

Henrik Nils Latter

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Date of birth: 16 August 1977

Nationality: Australian

EDUCATION

Doctorate in Theoretical Astrophysics (Oct 2003 - Dec 2006)

AFD group, DAMTP, University of Cambridge
Supervisor: Gordon Ogilvie
Thesis title: *Instabilities in Planetary Rings*

Master of Science (Mar 2003 - Oct 2003)

Department of Mathematics, University of Sydney
Supervisor: David Ivers
Thesis title: *Topics in Kinematic Dynamo Theory*

Bachelor of Arts (Honours) (Aug 2001 – Jun 2002)

Department of Mathematics, University of Sydney
Applied Mathematics – First Class

Bachelor of Arts and Bachelor of Science (Mar 1996 – Dec 2000)

University of Sydney
Majors: Mathematics, English Literature, History

EMPLOYMENT

Research associate (Sep 2010 - present)

AFD group, DAMTP, University of Cambridge
under John Papaloizou and Gordon Ogilvie

Undergraduate supervisor (Sep 2010 - present)

Clare College, University of Cambridge

Postdoctoral researcher (Oct 2007 - Aug 2010)

Laboratoire de Radioastronomie (LERMA), Ecole Normale Supérieure, Paris
under Steve Balbus

Research assistant (Apr 2007 – Sep 2007)

AFD group, DAMTP, University of Cambridge
under Gordon Ogilvie

Casual tutor (Mar 2003 – Jun 2003)

Department of Mathematics, University of Sydney

Part-time sales assistant and delivery driver (1998-2003)

Universal Fashion Uniforms, Sydney

AWARDS

- **2006** Mini Rouse-Ball Fellowship, Trinity College, Cambridge
- **2005** Smith Prize, Class 2, DAMTP, Cambridge
- **2003-2006** Australian Alumni Scholarship, Cambridge Commonwealth Trust
- **2003-2006** Overseas Research Studentship, Universities UK
- **2003** University of Sydney Postgraduate Award
- **2003** Bullen Prize for Applied Maths, University of Sydney
- **2002** University Medal, Applied Maths, University of Sydney

SELECTED SEMINARS & POSTERS

- Invited seminar 02.2011. 'Fine-scale structure formation in Saturn's rings', at Queen Mary, University of London, UK.
- Invited seminar 11.2010. 'Fine-scale structure formation in Saturn's rings', at the University of Exeter, UK.
- Invited seminar 11.2010. 'Fine-scale structure formation in Saturn's rings', at the University of Newcastle, UK.
- Seminar 08.2010. 'Fine-scale structure formation in Saturn's rings', at the Harvard-Smithsonian CFA, Cambridge, USA.
- Seminar 07.2010. 'Planet formation and MHD turbulence in circumstellar disks', at the ISIMA, University of Santa Cruz, Santa Cruz, USA.
- Seminar 07.2010. 'Planet formation and MHD turbulence in circumstellar disks', at NASA JPL, Pasadena, USA.
- Seminar 06.2010. 'The magnetorotational instability and the structure of protoplanetary disks', at the Oxford Plasma Theory Group, Oxford.
- Invited seminar 02.2010. 'Coherent structures in turbulent accretion disks', ENS MHD seminar series, ENS, Paris.
- Seminar 09.2009. 'Double-diffusive instability in the dead-zones of protoplanetary disks', at the Isaac Newton Institute, Cambridge, UK.
- Seminar 04.2009. 'The dynamics of MRI channel flows', at *The Astrophysics of the Magnetorotational Instability and Related Processes* conference, Ringberg, Germany.
- Invited seminar 02.2009. 'MRI channel flows in accretion disks', AFD seminar series, DAMTP, Cambridge, UK.
- Seminar 09.2007. 'Nonlinear waves and the viscous overstability in dense planetary rings', at the 2007 Europlanets Conference, Potsdam, Germany.
- Poster 09.2005. 'Instabilities in Kinetic Models of Planetary Rings', at the Annual Conference of the Division for Planetary Sciences (AAS), Cambridge, UK.

MISCELLANEOUS

- Reviewer for *MNRAS* (from 2009), *Astronomical Journal* (from 2009), *Icarus* (from 2010)
- Group seminar organiser for the LRA, ENS, 2008-2010
- Group seminar organiser for the AFD group, DAMTP, Cambridge, 2010-present
- Representative for all LERMA (Laboratoire d'Etude du Rayonnement et de la Matière en Astrophysique) postdocs (2009)
- Co-supervisor of Julius Bonart (2009) and Marie Chupeau (2011) for their ENS MSc research projects
- Contributor to *Plus* internet magazine (a popular mathematics website)

PEER-REVIEWED ARTICLES:

1. E. Jacquet, S. A. Balbus, H. Latter, 2011. 'On linear dust-gas streaming instabilities in protoplanetary discs'. *MNRAS*, in press.
2. H. N. Latter & G. I. Ogilvie, 2010. 'Hydrodynamical simulations of viscous overstability in Saturn's rings'. *Icarus*, 210, 318.
3. S. A. Balbus & H. N. Latter, 2010. 'The tachocline and differential rotation in the Sun'. *MNRAS*, 407, 2565.
4. H. N. Latter & D. Ivers, 2010. 'Spherical single-roll dynamos at large magnetic Reynolds numbers'. *Physics of Fluids*, 22, 066601.
5. H. N. Latter, S. Fromang, O. Gressel, 2010. 'MRI channel flows in vertically-stratified models of accretion disks'. *MNRAS*, 406, 848.
6. H. N. Latter, J. Bonart, S. A. Balbus, 2010. 'Resistive double-diffusive instability in the dead-zones of protostellar disks'. *MNRAS*, 405, 1831.
7. S. A. Balbus, J. Bonart, H. Latter, N. Weiss, 2009. 'On differential rotation and convection in the Sun'. *MNRAS*, 400, 176.
8. H. N. Latter & S. A. Balbus, 2009. 'Inertial waves near corotation in 3D hydrodynamical disks'. *MNRAS*, 399, 1058.
9. H. N. Latter & G. I. Ogilvie, 2009. 'The viscous overstability, nonlinear wavetrains, and fine-scale structure in dense planetary rings'. *Icarus*, 202, 565.
10. P. Lesaffre, S. A. Balbus, H. N. Latter, 2009. 'A comparison of local simulations and reduced models of MRI-induced turbulence'. *MNRAS*, 396, 779.
11. H. N. Latter, P. Lesaffre & S. A. Balbus, 2009. 'MRI channel flows and their parasites'. *MNRAS*, 394, 715.
12. H. N. Latter & G. I. Ogilvie, 2008. 'Dense planetary rings and the viscous overstability'. *Icarus*, 195, 725.
13. H. N. Latter & G. I. Ogilvie, 2006. 'Viscous overstability and eccentricity evolution in three-dimensional gaseous disks'. *MNRAS*, 372, 1829.
14. H. N. Latter & G. I. Ogilvie, 2006. 'The linear stability of dilute particulate rings'. *Icarus*, 184, 498.
15. H. Latter & D. Ivers, 2004. 'Kinematic roll dynamo computations at large magnetic Reynolds numbers'. *ANZIAM J.*, 45(E), C905.

IN PREPARATION:

1. H. N. Latter, 2011. 'The dynamics of inner dead-zones boundaries in protoplanetary disks'. For *MNRAS*
2. Z. M. Leinhardt, G. I. Ogilvie, H. N. Latter, E. Kokubo, 2011. 'Tidal disruption of satellites and formation of narrow rings'. For *Icarus*.
3. H. N. Latter, M. Chupeau, G. I. Ogilvie, 2011. 'The ballistic transport instability and axisymmetric structure in Saturn's B and C rings I: governing equations and linear theory'. For *Icarus*.
4. H. N. Latter, M. Chupeau, G. I. Ogilvie, 2011. 'The ballistic transport instability and axisymmetric structure in Saturn's B and C rings II: nonlinear theory'. For *Icarus*.
5. H. N. Latter & J. Papaloizou, 2011. 'Hysteresis and instability in local MRI simulations of dwarf nova disks'. For *MNRAS*.

Research interests

My research concerns the fluid dynamics of astrophysical disks orbiting planets, young stars, and black holes. These flows are some of the most important and best-studied in astronomy, as well as the most striking and beautiful. I am particularly interested in phenomena related to: instabilities and pattern formation, the onset and properties of turbulence, and planet formation. To understand these, I employ various analytic and semi-analytic techniques in the context of kinetic theory, hydrodynamics, and magnetohydrodynamics (MHD), and supplement them with large-scale numerical simulations. Find below a (very) brief list of current and past projects.

Planetary rings:

- Developing dense-gas kinetic theories in order to model the disk as a swarm of infrequently colliding ice particles and the unusual rheology that ensues.
- Outlining analytically, and through simulations, the axisymmetric patterns generated on 100m - 100km by various instabilities (gravitational instability, viscous overstability, and ballistic transport instability). These comprise nonlinear wavetrains, wave-fronts, plateaus, and wakes.
- Satellite disruption and the formation of narrow rings, such as the Uranian epsilon ring.

Accretion disks:

- Understanding intermittency and mixing in turbulence generated by the magnetorotational instability in generic disk systems.
- Capturing disk instability and dwarf nova cycles in direct numerical simulations of MRI turbulence.
- The dynamics of the interfaces between quiescent ('dead') and MRI turbulent ('active') regions in protoplanetary disks. How do these dynamics influence the accumulation and agglomeration of solid material in the disk?
- The onset and saturation of slow instabilities in the dead-zones of protoplanetary disks: double-diffusive and dust-gas streaming instabilities.
- The diskoseismology of black hole disks and its connection (or not) to the observed quasi-periodic oscillations in their X-ray emission.

Other interests

- Mean-field (and other) models of solar differential rotation. The interpenetration of convection and rotation, more generally.
- The MHD of exoplanet atmospheres, in particular applied to the supposed Ohmic heating of hot Jupiters.
- Slow, large-scale instabilities in very hot plasmas, such as the HBI in the intracluster medium.
- Dynamo theory