Florian Breuer | CV

University of Newcastle – Newcastle – Australia

✉ florian.breuer@newcastle.edu.au

Education

Université Denis Diderot (Paris 7)
Ph.D., mention très honorable   *1999–2002*
Thesis: *Sur la conjecture d'André-Oort et courbes modulaires de Drinfeld* (*On the André-Oort conjecture and Drinfeld modular curves*), under supervision of Marc Hindry.

Université Pierre et Marie Curie (Paris 6)
Diplôme d'Etudes Approfondies (D.E.A), (Méthodes Algébriques), mention très bien   *1998–1999*

Stellenbosch University, South Africa
Hons.B.Sc., cum laude   *1998*

Stellenbosch University, South Africa
B.Sc., cum laude   *1995–1997*

Positions Held

University of Newcastle   **Australia**
Director of CARMA   *2020*

University of Newcastle   **Australia**
Professor of Mathematics   *2018 –*

Stellenbosch University   **South Africa**
Extraordinary Professor of Mathematics   *2018 – 2021*

Stellenbosch University   **South Africa**
Professor of Mathematics   *2013 – 2018*

Stellenbosch University   **South Africa**
Head: Mathematics Division   *2012 – 2015*

Stellenbosch University   **South Africa**
Associate Professor   *2007 – 2012*

Stellenbosch University   **South Africa**
Senior Lecturer   *2004 – 2007*

Max-Planck-Institut für Mathematik   **Bonn, Germany**
Postdoctoral Fellow   *2004*

National Center for Theoretical Sciences   **Hsinchu, Taiwan**
Postdoctoral Fellow   *2003*

Editorial Boards

Journal of Number Theory   *2011 –*
Quaestiones Mathematicae   *2018 –*

Scientific Publications

Refereed Articles

1. F. Breuer, "Multiplicative orders of Gauss periods and the arithmetic of real quadratic fields", *Finite Fields Appl.*, **73** (2021), to appear. arXiv:2006.10344

2. G. Böckle, F. Breuer, "Generic monodromy of Drinfeld modular varieties in special characteristic", to appear in *Proceedings in Honour of G. Frey's 75th Birthday, Contemp. Math., Amer. Math. Soc.* (2021), arXiv:1912.09820

3. F. Breuer, F. M. Pazuki, H. M. Razafinjatovo, "Heights and isogenies of Drinfeld modules", *Acta. Arith.* **197** no.2 (2021), 111–128. arXiv:1908.03485

4. F. Breuer, I.E. Shparlinski, "Lower bounds for periods of Ducci sequences", *Bull. Aust. Math. Soc.* **102** no.1 (2020), 31–38. arXiv:1909.04462

5. F. Breuer, "Periods of Ducci sequences and odd solutions to a Pellian equation." *Bull. Aust. Math. Soc.* **100** no.2 (2019), 201–205.

6. F. Breuer, D.J. Basson, "On certain Drinfeld modular forms of higher rank." *J. Théor. Nombres Bordeaux*, **29** no.3 (2017), 827–843.

7. F. Breuer, "A note on Gekeler's h-function." *Arch. Math.* **107** (2016), 305–313.

8. F. Breuer, H.-G. Rück, "Drinfeld modular polynomials in higher rank II: Kronecker congruences." *J. Number Theory* **165** (2016) 1–14.

9. F. Breuer, "Explicit Drinfeld moduli schemes and Abhyankar's Generalized Iteration Conjecture." *J. Number Theory* **160** (2016), 432–450.

10. F. Breuer, "Newton identities for Weierstrass products." *Amer. Math. Monthly.* **119**, no. 9 (2012), 796–799.

11. F. Breuer, "Special subvarieties of Drinfeld modular varieties." *J. reine angew. Math.* **668** (2012), 35–57.

12. F. Breuer, "Torsion bounds for elliptic curves and Drinfeld modules." *J. Number Theory* **130** (2010), 1241–1250.

13. F. Breuer, "Ducci sequences and cyclotomic fields." *J. Difference Eq. Appl.* **16** (2010), no. 7, 847–862.

14. F. Breuer, H.-G. Rück, "Drinfeld modular polynomials in higher rank." *J. Number Theory* **129** (2009), 59–83.

15. F. Breuer, B.-H. Im, "Heegner points and the rank of elliptic curves over large extensions of global fields." *Canadian J. Math.* **60** (2008), no.3: 481–490

16. F. Breuer, "The André-Oort conjecture for Drinfeld modular varieties." *C. R. Math. Acad. Sci. Paris*, **344** (2007): 733–736.

17. F. Breuer, "Ducci sequences in higher dimensions." *Integers: Electronic Journal of Combinatorial Number Theory* **7** (2007), #A24.

18. F. Breuer, E.C. Lötter, A.B. van der Merwe, "Ducci sequences and cyclotomic polynomials." *Finite Fields Appl.*, **13**, (2007): 293–304.

19. F. Breuer, "CM points on products of Drinfeld modular curves." *Trans. Amer. Math. Soc.*, **359** (2007): 1351–1374.

20. F. Breuer, R .Pink, "Monodromy groups associated to non-isotrivial Drinfeld modules in generic characteristic.", in: "Number Fields and Function Fields : Two Parallel Worlds", (G. van der Geer, B. Moonen, R. Schoof eds), *Progress in Mathematics* **239**, Birkhäuser, Basel, 2005.

21. F. Breuer, "The André-Oort conjecture for products of Drinfeld modular curves." *J. reine angew. Math.*, **579** (2005): 115–144.

22. F. Breuer, "Images of isogeny classes on modular elliptic curves." *Math. Res. Lett.* **11.5** (2004): 649–651.

23. F. Breuer, "Higher Heegner points on elliptic curves over function fields." *J. Number Theory* **104** (2004): 315–326.

24. F. Breuer, "La conjecture d'André-Oort pour le produit de deux courbes modulaires de Drinfeld." *C. R. Math. Acad. Sci. Paris*, **335** (2002): 867–870.

25. F. Breuer, "Distinguished liftings and the André-Oort conjecture." *Quaest. Math.* **25.3** (2002): 363–380.

26. F. Breuer, "Heights of CM points on complex affine curves." *Ramanujan J.* **5** (2001): 311–317.

27. F. Breuer, "Ducci sequences over abelian groups." *Comm. Algebra* **27.12** (1999): 5999–6013.

28. F. Breuer, "A note on a paper by Glaser and Schöffl.", *Fibonacci Quart.* **36.5** (1998): 463–466.

29. F. Breuer, J.M. Robson, "Strategy and complexity of the game of squares.", *Bull. London Math. Soc.* **30** (1998): 274–282.
30. E. Poretti, L. Mantegazza, C. Koen, P. Martinez, F. Breuer, D. De Alwis, H. Haupt, "Line profile variations in the spectra of the gamma Dor star HR 2740", In: IAU Symposium **185** "New Eyes to See Inside the Sun and Stars", (F.-L. Deubner, J. Christensen-Dalsgaard, D. Kurtz, eds) Kyoto, Japan, 18-22 August, 1997, p. 387.
31. E. Poretti, C. Koen, P. Martinez, F. Breuer, D. de Alwis, H. Haupt, "Discovery and analysis of gamma doradus type pulsations in the F0 IV star HR 2740 QW pup", *Mon. Not. R. Astron. Soc.* **292** (1997): 621–630.

Preprints

32. D.J. Basson, F. Breuer, R. Pink, "Drinfeld modular forms in arbitrary rank III: Examples", (2018) arXiv:1805.12339
33. D.J. Basson, F. Breuer, R. Pink, "Drinfeld modular forms in arbitrary rank II: Comparison with Algebraic Theory", (2018) arXiv:1805.12337
34. D.J. Basson, F. Breuer, R. Pink, "Drinfeld modular forms in arbitrary rank I: Analytic Theory", (2018) arXiv:1805.12335

Honours and Awards

- African Institute for Mathematical Sciences Associate Research Fellow, 2013 – present.
- Rector's Award for Performance, Stellenbosch University, 2011.
- Rector's Award for Excellence in Research, Stellenbosch University, 2010.
- Meiring Naudé Medal of the Royal Society of South Africa, 2007 ("For research achievement by a young scientist under the age of 35 years").

Invited Talks

1. "Torsion bounds for CM Drinfeld modules", Special session talk, AMS-MAA Joint Meeting, Online, January 2021.
2. "Drinfeld modules, isogenies and modular polynomials", New Zealand Number Theory Day, Online, November 2021.
3. "The generic monodromy of Drinfeld modular varieties in special characteristic", Special session talk, AMS Fall Eastern Meeting, Online, October 2020.
4. "Heights and isogenies of Drinfeld modules", La 3$^{\text{ième}}$ petite journeé GANDA, Bordeaux, France, November 2019.
5. "Drinfeld modular forms in arbitrary rank", Arithmetic of Function Fields and Diophantine Geometry, Taipei, Taiwan, 20-24 May 2019.
6. "Heights and isogenies of Drinfeld modules", Special session talk, AMS Central & Western Joint Sessions Meeting, Honolulu, Hawaii, 22-24 March 2019.
7. "Drinfeld modular forms in higher rank", Arithmetic and Geometry of Local and Global Fields, Tuan Chau, Vietnam, June 2018.
8. "Mathematical Strucures in Art: The work of M C Escher", Stellenbosch Science Café, February 2018.
9. "Drinfeld modular forms in higher rank: Analytic theory", Arithmetic of Function Fields, Münster, Germany, June 2017.
10. "Analytic Drinfeld modular forms in higher rank", Workshop on Function Fields, Zeta Functions and Drinfeld Modular Forms, Imperial College, London, June 2015.
11. "Galois groups associated to Drinfeld modules", Global Fields Conference, Independent University of Moscow, September 2013.
12. "Drinfeld modular forms in higher rank", CEDAR workshop, University of Illinois, Chicago, May 2013.
13. "On Drinfeld modular polynomials", Penn State - Göttingen Number Theory Conference, Göttingen, Germany, August 2012.

14. "An invitation to the André-Oort Conjectures", Penn State - Göttingen Number Theory Conference, Göttingen, Germany, August 2012.
15. "Galois representations and Drinfeld modular polynomials", XXII-nd Rencontres Arithmétiques de Caen, France, June 2011.
16. "Drinfeld modular forms in higer rank", Workshop on the Arithmetic of Function Fields, Imperial College, London, June 2011.
17. "Number fields and function fields: Two parallel worlds", Diversity in Mathematics Conference, African Institute of Mathematical Sciences, South Africa, July 2010.
18. "Drinfeld modular polynomials", Modular Forms and Function Field Arithmetic, a conference in honor of Jing Yu's 60th birthday, Taipei, Taiwan, May 2009.
19. "Ducci sequences in higher dimensions", special session on Algebraic Dynamics, Joint Meetings of the AMS and MAA, San Diego, California, USA, January 2008.
20. "Mathematics in the art of M.C. Escher", Stellenbosch Forum, Stellenbosch, South Africa, 2006.
21. "Special points in moduli spaces", Workshop on Cryptography and Related Mathematics, 21st Century CEO Security Program and Research and Development Initiative, Chuo University, Tokyo, Japan, 2003.

Workshops and Conferences Organized

1. "Number Theory Down Under 2020", Online, 6–8 October 2020. (Organised with D. Badziahin, A. Ghitza, T. Trudgian and C. Wu)
2. "Number Theory Online Conference 2020", Online, 3–5 June 2020. (Organised with M. Coons, T. Morrill and A. Ostafe)
3. "CARMA Workshop on Computer-Aided Proof", Newcastle, 5–7 June 2019. (Organised with N. Thamwattana, G. Wheeler and G. Willis)
4. "Stellenbosch-AIMS Number Theory Conference", Stellenbosch, South Africa, 14–18 January 2019. (Organised with D.J. Basson, B.W. Green and F. Pazuki)
5. "AMSI-CARMA Workshop on Mathematical Thinking", Newcastle, Australia, 14–16 November 2018. (Organised with L. Brankovic, J.-A. Osborn, T. Trudgian)
6. "New Developments in the Theory of Modular Forms over Function Fields", CRM, Pisa, Italy, 5–9 November 2018. (Organised with A. El-Guindy, M. Papikian, F. Pellarin and R. Perkins)
7. "Stellenbosch Number Theory Day", Stellenbosch, South Africa, 22 January 2018. (Organised together with B.W. Green)
8. "AIMS-Stellenbosch Number Theory Conference", Stellenbosch, South Africa, 16–20 January 2017. Attended by 20 international visitors from France, Denmark, Israel, Japan, Madagascar, Qatar, Spain, Switzerland, Uganda, UK and the USA. (Organised together with B.W. Green and P. Rabarison)
9. "AIMS-Stellenbosch University Number Theory Conference", AIMS and Stellenbosch, South Africa, 19 - 23 January 2015. Attended by 16 international visitors from Brazil, France, Germany, Israel, Madagascar, UK and the USA. (Organised together with B.W. Green and P. Sarnak)
10. "Conference on Arithmetic Geometry", University of Stellenbosch, South Africa, 28 January - 1 February 2013. Attended by 17 international visitors from France, Germany, Japan, Madagascar, the Netherlands, Switzerland, UK and the USA. (Organised together with B.W. Green)
11. "Stellenbosch Summer School in Number Theory", a summer school for advanced undergraduate and graduate students, University of Stellenbosch, 23-27 January 2012. (Organised together with L. Wessels)
12. "Conference on Arithmetic Geometry", University of Stellenbosch, South Africa, 24-28 January 2011. Attended by 14 international visitors from France, Germany, Italy, Japan, Madagascar, the Netherlands, Switzerland, Taiwan, UK and the USA. (Organised together with B.W. Green)
13. "Conference on Arithmetic Geometry and Applications", University of Stellenbosch, South Africa, 4-9 April 2009. Attended by 10 international visitors from Brazil, Denmark, France and Germany. (Organised together with B.W. Green)
14. "International Conference on Arithmetic Geometry and Applications", University of Stellenbosch,

South Africa, 29 Jan - 2 Feb 2007. Attended by 18 international visitors from France, Germany, Israel, Italy, Japan, Netherlands, UK and USA. (Organised together with B.W. Green)
15. November Workshop (in honour of Barry Green's 50th birthday), University of Stellenbosch, South Africa, 7-9 November 2005.
16. Workshop: "Arithmetic Geometry, Related Areas and Applications", University of Stellenbosch, South Africa, 1-4 February 2005. Attended by 13 international visitors from Australia, Brazil, France, Germany, Israel and Japan. (Organised together with B.W. Green)
17. "Number Theory Day", University of Stellenbosch, South Africa, 20 November 2003.
18. "An Invitation to The Clay Millenium Problems", University of Stellenbosch, South Africa, 24 September 2002.

Research Visits

- Universität Heidelberg (Alexander-von-Humboldt Renewed Research Stay), Germany, July – December 2019.
- University of Stellenbosch, South Africa, December 2018–January 2019.
- Independent University of Moscow, Russia, September 2013.
- Mathematisches Forschungsinstitut Oberwolfach, Germany, June 2010.
- ETH-Zürich, Switzerland, October-November 2009.
- Universität Kassel (Alexander-von-Humboldt Fellow), Germany, August 2009 - January 2010.
- Universiteit Leiden (ALGANT scholar), Netherlands, July 2009.
- National Center for Theoretical Sciences, Hsinchu, Taiwan, May 2009.
- Universität Kassel, Germany, September 2007.
- ETH-Zürich, Switzerland, May-June 2004.
- Invited participant, 4th Texel Island Conference: "The Analogy between number fields and function fields", Texel Island, The Netherlands, 25-29 April 2004.
- Invited keynote participant, Workshop: "Special Points in Shimura Varieties", Universiteit Leiden, The Netherlands, 15-19 December 2003.
- University of the South Pacific, Suva, Fiji, August 2003.
- University of Stellenbosch, South Africa, August-September 2002; December 2002-January 2003.
- Universität Kassel, Germany, December 2001.
- Institut für Experimentelle Mathematik, Universität Essen, Germany, November-December 2001.
- University of Stellenbosch, South Africa, August-September 2000.

Graduate students

Postdocs
- Luca Demangos (Stellenbosch)
- Dirk Basson (Stellenbosch)

Current PhD students
- James Evans (Newcastle)
- Ran Zhenlin (Newcastle)
- Eddie Chen (Newcastle)
- Heriniaina Razafinjatovo (Antananarivo)

Past PhD students
- Liam Baker (Stellenbosch), 2020
- Andry Rabenantoandro (Stellenbosch), 2020
- Dirk Basson (Stellenbosch), 2014
- Archie Karumbidza (Stellenbosch), 2013
- Jay van Zyl (Stellenbosch), 2011

Past Masters students
- Faratiana Brice Razakarinoro (AIMS), 2017
- Gekonga Chacha (AIMS), 2017
- Waleed Khaled Hassaan (AIMS), 2016
- Gerard Louw (Stellenbosch), 2016
- Taboka Prince Chalebgwa (Stellenbosch), 2016
- Edwin Phiri (AIMS), 2016

- Safidy Nandrianina Ratsimbazafy (AIMS), 2015
- Tseliso Paul Lekhoaela (AIMS), 2014
- Yann Ranorovelonalohotsy (Stellenbosch) 2014
- Myriam Mahaman (AIMS), 2013
- Tovohery Hajatiana Randrianarisoa (Stellenbosch), 2012
- Alex Samuel Bamunoba (Stellenbosch) 2011
- Tahina Rakotoniaina (Stellenbosch), 2008
- Paul Joubert (Stellenbosch) M.Sc cum laude, 2006

Past Honours students
- Eddie Chen (Newcastle), 2020

Past Postgraduate Diploma students
- Yann Ranorovelonalohotsy (AIMS), 2012
- Tesfalem Tegegn (AIMS), 2012
- Tovohery Hajatiana Randrianarisoa (AIMS), 2011
- Darlison Nyirenda (AIMS) 2011
- Alex Samuel Bamunoba (AIMS), 2010
- Emma Owusu Kwaakwah (AIMS), 2010
- Dimbinaina Ralaivaosaona (AIMS), 2007
- Tahina Rakotoniaina (AIMS), 2006