W.Fangman NIH grant 1999-04 (24 months of salary support spread over 5 years).
11. NIH grant supplement attached to B.Brewer in Genome Sciences (PI), 3 months support June-Dec 2006.
12. NIH grant support through NIH continuing grant in Genome Sciences, B.Brewer (PI), 3 months support 2007 calendar year.
13. NIH grant support through NIH continuing grant in Genome Sciences, B.Brewer (PI), 2 months support Summer 2008.
14. NIH grant support through NIH continuing grant in Genome Sciences, B.Brewer (PI), 0.5 months support Summer 2009.

Graduate Students Supervised

1. Jim Humphreys, Masters Degree, 1988.
2. Irina Rabinovich, Masters Degree, 1994.
3. Michael Keynes, Ph.D., 1999.