

# FRÉDÉRIQUE MOTTE

CNRS Research Director

Date of birth: 24 November 1971

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## EDUCATION

- 2015 *Habilitation à Diriger les Recherches*  
*Star formation in extreme environment of our Galaxy*, Paris Diderot University, France
- 1998 *PhD in Astronomy*  
*Structure of protostellar dense cores: a millimeter continuum study*, Paris Sud University, supervised by Dr Ph. André, France

## CURRENT AND PREVIOUS POSITIONS

- 2015-present *Directrice de Recherche 2<sup>ème</sup> Classe at CNRS*  
at IPAG, Université Grenoble Alpes (UGA) and at CEA/AIM Paris-Saclay, France
- 2004 – 2015 *Chargée de Recherche au CNRS*, at CEA/AIM Paris-Saclay, France
- 2002 – 2004 *Postdoctoral fellow*, at CEA/AIM Paris-Saclay, France
- 2000 – 2002 *Postdoctoral fellow*, at California Institute of Technology, Pasadena, USA
- 1998 – 2000 *Postdoctoral fellow*, at the Max-Planck-Institute, Bonn, Germany

## SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

- 2016 – *PhD* T. Nony, *Formation of massive star clusters and cloud collision*
- 2011 – 2015 *PhD* J. Tigé, co-supervised with D. Russeil, *The formation of massive stars with Herschel*
- 2011 – 2014 *PhD* F. Louvet, *Hyper-massive clouds, shocks and star formation efficiency*
- 2009 – 2012 *PhD* Q. Nguyen Luong, *Linking the formation of molecular clouds and high-mass stars: A multi-tracer and multi-scale study*
- 2018 – *Postdoc* J.-F. Robitaille
- 2010 – 2013 *Postdoc* T. Hill
- 2009 – 2013 *Postdoc* M. Henneman

## ORGANISATION OF INTERNATIONAL CONFERENCES

- 2014 *Chair and Co-organizer of*  
*From Galactic to Extragalactic Star Formation – GESF2014*, Marseille (France)
- SOC Member of*
- 2007 *Massive Star Formation: Observations confront Theory*, Heidelberg (Germany)
- 2010 *Great Barriers in High Mass Star Formation*, Townsville (Australia)
- 2014 *Early Stages of Star Formation 2014 - EPOS2014*, Ringberg (Germany)
- 2016 *Star Formation in Different Environments*, Quy Nhon (Vietnam)
- 2017 *Multi-scale Star Formation, Morelia* (Mexico)
- SFDEI7: from Local Clouds to Distant Galaxies*, Quy Nhon (Vietnam)

## RESPONSIBILITIES

- 2017 – *Managerial responsibilities in large collaborations:*  
PI of the ALMA-IMF large program of ALMA, >40 researchers, 65 hours (+300h ACA)  
*ALMA-IMF: ALMA transforms our view of the origin of the stellar IMF*
- 2008 – PI of the W43-HERO large program of IRAM, 20 researchers, 150 hours  
*W43-HERO: Origins of molecular clouds and star formation in W43*
- 2004 – PI of the HOBYS key program of the ESA/Herschel satellite, 50 researchers, 130 hours  
*HOBYS: The Herschel imaging survey of OB Young Stellar objects*
- International committees and referee activities:*
- 2012 – 2014 *Review panel member*, allocating observing time at the world-class ALMA observatory
- 1998 – *Referee* of international journals (A&A, ApJ, MNRAS, PASJ, Nature, ...) and telescope time (James Clerk Maxwell Telescope, ALMA)

### *National committees:*

- 2014 - Member of the CNES “Groupe thématique Astronomy & Astrophysics”, evaluating the scientific merit of future satellites and ongoing spatial research programs, France
- 2014 - Member of the CNRS scientific committee “Programme National de Physique Stellaire”, evaluating research projects, France
- 2008 - 2012 Member of the CNRS national committee for scientific research, hiring and managing careers of CNRS astrophysicists, France

### *Local committees and responsibilities:*

- 2016 - Member of the institute board, IPAG, Université Grenoble Alpes, France
- 2008 - 2017 Evaluator or referee for 5 PhD defenses, 1 HDR defense and 2 personal promotions, Marseille, Bordeaux, and Paris 7 universities, France
- 2009 - 2014 Member of the institute board, AIM, CEA/AIM Paris-Saclay, France
- 2009 - 2013 Leader of the *High-mass star formation group* (9 members), CEA Paris Saclay, France

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## FUNDINGS

- 2018 - 2019 Marie Curie individual fellowship by J.-F. Robitaille, Univ. Grenoble Alpes, France, 185 k€
- 2016 - 2019 Member of the [Star Form Mapper](#) H2020 Space project, U. Cardiff/UGA/Madrid, 1776 k€
- 2014 Funding of the [GESF2014 international conference](#), CNES + region + lab, 60 k€
- 2010 - 2013 [Eurotalent fellowship](#) by T. Hill, CEA Paris-Saclay, France, 200 k€
- 2008 - 2011 Co-PI of the [PROBES ANR project](#), U. Bordeaux/CEA Saclay/U. Marseille, France, 400 k€

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## PUBLICATIONS

132 publications in refereed journals, citations: 9316, h-index: 51 (source: SAO/NASA ADS; 8/8/2017)  
7 first author, 10 behind young researchers I supervised [\*= former PhD student and/or postdoc].

### Main publications

- [Motte, F.](#), [Nony\\*](#), [Louvvet\\*, F.](#), Marsh, K.A., Whitworth, A.P., et al. *Challenging the relation between core masses and stellar masses*. 2017, Nature Astronomy, letter submitted.
- [Tigé\\*, J.](#), [Motte, F.](#), Russeil, D., Zavagno, A., Hennemann\*, M., et al. *The earliest phases of high-mass star formation, as seen in NGC 6334 by Herschel-HOBYS*. 2017, A&A 602, A77 (83 pages, 1 citation).
- [Louvvet\\*, F.](#), [Motte, F.](#), Gusdorf, A., Nguyen Luong, Q., Lesaffre, P., et al. *Tracing extended low-velocity shocks through SiO emission. Case study of the W43-MM1 ridge*. 2016, A&A, 595, A122 (12 pages, 2 citations).
- Didelon, P., [Motte, F.](#), Tremblin, P., Hill, T., Hony, S., et al. *From forced collapse to H ii region expansion in Mon R2: Envelope density structure and age determination with Herschel*. 2015, A&A 584, A4 (25 pages, 6 citations)
- [Motte, F.](#), Nguyen Luong, Q., Schneider, N., Heitsch, F., Glover, S. et al. 2014, *The formation of W43 complex: constraining its atomic-to-molecular transition and searching for colliding clouds*, A&A, 571, 32 (12 pages, 24 citations).
- [Louvvet\\*, F.](#), [Motte, F.](#), Hennebelle, P., Maury, A., Bonnell, I., et al. *The W43-MM1 mini-starburst ridge, a test for star formation efficiency models*. 2014, A&A 570, A15 (10 pages, 31 citations).
- [Nguyen Luong\\*, Q.](#), [Motte, F.](#), Carlhoff, P., Louvvet\*, F., Lesaffre, P. et al. *Low-velocity Shocks Traced by Extended SiO Emission along the W43 Ridges: Witnessing the Formation of Young Massive Clusters*. 2013 ApJ 775, 88 (21 pages, 48 citations).
- [Hennemann\\*, M.](#), [Motte, F.](#), Schneider, N., Didelon, P., Hill\*, T., et al. *The spine of the swan: a Herschel study of the DR21 ridge and filaments in Cygnus X*. 2012 A&A 543, L3 (7 pages, 92 citations).
- [Hill, T.](#), [Motte, F.](#), Didelon, P., White, G. J., Marston, A. P., Nguyen Luong, Q. *The M 16 molecular complex under the influence of NGC 6611. Herschel's perspective of the heating effect on the Eagle Nebula*. 2012 A&A 542, A114 (12 pages, 25 citations).
- [Nguyen Luong\\*, Q.](#), [Motte, F.](#), Hennemann, M., Hill, T., Rygl, K.L.J., et al. *The Herschel view of massive star formation in G035.39-00.33: dense and cold filament of W48 undergoing a mini-starburst*. 2011, A&A 535, A76 (11 pages, 51 citations).
- [Nguyen Luong\\*, Q.](#), [Motte, F.](#), Schuller, F., Schneider, N., Bontemps, S., et al. *W43: the closest molecular complex of the Galactic bar?* 2011, A&A 529, A41 (16 pages, 75 citations).
- [Hill\\*, T.](#), [Motte, F.](#), Didelon, P., Bontemps, S., Minier, V., et al. *Filaments and ridges in Vela C revealed by Herschel: from low-mass to high-mass star-forming sites*. 2011, A&A 533, A94 (9 pages, 128 citations).

- Bontemps, S., [Motte, F.](#), Csengeri, T., Schneider, N. *Fragmentation and mass segregation in the massive dense cores of Cygnus X*. 2010, A&A 524 A18 (13 pages, 100 citations).
- [Motte, F.](#), Zavagno, A., Bontemps, S., Schneider, N., Hennemann\*, M., et al. *Initial highlights of the HOBYS key program, the Herschel imaging survey of OB young stellar objects*. 2010, A&A 518, L77 (6 pages, 126 citations).
- Schneider, N., [Motte, F.](#), Bontemps, S., Hennemann, M., di Francesco, J. et al. *The Herschel view of star formation in the Rosette molecular cloud under the influence of NGC 2244*. 2010, A&A 518, L83 (6 pages, 34 citations).
- [Hennemann\\*, M.](#), [Motte, F.](#), Bontemps, S., Schneider, N., Csengeri, T., et al. *Herschel observations of embedded protostellar clusters in the Rosette molecular cloud*. 2010, A&A 518, L84 (5 pages, 29 citations).
- [Motte, F.](#), Bontemps, S., Schilke, P., Schneider, N., Menten, K. M., et al. *The earliest phases of high-mass star formation: a 3 square degree millimeter continuum mapping of Cygnus X*. 2007, A&A 476, 1243 (18 pages, 193 citations).
- [Motte, F.](#), Schilke, P., Lis, D.C. *From Massive Protostars to a Giant H II Region: Submillimeter Imaging of the Galactic Ministarburst W43*. 2003, ApJ, 582, 277 (15 pages, 120 citations).
- [Motte, F.](#), André, Ph., Ward-Thompson, D., Bontemps. *A SCUBA survey of the NGC 2068/2071 protoclusters*. 2001, A&A, 372, L41-L44 (6 pages, 145 citations).
- [Motte, F.](#), André, Ph. *The circumstellar environment of low-mass protostars: a millimeter continuum mapping survey*. 2001, A&A, 365, 440 (30 pages, 268 citations).
- [Motte, F.](#), André, Ph., Neri, R. *The initial conditions of star formation in the  $\rho$  Ophiuchi main cloud: wide-field millimeter continuum mapping*. 1998, A&A, 336, 150 (23 pages, 777 citations).

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## REVIEWS AND CHAPTERS IN BOOKS

1. [High-mass star and massive cluster formation in the Milky Way](#). [Motte, F.](#), Louvet\*, & Bontemps, S., Annual Review of Astronomy & Astrophysics, 56, in press.
2. *When Herschel links high-mass star formation to cloud structure*. [Motte, F.](#) et al. 2012. in: Proceedings of the Annual meeting of the French Society of Astronomy and Astrophysics, pp.45-50.
3. *The formation of low-mass stars with Herschel*. Hennebelle, P. & [Motte, F.](#) in: Astronomy in the submm and FIR domains with the Herschel Space Observatory, EAS Publications Series, 34, 177-193.
4. [Our knowledge of high-mass star formation at the dawn of Herschel.](#), [Motte, F.](#) & Hennebelle, P. in: Astronomy in the submm and FIR domains with the Herschel Space Observatory, EAS Publications Series, 34, 195-211.

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## INVITED PRESENTATIONS IN INTERNATIONAL CONFERENCES

1. **July 2017:** *High-mass SF and Cluster Formation in the MW: the HOBYS and W43-HERO view*. in: the 6th MPIA Summer Conference: Galactic Star Formation with Surveys. Heidelberg (Germany).
2. **August 2016:** *The formation of high-mass stars: new insights from Herschel, IRAM, and ALMA imaging*, in: Star clusters: from Infancy to Teenagehood, Heidelberg (Germany).
3. **September 2015:** [High-mass star and cluster formation: new insights from Herschel](#). in: the 6th Zermatt ISM symposium, Zermatt (Switzerland).
4. **August 2015:** [Clusters of high-mass protostars: From extreme clouds to minibursts of star formation](#). in: IAU XXIX General Assembly, Symp. 316, Honolulu (US).
5. **August 2015:** [HOBYS and W43, two more steps toward a Galaxy-wide understanding of high-mass star formation](#). in: IAU XXIX General Assembly, Symp. 315, Honolulu (US).
6. **August 2015:** *Cloud structure and high-mass star formation in HOBYS*. in: IAU XXIX General Assembly, Div. H, Honolulu (US).
7. **November 2014:** *HOBYS and W43, two more steps toward a Galaxy-wide understanding of high-mass star formation*. in: Star Formation across space and time, ESA, Noordwijk (Netherlands).
8. **November 2014:** *Clusters of high-mass protostars: From extreme clouds to minibursts of star formation*. in: Early Life of stellar Clusters (ELSC2014), Copenhagen (Denmark).
9. **June 2014:** *From filamentary clouds to fibers feeding individual cores: how do filaments impact cloud and star formation?* in: Early Stages of Star Formation 2014 - EPOS2014, Ringberg (Germany).
10. **October 2013:** *Mini-starburst ridges and present-day SFR in HOBYS, the Herschel imaging survey of OB Young Stellar objects*. in: The universe explored by Herschel, ESA, Noordwijk (Netherlands).
11. **July 2012:** *HOBYS and W43, two more steps towards a Galaxy-wide understanding of high-mass star formation*. in: Galactic Scale Star Formation: Observation meets Theory, Heidelberg (Germany).

12. [Sept 2011](#): *Gould-Belt & HOBYS, two Herschel key programs of star-forming regions within 3 kpc.* in: The Milky Way in the Herschel era: towards a Galaxy-scale view of the star formation life-cycle, Rome (Italy).
13. [Sept 2010](#): *Protostellar Clusters revealed by the HOBYS Herschel survey of massive clouds.* in: Herschel and the formation of stars and planetary systems, Göteborg (Sweden). [Presented by M. Hennemann]
14. [July 2010](#): *Initial highlights of HOBYS, The Herschel imaging survey of OB Young Stellar objects.* in: COSPAR 2010, 38th scientific assembly, Bremen (Germany). [Presented by M. Hennemann, health issues]
15. [May 2010](#): *Initial highlights of HOBYS, The Herschel imaging survey of OB Young Stellar objects.* in: ESLAB 2010: Herschel First Results Symposium, ESA, Noordwijk (Netherlands).
16. [September 2007](#): [Massive Infrared-Quiet Dense Cores: Unveiling the Initial Conditions of High-Mass Star Formation.](#) in: Massive Star Formation: Observations confront Theory, Heidelberg (Germany).
17. [July 2001](#): [Wide-field \(sub\)millimeter continuum surveys of protoclusters: clues to the origin of the IMF](#) in: From Darkness to Light, Cargèse (France).

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## TEACHING EXPERIENCE

- 2013 *Introduction to astronomy and the researcher's work,*  
7 hours, in schools for 6 to 10-years old kids
- 2007 *Astrophysical courses,* at CNRS school Les Houches, France
- 2002 – 2004 *Teacher in Physics at L1 level,* Monitorat (190 hours) at Grenoble 1 University, France

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## PUBLIC OUTREACH

- 2015 Oral contribution to a *documentary film* on the major current challenges in astrophysics.  
[Univers au-delà du visible – Science et Vie TV](#)
- 2010 –2015 [HOBYS public outreach homepage](#)
- **12 ESA Press Releases and ESA/OSHI showcase of Herschel images**
    - [HOBYS images and results](#)
    - [Feathery filaments in mon R2](#)
  - **Videos**
    - [Herschel interview \(CEA\)](#)
    - [Formation des étoiles massives \(Herschel\)](#)
    - [Visite guidée de la constellation Vela-C \(Dailymotion\)](#)
    - [La nébuleuse de la Rosette \(Dailymotion\)](#)
    - [M16, the Eagle Nebula \(Youtube\)](#)
- 2012 Articles in Science et Avenir, Ciel et Espace, Le Figaro newspapers
- [Au cœur des Piliers de la Création - Sciencesetavenir.fr](#)
  - [Le satellite Herschel redécouvre les Piliers de la Création - Ciel & Espace](#)
  - [Le télescope Herschel et les «piliers de la création» - Le Figaro](#)
  - [Les Piliers de la Création révélés par deux télescopes spatiaux – Futura Science](#)
- 2012 [NASA Astronomical Picture Of the Day \(APOD\)](#)
- 2007 [Surprenante population d'étoiles jeunes et massives dans la région du Cygne.](#) SAp/CEA highlight
- 2001 [L'effondrement des nuages](#) André, Ph., Motte F. & Bontemps, S. in: Vie et mœurs des étoiles, Dossier Hors-Série Pour La Science n° 30, 2001 jan. , p. 66-67.
- 2001 [Au cœur de la formation des étoiles.](#) SAp/CEA
- 2001 [Star formation: new insight gained from extensive millimeter-wave mapping of forming stars](#) Motte, F., André, Ph., Rostas, F., Bertout, C. 2001, A&A press release.
- 1998 [L'enfance des étoiles.](#) SAp/CEA