

VITA

Jon F. Carlson

Date and Place of Birth: July 3, 1940, Newport News, Virginia

Academic Degrees:

B.A. 1962 Old Dominion University
M.S. 1965 University of Virginia
Ph.D. 1967 University of Virginia

Professional Experience:

2002- Professor Emeritus, University of Georgia
1992-2002 Distinguished Research Professor, University of Georgia
1982-2002 Professor, University of Georgia
1976-1982 Associate Professor, University of Georgia
1968-1976 Assistant Professor, University of Georgia
1967-1968 Instructor, University of Virginia
1966-1967 Junior Instructor, University of Virginia
1964-1966 Teaching Assistant, University of Virginia
1962-1963 Teacher, Northside Junior High School

Coordinator of the Department of Mathematics Graduate program, University of Georgia, 1977-1983.

Publications - Journal Articles:

- (1) J. F. Carlson, *Automorphisms of groups of similitudes over \mathbb{F}_3* , Pac. J. Math., **28**(1969), 485-488.
- (2) J. F. Carlson, *Block idempotents and the Brauer correspondence*, Bull. Austral. Math. Soc., **5**(1971), 337-340.
- (3) J. F. Carlson, *A basis for some relative permutation representation rings*, J. Algebra, **32**(1974), 561-575.
- (4) J. F. Carlson, *Free modules over group algebras of p -groups*, International Conference on Representations of Algebra, Carleton University Lecture Notes, #**9**(1974), Chap. 7, 7.01-7.03.
- (5) J. F. Carlson, *Calculating some relative homology over group rings*, Acta Math. Hungar., **26**(1975), 1-2.
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- (7) J. F. Carlson, *Free modules over some modular group rings*, Australian J. Math., (Series A) part **1**(1975), 49-55.
- (8) J. F. Carlson, *Almost free modules over modular group algebras*, J. Algebra, **41**(1976), 243-254.

- (9) J. F. Carlson, *Cyclic modules over some modular group algebras*, Studia Sci. Math. Hung., **11**(1976), 327-333.
- (10) J. F. Carlson, *Periodic modules over modular group algebras*, J. London Math. Soc. (2), **14**(1977), 431-436.
- (11) J. F. Carlson, *Restrictions of modules over modular group algebras*, J. Algebra, **53**(1978), 334-343.
- (12) J. F. Carlson, *The dimensions of periodic modules over modular group algebras*, Illinois J. Math., **23**(1979), 295-306.
- (13) J. F. Carlson, *Periodic modules with large periods*, Proc. Amer. Math. Soc., **76**(1979), 209-215.
- (14) J. F. Carlson, *Endo-trivial modules over (p, p) -groups*, Illinois J. Math., **24**(1980), 287-295.
- (15) J. F. Carlson, *The structure of periodic modules over modular group algebras*, J. Pure Appl. Algebra, **22**(1981), 43-56.
- (16) J. F. Carlson, *The dimensions of modules and their restrictions over modular group algebras*, J. Algebra, **69**(1981), 95-104.
- (17) J. F. Carlson, *The complexity and varieties of modules*, Proceedings of Oberwolfach Conference on Integral Representations and Applications, Springer Lecture Notes No. 882, (1981), 415-422.
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- (19) D. Burry and J. F. Carlson, *Restrictions of modules to local subgroups*, Proc. Amer. Math. Soc., **84**(1982), 181-184.
- (20) J. F. Carlson, *The varieties and the cohomology ring of a module*, J. Algebra **85**(1983), 104-143.
- (21) J. F. Carlson, *The cohomology of irreducible modules over $SL(2, p^n)$* , Proc. London Math. Soc. (3), **47**(1983), 480-492.
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- (23) J. F. Carlson, *The cohomology ring of a module*, J. Pure Appl. Algebra, **36**(1985), 105-121.
- (24) J. F. Carlson, *The variety of a module*, in it Orders and Their Applications, Proceedings Oberwolfach, 1984. Lecture Notes in Mathematics, Vol. 1142, Springer, Berlin, 1985, pp. 88-95.
- (25) M. Auslander and J. F. Carlson, *Almost split sequences and group algebras*, J. Algebra, **103**(1986), 122-140.
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- (29) J. F. Carlson, *Cohomology rings of induced modules*, J. Pure and Appl. Algebra, **44**(1987), 85-97.
- (30) D. J. Benson and J. F. Carlson, *Complexity and multiple complexes*, Math. Zeit., **195**(1987), 221-238.
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- (34) J. F. Carlson, *On the exponents of homology and cohomology of finite groups*, Proc. Amer. Math. Soc., **102**(1988), 814-816.
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- (53) J. F. Carlson, P. Donovan and W. W. Wheeler, *Complexity and quotient categories for group algebras*, J. Pure and Appl. Algebra **93**(1994), 147-167.
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- (133) J. F. Carlson, E. Friedlander and J. Pevtsova, *Vector bundles associated to Lie algebras*, J. Reine u. Angew. Math. **716**(2016), 147-178.
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- (135) J. F. Carlson and S. Iyengar, *Hopf algebra structures and tensor products for group algebras*, New York J. Math. **23**(2017), 1-14.
- (136) J. F. Carlson and P. Webb, *The graded center of a triangulated category*, J. Australian Math. Soc. **102**(2017), 74-95.
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- (139) D. J. Benson and J. F. Carlson, *Nilpotence and generation in the stable module category*, J. Pure Appl. Algebra, **222**(2018), 3566-3584.
- (140) J. F. Carlson, *Thick subcategories of the relative stable category*, in "Geometric and Topological Aspects of the Representation Theory of Finite

- Groups, Springer Proceedings in Mathematics and Statistics, Springer, 2018, pp. 25–49.
- (141) J. F. Carlson, *Computing with matrix and basic algebras*, in “Advances in Algebra - Research from the Southern Regional Algebra Conference 2017, Springer Proceedings in Mathematics and Statistics, 2019 .
 - (142) J. F. Carlson and D. J. Benson, *Virtual projectivity and the stable module category*, J. Algebra. **558**(2020), 43–69.
 - (143) J. F. Carlson and D. J. Benson, *Endotrivial modules for nilpotent restricted Lie algebras*, Archiv Math. **114**(2020), 503–513.
 - (144) J. F. Carlson, L. Wang and J. Zhang, *Relatively projectivity and the Green correspondence for complexes*, J. Algebra **560**(2020), 879–913.
 - (145) D. J. Benson and J. F. Carlson, *Bounded complexes of permutation modules*, Proc. Amer. Math. Soc. **8**(2012), 349–357.
 - (146) J. F. Carlson, *Negative cohomology and the endomorphism ring of the trivial module*, J. Pure and Appl. Algebra, **226**(2022),
 - (147) J. F. Carlson, *Nilpotence and duality in the complete cohomology of a module*, Beitr. zur algebra und geometrie, **63**(2022), 547–660.
 - (148) J. F. Carlson, J. Grodal, N. Mazza and D. Nakano, *Torsion Free Endotrivial modules for finite groups of Lie type*, Pacific J. Math. **317**(2022), 239–274.

Publications - Journal Articles in Press:

- (1) J. F. Carlson, *The endomorphism ring of the trivial module in a localized category*, Math. Nachrichten (to appear).
- (2) J. F. Carlson, *The rank of homology of complexes of projective modules over finite groups*, Proc. Amer. Math. Soc. (to appear).
- (3) J. F. Carlson, *Idempotent modules, locus of compactness and local supports*, (submitted).

Publications - Journal Articles in Preparation:

- (1) J. F. Carlson, J. Grodal, N. Mazza and D. Nakano, *Endotrivial modules for groups of Lie type in nondefining characteristics*, (in preparation).
- (2) L. Avramov, J. F. Carlson and S. B. Iyengar, *coalgebra structures on commutative Hopf algebras*, (in preparation).
- (3) D. J. Benson and J. F. Carlson, *Modules with finitely generated cohomology*, (in preparation).

Publications - Books:

- (1) J. F. Carlson, *Module Varieties and Cohomology Rings of Finite Groups*, Lecture Notes of the University of Essen, Vol. **13** (1985).
- (2) J. F. Carlson, *Modules and group algebras*, ETH Lecture Notes, Birkhäuser (1996) Basel.

- (3) A. Adem, J. Carlson, S. Priddy and P. Webb, eds., *Group Representations: Cohomology, Group Actions and Topology*, Proceedings of Symposia in Pure Mathematics, Vol. 63, American Math. Soc. (1997), Providence, R. I.
- (4) J. F. Carlson and L. Townsley, L. Valero-Elizondo and M. Zhang *Cohomology rings of finite groups*, Kluwer, Dordrecht, 2003.
- (5) J. F. Carlson, S. B. Iyengar and J. Pevtsova, *Geometric and Topological Aspects of the Representation Theory of Finite Groups*, Springer Proceedings in Mathematics and Statistics, Springer-Verlag, 2018.

Other Publications:

- (1) J. F. Carlson, Review of *Methods of Representation Theory with Applications to Finite Groups and Orders*, Vol 1 by C.W. Curtis and I. Reiner, Bull. Amer. Math. Soc. (New Series), **8**(1983), 112-116.
- (2) J. F. Carlson, Review of *Methods of Representation Theory with Application to Finite Groups and orders*, Vol. 2 by C.W. Curtis and I. Reiner, Bull. Amer. Math. Soc. (New Series), **19**(1988), 484-488.

Unpublished notes

- (1) A. Adem, J. F. Carlson and R. J. Milgram, *The cohomology of the Higman-Sims group*.
- (2) J. F. Carlson and K. W. Roggenkamp, *Lifting modules of group rings and Gorenstein Orders using syzygy functors*.

Algorithms and Software

- (1) Packages for homological algebra and basic algebras, which have been included in the computer algebra system MAGMA since 1998. A package to compute ext algebras of basic algebras was added in 2008. Also the chapter describing the code in the Handbook of Magma Functions. Functionality for homomorphisms, automorphism, quotient algebras and subalgebra was added in 2012.
- (2) Packages for computing cohomology rings for finite groups, which computed most of the appendix in the book [101]. A newer version of the packages was released in MAGMA in the spring of 2005.
- (3) With Graham Matthews, a computer package to compute generators and relations for matrix algebras, described in [99]. The package was included in the release of MAGMA in the spring of 2005 and several improvements have been made since that time. Functions to compute the basic algebra of a matrix algebra and specific functions for computing Hecke algebras and Schur algebras were added in 2008. Functions for automorphisms and isomorphisms of basic algebras. Also the chapter describing the code is in the Handbook of Magma Functions.

Invited Seminars and Convergence Lectures (since 2018):

This list does not include seminars and lectures at the University of Georgia.

“Support varieties”, Connections for Women, workshop, MSRI, February 2, 2018.

“Virtual projectivity, strong nilpotence and zombies”, Representation Theory Seminar, MSRI, May 1, 2018

“Support varieties of modules”, Colloquium, Shangxi Normal University, Linfen, China, September 7, 2018.

“Virtual projectivity and the stable module category”, Special Session on Homological Aspects in Commutative Algebra and Representation Theory. Meeting of the American Mathematical Society, San Francisco State University, October 27, 2018.

“Nearly null maps, virtual projectivity and generation of the stable category”, conference on Geometric Methods in Representaton Theory, University of Iowa, November 18, 2018.

“Many categories for the green correspondence”, Representations of Algebras Seminar, University of Bielefeld, April 12, 2019.

“Many categories for the green correspondence”, Special Session at the joint American Mathematical Society and Vietnamese Mathematical society, Quy Nhon, Vietnam, June 13, 2019.

“Endotrivial Modules for group algebras and restricted p -Lie algebras”, International Conference on Representation Theory, VIII, Harbin, China, July 13, 2019.

“Endotrivial Modules for nilpotent restricted p -Lie algebras”, Conference on “Representations of Algebraic Groups and Quantum Groups, University of Virginia, March 12, 2020.

“The endomorphism ring of the trivial module”, Workshop on “Cohomology of finite groups: Interactions and application”, Mathmatisches Forschungsinstitut Oberwolfach, August 13, 2020.

“Modular representations of finite groups”, Three week course presented to students at Central China Normal University and Peking University and others, August 2 – 20, 2021.

“Nilpotence and Duality in the Complete Cohomology of a Module”, AMS Southeastern Section Meeting, University of South Alabama, November 20, 2021.

“Idempotent modules and endomorphisms”, Online seminar on ”New Directions in Group Theory and Triangulated Categories”, January 11, 2022.

“Modules: idempotent and otherwise, Seminar Hausdorff Institute, University of Bonn, November 10, 2022.

“Idempotent modules and local supports”, Conference on New Trends in Algebra, Geometry and Homotopy Theory, Merida, Mexico, December 1, 2022.

“Modules with finitely generated cohomology”, Conference on Groups, Topology and applications, Bilbao, Spain, February 3, 2023.

“Finitely generated cohomology modules”, Algebra Seminar, Peking University, Beijing, February 24, 2023. (delivered remotely)

“Support varieties in group representations”. Public Lecture, IPM Isfahan, March 1, 2023 (delivered remotely)

Honors and Visiting Positions:

- Philip Francis DuPont Fellowship, 3 years, University of Virginia.
- Fulbright senior research fellowship, Universität Essen, West Germany, Summer semester 1984 (4 months).
- Visiting Professor for one month, École Normale Supérieure, Paris, June 1985.
- Visiting Professor for one month, University of Chicago, April 1986.
- Invited Participant, Symposium on Representation Theory of Groups and Related Topics, University of Manchester, March-May, 1988.
- Visiting Professor, Universität Essen, January-March, 1989.
- Visiting Professor, University of Bielefeld, January 1990.
- Invited speaker, Algebra Section, International Congress of Mathematicians, Kyoto, Japan, August 1990.
- Invited participant, Algebra Symposium on Groups, Rings and Representations, University of Warwick, March-June, 1991.
- Visiting Fellow, Mathematics Research Section, The Australian National University, Canberra, January-March, 1992.
- Visiting Fellow, Centre for Mathematics and its Applications, Australian National University, Canberra, March-May, 1994.
- Visiting Member, Forschungsinstitut für Mathematik, ETH, Zürich, April-July, 1995.
- Visiting Member, Mathematical Institute, Oxford, April-July 1997
- Humboldt Research Award for Senior Scientists
- Visiting Professor, University of Sydney, January 1999.
- Visiting Fellow, University of Stuttgart, March-July 1999 (supported by the Humboldt Foundation).
- Visiting Fellow, University of Stuttgart, April-July 2000 (supported by the Humboldt Foundation).
- Visiting Professor, University of Sydney, July, 2003.
- Visiting Professor, Max Planck Institut für Mathematik, Bonn, Germany, September-Novembers, 2003 (supported by the Humboldt Foundation).
- Visiting Professor, University of Sydney, October-November, 2004.
- Visiting Professor, Ecole Polytechnique (EPFL), Lausanne, February-June, 2005.
- Visiting Professor, University of Sydney, May, 2006.
- Visiting Professor, Rheinisch-Westfälische Technische Hochschule, Aachen, March-June, 2007 (supported by the Humboldt Foundation).
- Visiting Professor, University of Sydney, April-June, 2012.
- Named Fellow of the American Mathematical Society (Inaugural Class), January, 2013.
- Visiting Professor, University of Sydney, October, 2013.
- Visiting Professor, Peking University, September-October, 2014.
- Visiting Professor, University of Sydney, November 2015.
- Member Mathematical Sciences Research Institute, April-May, 2018.

Simons Research Professor, Mathematical Research Institute, to visit the University of Bielefeld, April 1-14, 2019

Invited Participant, Hausdorff Trimester Program on “Spectral Methods in Algebra, Geometry and Topology”, Hausdorff Research Institute for Mathematics, Bonn, October-November 2023.

Ph.D. Students:

Directed dissertation of

Stephen Kuhn - PhD. Mathematics (1978)
 Deborah Sherman - PhD. Mathematics (1994)
 Chuang Peng - PhD. Mathematics (1995)
 Peteris Daugulis - PhD. Mathematics (1998)
 Jason Whitt - PhD. Mathematics (1998)
 Mucheng Zhang - PhD. Mathematics (2000)
 Graham Matthews- PhD. Mathematics (2004)

Masters Students:

Victoria Seals, Mathematics, MA, Fall 1993

Grant Support from NSF:

DMS 7801685: “Representations of Modular Group Algebras”, June 1, 1978 - November 30, 1980, \$14,600.

DMS 8002509: “Representations of Modular Group Algebras”, June 15, 1980 - November 30, 1982, \$19,000.

DMS 8201469: “Modular Representations of Groups” (co-P. I. with Leonard Chastkofsky), June 1, 1982 - May 30, 1986. \$68,700

DMS 8501760: “Representations of Groups and Algebras”, June 1, 1985 - November 30, 1987, \$41,100.

INT 8617583: “Scientific Visit to Study Integral Representations of Finite Groups”, April 1, 1987 - April 30, 1987, \$3,991.40.

Conference on Cohomology and Representation Theory of Finite and Algebraic Groups, University of Georgia (Jan. 1988) \$6000.

DMS 8701068: “Modular Representations of Finite Groups”, July 1, 1987 - December 30, 1990. \$68,200

DMS 9001689: “Modular Representations of Finite Groups”, June 1, 1990 - November 30, 1993, \$123,150.

DMS 9001929: “Modular Representations of Finite Groups”, June 1, 1993 - November 30, 1998, \$244,894.

DMS 9526513: “1996 Summer Research Institute, ‘Cohomology, Representations and Actions of Finite Groups’”, (co-principal investigator with Samuel M. Rankin, Associate Executive Director, American Mathematical Society) \$151,793, Grant awarded to the American Mathematical Society.

DMS9870035: “Modular Representations of Finite Groups”, June 1, 1998 - November 30, 2001, \$216,256.

DMS0100662: “Modular Representations of Finite Groups”, July 15, 2001 - June 30, 2005, \$144,213.

DMS0401431: “Modular Representations of Finite Groups”, June 1, 2004 - May 31, 2007, \$112,344.

DMS0654173: “Modular Representations of Finite Groups”, June 1, 2007 - May 31, 2010, \$110,001. DMS101102: “Modular Representations of Finite Groups”, June 1, 2010 - May 31, 2014, \$109,371.

Other grant activity:

Partially supported by the University of Georgia Middle Grades Teacher Education Project (N.S.F. funded), Academic years 1987-89.

ARC DP1096599: “Computations in Associative Algebras and Representations”, January 1, 2010 - December 31, 2012, (joint with John Cannon and Derek Holt, to support the development of algorithms for computing in algebras in Sydney), A\$ 300,000.

Simons 315728: “Modular Representations of Finite Groups”, Simons Foundation, September 1, 2014 - August 31, 2015, \$ 7000.00.

H98230-15-1-0007: “Modular Representations of Finite Groups”, National Security Agency, May 6, 2015 - May 5, 2016, \$ 25,884.00.

Simons 054813-01: “Modular Representations of Finite Groups”, Simons Foundation, September 1, 2016 - August 31, 2021, \$ 35,000.00.

Other Activities:

Member of Board of Editors for Communications in Algebra, 1985-90.

Member of the A.M.S. Committee to select speakers for Southeastern Section Meetings (1987-88).

Organizer of conference on “Cohomology and Representation Theory of Finite and Algebraic Groups”, Athens, Ga., Jan. 3-5, 1988.

Chairman of the organizing committee for the conference “Finite and Algebraic Groups: Representations and Cohomology”, Arcata, Ca. July 8-14, 1989, jointly sponsored by AMS, SIAM and IMS and supported by a grant from NSF.

Chairman of organizing committee for “Workshop on General Representation Theory”, MSRI, Berkeley, December 3-7, 1990.

Chairman of organizing committee for the conference “Cohomology, Representations and Actions of Finite Groups”, South Hadley, Mass., June 20-26, 1992, jointly sponsored by AMS, IMS and SIAM and supported by NSF.

Member of the AMS Committee to select speakers for the Southeast Section Meetings (1994-95).

Organizer (with A. Adem) Special Session on “Cohomology and Representations of Finite Groups” at the annual meeting of the American Mathematical Society in San Francisco, January 4-7, 1995.

Member of the Program Committee for the “Second Magma Conference on Computational Algebra”, Marquette University in Milwaukee, May 12-17, 1995.

Organizer (with J. Alperin) Special Session on “Representations of Finite Groups” for the annual meeting of the American Mathematical Society in Baltimore, Md., January 7-10, 1998.

Member of Board of Editors for the journal “Algebras and Representation Theory”, 1999 – 2019.

Organizer (with A. Adem and H.-W. Henn) of a meeting at the Mathmatisches Forschungsinstitut Oberwolfach (Germany) on the topic “Cohomology, Representations and Actions of Finite Groups”, July 23–29, 2000.

Organizer (with A. Adem) Special Session on “Group Cohomology and Applications to Homotopy Theory and Representation Theory” at the annual meeting of the American Mathematical Society in New Orleans, January 10-13, 2001.

Cochairman of organizing committee for the conference “Groups, Representations and Cohomology”, South Hadley, Mass., June 6-14, 2002, jointly sponsored by AMS, IMS and SIAM and supported by NSF.

Invited participant in the workshop on Computation in Algebra, Number Theory and Combinatorics, sponsored by the American Institute of Mathematics, at the National Science Foundation, September 21-22, 2002.

Member of the board of editors for the Computational Algebra section of the Journal of Algebra, 2004 – 2018.

Organizer (with A. Adem and H.-W. Henn) of a meeting at the Mathmatisches Forschungsinstitut Oberwolfach (Germany) on the topic “Cohomology, Representations and Actions of Finite Groups”, Sept, 4-10, 2005.

Chairman of the Organizing Committee for the semester program “Representation Theory of Finite Groups and Related Topics”, Mathematical Sciences Research Institute, Berkeley, January-May, 2008.

Member of the organizing committee for a meeting at the Banff International Research Station, Banff, Canada, on the topic “Flavors of Groups”, November 17-22, 2005.

Organizer (with A. Adem and H. Krause) of a workshop at the Mathmatisches Forschungsinstitut Oberwolfach (Germany) on the topic “Cohomology, Representations and Actions of Finite Groups”, July 25 - 31, 2010.

Member of the organizing committee for a conference on Representation of Finite Groups and related topics, EPFL, Lausanne, June 22 - 25, 2010.

Editor (with John Cremona and Eamonn O’Brien) of a special issue of the Journal of Algebra in honor of the birthdays of Derek Holt and John Cannon, 2009.

Organizer (with B. Eick, A. Hulpke, E. O’Brien and A. Seress) of a meeting on “Algorithms for Linear Groups”, November 16-21, 2014.

Organizer (with A. Adem, D. Benson and H. Krause) of a workshop at the Mathmatisches Forschungs-Institut Oberwolfach (Germany) on the topic “Cohomology, Representations and Actions of Finite Groups”, May 2-9, 2015.

Organizer (with A. Kustin) Special session on “Commutative Algebra”, AMS meeting, Athens, GA., March 5–6, 2016.

Organizer (with S. Iyengar and J. Pevtsova) of a meeting on “Geometric and topological aspects of the representation theory of finite groups” at the Pacific Institute of Mathematics, University of British Columbia, Vancouver. July 26 - August 5, 2016.

Organizer (with D. Nakano and N. Ngo) of a special session on “Homological Methods in Representation Theory”, at the joint meeting of the American Mathematical Society and the Vietnamese Mathematical Society in Quy Nhon, Vietnam, June 10-14, 2019.

Organizer (with B. Eick, A. Hulpke and E. O'Brien) of a meeting on "Algorithms for Linear Groups", June 21-26, 2020. .