
Andrew Mathas

Professor of Pure Mathematics

Curriculum Vitae

School of Mathematics and Statistics F07
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Education

Ph.D. University of Illinois at Chicago, 1993.

M.Sc. University of Sydney, 1990.

B.Sc. University of Sydney, 1989. First class honours.

Academic Positions

- 1/2011– Professor of Pure Mathematics, University of Sydney.
- 1/2015–12/2015 Head of School, School of Mathematics and Statistics, University of Sydney.
- 1/2009–12/2013 Australian Professorial Fellow, University of Sydney.
- 1/2007–12/2010 Associate Professor, University of Sydney.
- 1/2004–12/2006 Senior Lecturer, University of Sydney.
- 1/2000–12/2003 Lecturer, University of Sydney.
- 10/1997–12/1999 Senior Research Associate and U2000 Postdoctoral Fellow, University of Sydney.
- 4/1997–10/1997 Research Fellow, Sonderforschungsbereich 343, Universität Bielefeld.
- 6/1994– 4/1997 Research Associate, Imperial College.
- 8/1993– 5/1994 Kenna Assistant Professor, University of Notre Dame, USA.
- 8/1990– 8/1993 Graduate Fellow and Research Assistant, University of Illinois at Chicago.

Fellowships and awards

- 2009–13** Australian Professorial Fellow, Australian Research Council.
- 2008** Re-entry Fellowship, Faculty of Science, University of Sydney.
- 2007** Fellow of the Australian Mathematical Society.
- 2006** Medal of the Australian Mathematical Society. (*Awarded annually for distinguished research in the mathematical sciences to an Australian mathematician under 40.*)
- 2004** Faculty of Science Teaching Award, University of Sydney.
- 2004** JSPS Invitation Fellowship, Research institute for Mathematical Sciences, Kyoto, Japan.
- 2003** EPSRC Visiting Research Fellow, Imperial College, London.
- 2001** EPSRC Visiting Research Fellow, University of Leicester.
- 1997–00** U2000 Postdoctoral Fellowship, University of Sydney.
- 1990–91** Graduate Fellowship, University of Illinois.

Research Funding since 2001

I have received continuous grant funding from the Australian Research Council since my appointment as a Lecturer at the University of Sydney in 2001.

- *Graded semisimple deformations*, ARC Discovery Grant. 2020.
- *The dimension problem for Hecke algebras*, ARC Discovery Grant. 2015.
- *Graded representations of Hecke algebras*, ARC Discovery Grant. With Jon Brundan. 2011.
- *Pyramids and decomposition matrices for the symmetric and general linear groups*, Australian Professorial Fellowship and ARC Discovery Grant. With Anthony Henderson, 2009.
- *Modular representations of cyclotomic algebras*, ARC Discovery Grant, 2007.
- Re-entry Fellowship, Faculty of Science, University of Sydney, 2007.
- *Representations of cyclotomic algebras*, Near Miss Grant, University of Sydney, 2006.
- *Affine buildings and Hecke algebras*, ARC Discovery Grant. With Bob Howlett and Donald Cartwright, 2005.

- *Cyclotomic induction functors*, Sesqui Research and Development, University of Sydney, 2003.

Service to the University

2015	Head of School, School of Mathematics and Statistics
2014	Selection Committee, Head of School, School of Mathematics and Statistics.
2010–12	ARC panel session, School of Mathematics and Statistics.
2009	Selection Committee, Professorship, School of Mathematics and Statistics.
2009	Selection Committee, Lectureship, School of Mathematics and Statistics.
2008–	Performance, Management and Development Reviewer, School of Mathematics and Statistics.
2006–2008	Postgraduate Director, School of Mathematics and Statistics.
2006	College of Science and Technology Representative, Staff Consultative Forum.
2004–2005	Deputy Postgraduate Director, School of Mathematics and Statistics.
2003–	Member of Research and IT committees in the School of Mathematics and Statistics.
2002–2003	Shadow Associate Dean for Postgraduate Research and Coursework, Faculty of Science.
2002	Pure Mathematics Honours coordinator.
2001–	Member/Chair of Selection Committees for 10 different postdoctoral appointments.

Service to the Mathematics Community

2012	Macquarie University Level E promotions committee, External member.
2010	ERA Peer Reviewer (Pure Mathematics), Australian Research Council.
2010–	Chair, Fellowship Committee, Australian Mathematical Society.
9/09–8/11	Vice-President (elected), Australian Mathematical Society. Member of the Council and Steering Committee of the Australian Mathematical Society.
2004	Program Committee, Australian Mathematical Sciences Postgraduate Summer School, ANU, 2005.
Ongoing	Assessing grant applications for the ARC, EPSRC, ISF, NSA, NSF, NWO (Netherlands).
Ongoing	Refereeing for international journals (approximately 12 papers per year).
Ongoing	Reviewing for MathScinet, American Mathematical Society (approximately 7 papers per year).

Conferences and Seminars Organized

Organiser	<i>KLR algebras and categorification</i> , University of Sydney, February 2023.
Organiser	<i>Hendoff</i> , University of Sydney, April 2022.
Scientific committee	<i>7th Australian and New Zealand Mathematics Convention</i> , Christchurch, December 2008.
Organiser	<i>Geometry and Lie theory</i> , ANU and University of Sydney, July 2007.
Organiser	<i>Mathematical Physics and Lie Theory</i> , Coolangatta, December, 2004.
Organiser	<i>Quantum Groups and Braid Groups</i> , University of Sydney, November, 2003.
Organiser	<i>Algebra Special Session</i> , 46 th Annual General Meeting of the Australian Mathematics Society, Newcastle, October 2002.
Chair	<i>Algebra Seminar</i> , University of Sydney, 1998–2003.

Editorial work

Associate editor	Algebras and representation theory . Since 2020.
Guest Editor	Special issue of SIGMA on the Representation Theory of the Symmetric Groups and Related Topics .
Editor	Special issue of the <i>Journal of Algebra</i> in honour of Professor Gus Lehrer (Sydney) <i>Journal of Algebra</i> , 321 (11), 2009. 548 pages.
Editor	Special issue of the <i>Journal of Algebra</i> in honour of Professor Gordon James (Imperial College) <i>Journal of Algebra</i> , 306 (1), 2006. 290 pages.

Postgraduate students

- 2019 Alexander Kersch, PhD, [Simple modules of cyclotomic Hecke algebras](#)
(*Awarded the T.G. Room Medal for best PhD thesis in 2019*)
- 2014 Clinton Boys, PhD, [Alternating quiver Hecke algebras](#)
- 2013 Matthew Gibson, MSc, [Graded Decomposition Numbers in Type A](#)
- 2012 Ge Li, PhD, [Integral basis theorem of cyclotomic Khovanov-Lauda-Rouquier algebras of type A](#)
(*Awarded the T.G. Room Medal for best PhD thesis in 2012*)
- 2006 Leah Ratliff, PhD, [The alternating Hecke algebra and its representations](#)

Publications

Book

1. A. MATHAS, [Iwahori-Hecke algebras and Schur algebras of the symmetric group](#), University Lecture Series, **15**, American Mathematical Society, Providence, RI, 1999. [MR1711316](#).

Book chapters (refereed)

2. A. MATHAS, [Decomposition matrices of Hecke algebras of type A](#), in Gap: groups, algorithms and programming, 3.4.4, M. Schönert et al., eds., RWTH Aachen, 1997.
3. A. MATHAS, [The representation theory of the Ariki-Koike and cyclotomic \$q\$ -Schur algebras](#), in Representation theory of algebraic groups and quantum groups, Adv. Stud. Pure Math., **40**, Math. Soc. Japan, Tokyo, 2004, 261–320. [MR2074597](#).
4. A. MATHAS, [Cyclotomic quiver Hecke algebras of type A](#), in Modular representation theory of finite and p -adic groups, G. W. Teck and K. M. Tan, eds., National University of Singapore Lecture Notes Series, **30**, World Scientific, 2015, ch. 5, 165–266. [arXiv:1310.2142](#). [MR3495747](#).

Journal articles (refereed)

5. A. MATHAS, [A \$q\$ -analogue of the Coxeter complex](#), J. Algebra, **164** (1994), 831–848. [MR1272115](#).
6. A. MATHAS, [Some generic representations, \$W\$ -graphs, and duality](#), J. Algebra, **170** (1994), 322–353. [MR1302844](#).
7. A. MATHAS, [On the left cell representations of Iwahori-Hecke algebras of finite Coxeter groups](#), J. London Math. Soc. (2), **54** (1996), 475–488. [MR1413892](#).
8. G. JAMES AND A. MATHAS, [Hecke algebras of type A with \$q = -1\$](#) , J. Algebra, **184** (1996), 102–158. [MR1402572](#).
9. G. JAMES AND A. MATHAS, [A \$q\$ -analogue of the Jantzen–Schaper theorem](#), Proc. London Math. Soc. (3), **74** (1997), 241–274. [MR1425323](#).
10. A. MATHAS, [Simple modules of Ariki-Koike algebras](#), in Group representations: cohomology, group actions and topology (Seattle, WA, 1996), Proc. Sympos. Pure Math., **63**, Amer. Math. Soc., Providence, RI, 1998, 383–396. [MR1603195](#).
11. R. DIPPER, G. JAMES, AND A. MATHAS, [The \$\(Q, q\)\$ -Schur algebra](#), Proc. London Math. Soc. (3), **77** (1998), 327–361. [MR1635149](#).
12. G. MALLE AND A. MATHAS, [Symmetric cyclotomic Hecke algebras](#), J. Algebra, **205** (1998), 275–293. [MR1631350](#).
13. R. DIPPER, G. JAMES, AND A. MATHAS, [Cyclotomic \$q\$ -Schur algebras](#), Math. Z., **229** (1998), 385–416. [MR1658581](#).
14. A. MATHAS, [Murphy operators and the centre of the Iwahori-Hecke algebras of type A](#), J. Algebraic Combin., **9** (1999), 295–313. [MR1695079](#).

15. G. JAMES AND A. MATHAS, *The irreducible Specht modules in characteristic 2*, Bull. London Math. Soc., **31** (1999), 457–462. [MR1687552](#).
16. G. JAMES AND A. MATHAS, *The Jantzen sum formula for cyclotomic q -Schur algebras*, Trans. Amer. Math. Soc., **352** (2000), 5381–5404. [MR1665333](#).
17. S. ARIKI AND A. MATHAS, *The number of simple modules of the Hecke algebras of type $G(r, 1, n)$* , Math. Z., **233** (2000), 601–623. [MR1750939](#).
18. R. DIPPER AND A. MATHAS, *Morita equivalences of Ariki–Koike algebras*, Math. Z., **240** (2002), 579–610. [MR1924022](#).
19. G. JAMES AND A. MATHAS, *Equating decomposition numbers for different primes*, J. Algebra, **258** (2002), 599–614. [arXiv:math/0111140](#). [MR1943936](#).
20. A. MATHAS, *Tilting modules for cyclotomic Schur algebras*, J. Reine Angew. Math., **562** (2003), 137–169. With an appendix by Marcos Soriano. [MR2011334](#).
21. S. ARIKI AND A. MATHAS, *The representation type of Hecke algebras of type B* , Adv. Math., **181** (2004), 134–159. [MR2020657](#).
22. A. MATHAS, *Matrix units and generic degrees for the Ariki–Koike algebras*, J. Algebra, **281** (2004), 695–730. [arXiv:math/0108164](#). [MR2098790](#).
23. G. JAMES AND A. MATHAS, *Symmetric group blocks of small defect*, J. Algebra, **279** (2004), 566–612. [MR2078931](#).
24. S. ARIKI AND A. MATHAS, *Hecke algebras with a finite number of indecomposable modules*, in Representation theory of algebraic groups and quantum groups, Adv. Stud. Pure Math., **40**, Math. Soc. Japan, Tokyo, 2004, 17–25. [MR2074587](#).
25. M. KÜNZER AND A. MATHAS, *Elementary divisors of Specht modules*, European J. Combin., **26** (2005), 943–964. [MR2143203](#).
26. S. LYLE AND A. MATHAS, *Row and column removal theorems for homomorphisms of Specht modules and Weyl modules*, J. Algebraic Combin., **22** (2005), 151–179. [MR2164395](#).
27. G. JAMES, S. LYLE, AND A. MATHAS, *Rouquier blocks*, Math. Z., **252** (2006), 511–531. [MR2207757](#).
28. S. ARIKI, A. MATHAS, AND H. RUI, *Cyclotomic Nazarov–Wenzl algebras*, Nagoya Math. J., **182** (2006), 47–134. (Special issue in honour of George Lusztig), [arXiv:math/0506467](#). [MR2235339](#).
29. S. LYLE AND A. MATHAS, *Blocks of cyclotomic Hecke algebras*, Adv. Math., **216** (2007), 854–878. [arXiv:math/0607451](#). [MR2351381](#).
30. A. MATHAS, *Seminormal forms and Gram determinants for cellular algebras*, J. Reine Angew. Math., **619** (2008), 141–173. With an appendix by Marcos Soriano, [arXiv:math/0604108](#). [MR2414949](#).
31. A. MATHAS AND R. C. ORELLANA, *Cyclotomic Solomon algebras*, Adv. Math., **219** (2008), 450–487. [MR2435646](#).
32. J. HU AND A. MATHAS, *Morita equivalences of cyclotomic Hecke algebras of type $G(r, p, n)$* , J. Reine Angew. Math., **628** (2009), 169–194. [MR2503239](#).
33. A. MATHAS, *A Specht filtration of an induced Specht module*, J. Algebra, **322** (2009), 893–902. [MR2531227](#).
34. J. HU AND A. MATHAS, *Graded cellular bases for the cyclotomic Khovanov–Lauda–Rouquier algebras of type A* , Adv. Math., **225** (2010), 598–642. [arXiv:0907.2985](#). [MR2671176](#).
35. S. LYLE AND A. MATHAS, *Carter–Payne homomorphisms and Jantzen filtrations*, J. Algebraic Combin., **32** (2010), 417–457. [arXiv:0912.2038](#). [MR2721060](#).
36. J. HU AND A. MATHAS, *Graded induction for Specht modules*, Int. Math. Res. Not. IMRN, **2012** (2012), 1230–1263. [arXiv:1008.1462](#). [MR2899951](#).
37. J. HU AND A. MATHAS, *Decomposition numbers for Hecke algebras of type $G(r, p, n)$: the (ϵ, q) -separated case*, Proc. Lond. Math. Soc. (3), **104** (2012), 865–926. [MR2928331](#).
38. A. KLESHCHEV, A. MATHAS, AND A. RAM, *Universal graded Specht modules for cyclotomic Hecke algebras*, Proc. Lond. Math. Soc. (3), **105** (2012), 1245–1289. [arXiv:1102.3519](#). [MR3004104](#).
39. A. MATHAS AND M. SORIANO, *Blocks of the truncated q -Schur algebras of type A* , in Recent developments in algebraic and combinatorial aspects of representation theory, Contemp. Math., **602**, Amer. Math. Soc.,

- Providence, RI, 2013, 123–141. [MR3203901](#).
40. S. LYLE AND A. MATHAS, *Cyclotomic Carter-Payne homomorphisms*, Represent. Theory, **18** (2014), 117–154. [arXiv:1310.7474](#). [MR3213527](#).
 41. J. HU AND A. MATHAS, *Quiver Schur algebras for linear quivers*, Proc. Lond. Math. Soc. (3), **110** (2015), 1315–1386. [arXiv:1110.1699](#). [MR3356809](#).
 42. J. HU AND A. MATHAS, *Seminormal forms and cyclotomic quiver Hecke algebras of type A*, Math. Ann., **364** (2016), 1189–1254. [arXiv:1304.0906](#). [MR3466865](#).
 43. C. BOYS AND A. MATHAS, *Quiver Hecke algebras for alternating groups*, Math. Z., **285** (2017), 897–937. [arXiv:1602.07028](#). [MR3623735](#).
 44. A. MATHAS AND L. NEVES, *The irreducible characters of the alternating Hecke algebras*, J. Algebraic Combin., **47** (2018), 175–211. [arXiv:1605.02859](#). [MR3775219](#).
 45. A. MATHAS, *Restricting Specht modules of cyclotomic Hecke algebras*, Science China Mathematics, **61** (2018), 299–310. Special Issue on Representation Theory, [arXiv:1610.09729](#). [MR3755782](#).
 46. J. HU AND A. MATHAS, *Fayers’ conjecture and the socles of cyclotomic Weyl modules*, Trans. Amer. Math. Soc., **371** (2019), 1271–1307. [arXiv:1602.06631](#).
 47. A. MATHAS, *Positive Jantzen sum formulas for cyclotomic Hecke algebras*, Math. Z., **301** (2022), 2617–2658. [arXiv:2106.15486](#). [MR4437333](#).
 48. A. MATHAS, *Gordon Douglas James, 1945–2020*, Bulletin of the London Mathematical Society, 2022, 1–24.

Preprints (submitted)

49. J. HU, A. MATHAS, AND S. ROSTAM, *Skew cellularity of the Hecke algebras of type $G(\ell, p, n)$* , 2021. [arXiv:2106.11459](#).
50. A. MATHAS AND D. TUBBENHAUER, *Subdivision and cellularity for weighted KLRW algebras*, 2021. ArXiv preprint, [arXiv:2111.12949](#).
51. A. MATHAS AND D. TUBBENHAUER, *Cellularity for weighted KLRW algebras of types B , $A^{(2)}$, $D^{(2)}$* , J. London Math. Soc. (2), to appear. ArXiv preprint, [arXiv:2201.01998](#).
52. A. EVSEEV AND A. MATHAS, *Content systems and deformations of cyclotomic KLR algebras of type A and C*, 2022. [arXiv:2209.00134](#).

Papers in preparation

53. C. CHUNG, A. MATHAS, AND L. SPEYER, *Some graded decomposition matrices of finite quiver Hecke algebras in type C*, 2022, in preparation.
54. A. MATHAS, *Graded Jantzen filtrations for cyclotomic KLR algebras of type A and C*, 2022, in preparation.
55. A. MATHAS, *Computing graded decomposition numbers of KLR algebras*, 2022, in preparation.
56. A. MATHAS, *Intertwiners and Garnir relations for KLR algebras*, 2022, in preparation.

Selected addresses

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| Invited speaker | <i>Character Theory and Categorification</i> , Oberwolfach, Germany, August 2022 |
| Invited speaker | <i>Hecke algebras, symmetric groups and friends</i> , Hannover, Germany, August 2020 (cancelled) |
| Invited speaker | <i>Categorifications: Hecke algebras, finite groups and quantum groups</i> , Paris, France, March 2020 (cancelled) |
| Invited speaker | <i>Representation Theory of Algebraic Groups and Quantum Groups</i> , RIMS, Japan, October 2019 |
| Keynote Speaker | <i>Algebraic Representation Theory</i> , Stuttgart, 2018 |
| Invited Speaker | <i>Representation Theory of Symmetric Groups and Related Algebras</i> , Singapore, December 2017 |

- Invited Lecturer *Workshop: Quantum geometric and algebraic representation theory*, Hausdorff Institute for Mathematics, Bonn, November 2017 (Four lectures)
- Plenary Speaker *The 7th International Conference on Representation Theory*, Xiamen, China, 2016.
- Invited Speaker *Categorical Representation Theory and Combinatorics*, KIAS, Korea, 2015.
- Keynote Speaker *Victoria Algebra Seminar*, UWS, Australia, 2015.
- Invited Lecturer *Algebraic Lie theory and representation theory*, University of Glasgow, 2014. (Five lectures.)
- Invited Speaker *Polynomial functors and Schur algebras*, Universität Bielefeld, 2013.
- Plenary Lecture *Some Trends in Algebra 2013*, Charles University, Prague, 2013.
- Keynote Lecture *Combin'á Tours*, Université Tours, France, 2013.
- Invited Lectures *Modular Representation Theory of Finite and p -adic Groups*, University of Singapore, 2013.
- Invited Speaker *Multiple Dirichlet Series, Combinatorics, and Representation Theory*, ICREM, 2013.
- Keynote Speaker *Gradings and Decomposition Numbers*, Universität Stuttgart, Germany, 2012. (Two talks)
- Invited Speaker *Representations of finite groups*, Oberwolfach, Germany, 2012.
- Invited Speaker *LMS workshop on representation theory*, Birmingham, UK, 2011.
- Invited Speaker *Combinatorial Representation Theory and Integrable Models*, Melbourne, 2011.
- Invited Speaker *Algebraic and combinatorial approaches to representation theory*, Bangalore, India, 2010.
- Invited Speaker *Sage collaborative workshop*, Cernay-la-Ville, France, 2010.
- Invited Speaker *Combinatorial Representation Theory*, Oberwolfach, Germany, 2010.
- Colloquium University of Maynooth, Ireland, 2009.
- Invited Speaker Isaac Newton Institute, Cambridge, UK, 2009.
- Invited Speaker *7th Australia - New Zealand Mathematics convention*, Christchurch, New Zealand, 2008.
- Invited Speaker Mathematical Sciences Research Institute, Berkeley, USA, 2008.
- Invited Speaker *Finite groups and representations*, Kaikoura, New Zealand, 2008.
- Invited Speaker *Algebraic Lie Theory*, BIRS, Canada, 2007
- Colloquium *Seminar Chevalley*, Université Paris, France, 2007.
- Invited Speaker *Representations of finite groups*, Oberwolfach, Germany, 2006.
- Invited Speaker *50th Annual meeting AustMS*, Macquarie University, Australia, 2006.
- Plenary Speaker *Algebraic groups and finite reductive groups*, Bernoulli center, EPFL Lausanne, 2005.
- Keynote address *Representation Theory of Finite Groups and Finite Dimensional Algebras*, Hannover, 2004.
- Invited Speaker *Nilpotent Orbits and Representation Theory*, Fuji-Zakura, Japan, 2004.
- Invited Speaker *Interaction of Finite Dimensional Algebras with other areas of Mathematics*, BIRS, 2004.
- Invited Speaker *Mathematical physics and Lie theory*, Coolangatta, 2004.
- Invited Speaker *Current trends in representation theory of finite groups*, BIRS, Canada, 2003.
- Keynote address *KIAS Workshop on algebraic groups and quantum groups*, Seoul, Korea, 2003.
- Plenary Speaker *LMS Durham symposium on representations of finite groups and related algebras*, Durham 2002.
- Colloquium University of Melbourne, 2002.
- Plenary Speaker *Representation theory of algebraic groups and quantum groups*, Tokyo, Japan 2001.
- Plenary Speaker *Combinatorics of Lie type*, Wisconsin, USA, 2000.
- Keynote address *Decomposition Numbers and Character Formulae for Lie Algebras, Algebraic Groups and Quantum Groups*, Blaubeuren, Germany, 1999.
- Plenary Speaker *Tilting modules for algebraic groups and quantum groups*, Aarhus, 1998.

Visiting invitations

Max Plank Institute for Mathematik, Bonn (September-December, 2017), Universität Bonn (June 2016), Universität Stuttgart (August-September 2013), Charles University, Czech Republic (July-December 2013), Beijing Institute of Technology (June 2012), University of East Anglia (June 2012), Oberwolfach, Germany (March 2012), University of Osaka (January 2012), University of East Anglia (June 2011), Oberwolfach, Germany (March 2010), University of Maynooth, Dublin (July 2009), Isaac Newton Institute, University of Cambridge (June 2009), Mathematical Science

Research Institute, Berkeley, (January 2008), University of East Anglia (June 2008), University of York (September 2007), Banff International Research Station, Canada (May 2007), Université Paris (February 2007), Université Besançon (February 2007), Imperial College (December 2005), Universität Jena (July 2005), Bernoulli Institute, Switzerland (June 2005), University of Dartmouth (October 2004), RIMS, University of Kyoto (August–September 2004), Universität Hanover (July 2004), Imperial College (July 2003), Korean Institute of Advanced Studies (April 2003), Institut Henri-Poincaré, France (February 2002), Universität Kassel, (June 2002), University of Leicester (January 2002), Sophia University, Tokyo (August 2001), University of Leicester (February 2001), University of Oregon (June 2000), University of Tokyo Mercantile Marine (February 2000), Imperial College (January 2000).

Computational experience

Andrew is the author of the GAP share package `SPECHT` which is used for research by mathematicians worldwide. This package is one of the main computational tools in the modular representation theory of the symmetric groups, Hecke algebras and q -Schur algebras. It is distributed as part of GAP 3.4.4 and it is currently being ported to SAGE. Andrew has also made significant contributions to `CHEVIE`, a package for computing with Coxeter groups, Iwahori–Hecke algebras and groups of Lie type. Computational techniques often play an important role in the initial stages of Andrew’s research.

Personal

Nationality Australian.

Married with two children (Alex 18 and Erika 15)