

Magnus Gustafsson

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Employment:

- Assistant Professor (VR-forskarassistent), Department of Chemistry, **University of Gothenburg**, June 2007 – present
- Postdoctoral Fellow, Reaction Dynamics, **Prof. Rex Skodje**, Department of Chemistry and Biochemistry, **University of Colorado at Boulder** and Institute of Atomic and Molecular Sciences, **Academia Sinica, Taipei, Taiwan**, April 2003 – May 2007
- Instructor, Department of Physics, **University of Colorado at Boulder**, August 2006 – May 2007
- Postdoctoral Fellow, Collision-induced Spectroscopy, **Prof. Lothar Frommhold**, Department of Physics, **University of Texas at Austin**, June 2002 – March 2003
- Physics instructor, **Austin Community College**, May 2002 – August 2002

Degrees:

- Docent, Physical Chemistry, University of Gothenburg, August 2010
- Ph.D., Physics, University of Texas at Austin, May 2002
- M.S., Physics, Lund University, Sweden, June 1997

Grants:

- Swedish Research Council, salary grant (anställning som forskarassistent), 3.18 million SEK over 4 years (2007–2010)
- Swedish Research Council, project grant, 432 000 SEK over 4 years (2007–2010)
- European network ASTRONET, 2.64 million SEK over 3 years (2009–2011), co-applicant with Gunnar Nyman

Research interests:

Theoretical physical chemistry, reaction dynamics, quantum and classical dynamics, chemical physics, molecular collisions and spectroscopy, spectral line shapes

Peer-reviewed articles:

1. C. Richard, I. E. Gordon, L. S. Rothman, M. Abel, L. Frommhold, M. Gustafsson, J.-M. Hartmann, C. Hermans, W. J. Lafferty, G. Orton, K. M. Smith, H. Tran, *New section of the HITRAN database: Collision-Induced Absorption (CIA)* accepted for publication in *J. Quant. Spectroscopy and Rad. Transfer* (2011).

2. J. Franz, M. Gustafsson, and G. Nyman, *Formation of carbon-monoxide by radiative association: a quantum-dynamical study*, Mon. Not. R. Astron. Soc. **414**, 3547 (2011).
3. S. V. Antipov, M. Gustafsson, and G. Nyman, *Spin-orbit and rotational couplings in radiative association of $C(^3P)$ and $N(^4S)$ atoms*, J. Chem. Phys. **135**, 184302 (2011).
4. X. Li, J. F. Harrison, M. Gustafsson, L. Frommhold, and K. L. C. Hunt, *The anisotropic polarizability of pairs of hydrogen molecules and the depolarized collision-induced roto-translational Raman light scattering spectra*, J. Comput. Meth. Sci. Eng. **10** 353 (2010).
5. L. Frommhold, M. Abel, F. Wang, M. Gustafsson, X. Li, and K. L. C. Hunt, *Infrared atmospheric emission and absorption by simple molecular complexes, from first principles*, Mol. Phys. **108**, 2265 (2010).
6. M. Gustafsson, *Far wing asymmetry of rotational Raman lines in hydrogen*, International J. Spec. **2010**, 705896 (2010).
7. M. Abel, L. Frommhold, and M. Gustafsson, *Collision-induced absorption at wavelengths near $5\ \mu\text{m}$ by dense hydrogen gas*, J. Chem. Phys. **131**, 181102 (2009).
8. S. V. Antipov, T. Sjölander, G. Nyman, and M. Gustafsson, *Rate coefficient of CN formation through radiative association: A theoretical study of quantum effects*, J. Chem. Phys. **131**, 074302 (2009).
9. M. Gustafsson, L. Frommhold, X. Li, and K. L. C. Hunt, *Roto-translational Raman spectra of pairs of hydrogen molecules from first principles*, J. Chem. Phys. **130**, 164314 (2009).
10. G.S. Orton, M. Gustafsson, M. Burgdorf, and V. Meadows, *Revised ab initio models for H_2-H_2 collision-induced absorption at low temperatures*, Icarus **189**, 544 (2007).
11. M. Gustafsson and R.T. Skodje, *Probing stereodynamics in reactive collisions using helicity filtering*, Chem. Phys. Lett. **434**, 20 (2007).
12. M. Gustafsson and L. Frommhold, *Infrared absorption by H_2-Ar collisional complexes and the anisotropy of the intermolecular interaction potential*, Phys. Rev. A, **74**, 054703 (2006).
13. M. Gustafsson, R.T. Skodje, J. Zhang, D. Dai, S.A. Harich, X. Wang, and X. Yang, *Observing the stereodynamics of chemical reactions using randomly oriented molecular beams*, J. Chem. Phys. **124**, 241105 (2006). (Erratum: **125**, 229901 (2006))
14. M. Gustafsson and R.T. Skodje, *The state-to-state-to-state model for direct chemical reactions: Application to $D+H_2 \rightarrow HD+H$* , J. Chem. Phys. **124**, 144311 (2006).
15. M. Qiu, Z. Ren, L. Che, D. Dai, S.A. Harich, X. Wang, X. Yang, C. Xu, D. Xie, M. Gustafsson, R.T. Skodje, Z. Sun, and D.H. Zhang, *Observation of Feshbach resonances in the $F+H_2 \rightarrow HF+H$ reaction*, Science **311**, 1440 (2006).

16. J. Zhang, D. Dai, C.C. Wang, S.A. Harich, X. Wang, X. Yang, M. Gustafsson, and R.T. Skodje, *State to state to state dynamics of the $D+H_2$ reaction: Control of transition-state pathways via reagent orientation*, Phys. Rev. Lett. **96**, 093201 (2006).
17. M. Hayes, M. Gustafsson, A.M. Mebel, and R.T. Skodje, *An improved potential energy surface for the $F+H_2$ reaction*, Chem. Phys. **308**, 259 (2005).
18. M. Buser, L. Frommhold, M. Gustafsson, M. Moraldi, M.H. Champagne, and K.L.C. Hunt, *Far-infrared absorption by collisionally interacting nitrogen and methane molecules*, J. Chem. Phys. **121**, 2617 (2004).
19. M. Gustafsson, L. Frommhold, D. Bailly, J-P Bouanich, and C. Brodbeck, *Collision-induced absorption in the rototranslational band of dense hydrogen gas*, J. Chem. Phys. **119**, 12264 (2003).
20. M. Gustafsson and L. Frommhold, *The H_2-H infrared absorption bands at temperatures from 1000 K to 2500 K*, Astr. & Astrophys. **400**, 1161 (2003).
21. M. Gustafsson, L. Frommhold, and W. Meyer, *The H_2-H complex: Interaction-induced dipole surface and infrared absorption spectra*, J. Chem. Phys. **118**, 1667 (2003).
22. M. Gustafsson and L. Frommhold, *The $HD-He$ complex: Interaction-induced dipole surface and infrared absorption spectra*, J. Chem. Phys. **115**, 5427 (2001).
23. M. Gustafsson and L. Frommhold, *Intracollisional interference of R -lines of HD in mixtures of deuterium hydride and helium gas*, Phys. Rev. A, **63**, 052514 (2001).
24. M. Gustafsson and L. Frommhold, *Infrared absorption spectra of collisionally interacting He and H atoms*, Astrophys. J. **546**, 1168 (2001).
25. M. Gustafsson, L. Frommhold, and W. Meyer, *Infrared absorption spectra by H_2-He collisional complexes: The effect of the anisotropy of the interaction potential*, J. Chem. Phys. **113**, 3641 (2000).

Conference proceedings and theses:

1. M. Gustafsson and S. V. Antipov, *Calculation of interaction-induced spectra using complex absorbing potentials*, in 20th International Conference on Spectral Line Shapes, edited by J. Lewis and A. Predoi-Cross (Am. Inst. Physics, New York, 2010) pp. 240–244.
2. M. Abel, L. Frommhold, F. Wang, M. Gustafsson, X. Li, and K. L. C. Hunt, *Collision-induced absorption by supermolecular complexes from a new potential energy and induced dipole surface, suited for calculations up to thousands of Kelvin*, in 20th International Conference on Spectral Line Shapes, edited by J. Lewis and A. Predoi-Cross (Am. Inst. Physics, New York, 2010) pp. 251–257.
3. M. Gustafsson, *Career achievements of Professor Lothar Frommhold*, in 20th International Conference on Spectral Line Shapes, edited by J. Lewis and A. Predoi-Cross (Am. Inst. Physics, New York, 2010) pp. 294–300.

4. X. Li, J. F. Harrison, M. Gustafsson, F. Wang, M. Abel, L. Frommhold, and K. L. C. Hunt, *Collision-induced dipoles and polarizabilities of pairs of hydrogen molecules: Ab initio calculations and results from spherical tensor analysis*, Proceedings of the Seventh International Conference of Computational Methods in Science and Engineering, edited by George Maroulis and Theodore Simos (Am. Inst. Physics, College Park, Maryland, 2010) accepted for publication.
5. M. Gustafsson, *Diatom-diatom interactions with light: Applications and line shape theoretical aspects*, in Spectral Line Shapes **15**, edited by M. A. Gigoso and M. Á. González (Am. Inst. Physics, New York, 2008) pp. 297–301.
6. M. Gustafsson and R. T. Skodje, *The state-to-state-to-state model of direct chemical reactions*, in Semiclassical and Other Methods for Understanding Molecular Collisions and Chemical Reactions, edited by D. Sokolovski, J. M. L. Connor, and S. Sen (CCP6, Daresbury, 2005) pp. 34–42.
7. M. Gustafsson and L. Frommhold, *Spectra of 2- and 3-body van der Waals complexes*, in Proceedings of the NATO, Advanced Research Workshop, Fontevraud 2002, edited by C. Camy-Peyret and A. A. Vigasin (Kluwer Academic Publishers, Netherlands, 2003) pp. 3–22.
8. M. Gustafsson and L. Frommhold, *Effects of the anisotropy of the intermolecular potential on the collision-induced spectra of H_2-H , H_2-He , H_2-H_2 , $HD-He$* , in Spectral Line Shapes **12**, edited by C. Back (Am. Inst. Physics, New York, 2002) pp. 216–227.
9. M. Gustafsson, *Collision-induced absorption and anisotropy of the intermolecular potential*, Dissertation, Supervisor: Lothar Frommhold, Physics Department, University of Texas at Austin, 2002.
10. M. Gustafsson, L. Frommhold, and W. Meyer, *Infrared absorption spectra of H_2-He collisional complexes: The effect of the anisotropy of the interaction potential*, in Spectral Line Shapes **11**, edited by J. Seidel (Am. Inst. Physics, New York, 2001) pp. 425–427.
11. V. Petrov, M. Gustafsson, and H. L. Swinney, *Formation of labyrinthine patterns in a periodically forced reaction-diffusion model*, in Proceedings of the 4th experimental chaos conference, edited by M. Ding, W. Ditto, L. Pecora, M. Spano, and S. Vohra (World Scientific, Singapore, 1998) pp. 7–12.
12. M. Gustafsson, *Protein secondary structure prediction from hydrophobicity using neural networks*, Master thesis, Supervisor: Carsten Peterson, Department of Theoretical Physics, Lund University, 1996.

Conferences and workshops:

- Ninth International Conference of Computational Methods in Sciences and Engineering, Halkidiki, Greece, October 2011
- Negative ions and molecules in astrophysics, Gothenburg, August 2011

- Meeting of the Atomic and Molecular Physics Section, Swedish Physical Society, Karlstad University, October 2010
- 18th European Conference on Dynamics of Molecular Systems (MOLEC), Curia-Anadia, Portugal, September 2010
- 20th International Conference on Spectral Line Shapes, Memorial University of Newfoundland, Canada, June 2010
- Workshop Devoted to the Atmospheres of White Dwarfs, dedicated to Professor Dr. Frommhold, The University of Texas at Austin, May 2010
- Data needs for ALMA (Atacama Large Millimeter/submillimeter Array) workshop, Cologne, Germany, October 2009
- 14th SPUCK (Chemistry Education Meeting), Aspenäs, August 2009
- 30th International Symposium on Free Radicals, Savonlinna, Finland, July 2009
- 19th International Conference on Spectral Line Shapes, Universidad de Valladolid, Spain, June 2008
- 3rd MOLCAS workshop, IDEON, Lund University, April 2008
- Meeting of the Atomic and Molecular Physics Section, Swedish Physical Society, Uppsala University, October 2007
- 1st Annual Symposium, Division of Theoretical Chemistry, Swedish Chemical Society, Örebro University, September 2007
- 21st Conference on the Dynamics of Molecular Collisions, Santa Fe, New Mexico, July 2007
- 20th Conference on the Dynamics of Molecular Collisions, Asilomar, California, July 2005
- Dalian Institute of Chemical Physics Symposium on Molecular Dynamics (IV), Dalian, China, July 2004
- International Complutense Seminar on Quantum Reactive Scattering, El Escorial, Spain, June 2003
- Joint meeting of the Division of Atomic, Molecular, and Optical Physics of the American Physical Society, Boulder, Colorado, May 2003
- 16th International Conference on Spectral Line Shapes, University of California at Berkeley, Berkeley, California, June 2002
- Fall meeting of the Texas section of the American Physical Society, Texas Christian University, Fort Worth, October 2001
- 15th International Conference on Spectral Line Shapes, Physikalisch–Technische Bundesanstalt, Berlin, Germany, July 2000
- Quantum optics theory workshop, The University of Texas at Austin, April 2000
- Fall meeting of the Texas section of the American Physical Society, The University of Texas at Austin, October 1999

Research supervision:

- PhD student: Sergey Antipov, September 2008 – present. Licentiate thesis: October 2010, “Radiative association of C(3P) and N(4S) atoms: From semi-classical theory to coupled-states quantum dynamics”. Reviewer: Hans Karlsson, Uppsala University
- Postdoc: Jan Franz, June 2009 – May 2011, (with Prof. Gunnar Nyman)
- Kristin Axelsson, April–May 2011 (Bachelor degree project)
- Qinqin Lü, August 2007 (5 week project)
- Tobias Sjölander, June–August 2008 (12 week project)
- Huaqing Li, June–July 2008 (6 week project)

Teaching experience:

- Instructor, Department of Chemistry, University of Gothenburg
 - Fall 2007, 2008, 2009, 2010: Spectroscopy section of *Physical Chemistry*, KEM 040, 2nd year undergraduate level, 12 lecture hours, (overall course responsibility from the fall of 2009)
 - Fall 2008: Optics section of *Classical Mechanics, Optics, and Molecular Quantum Mechanics*, graduate level, 12 lecture hours, overall course responsibility
 - Spring 2010 and fall 2010: Guest lecturer at the unit for Pedagogical Development and Interactive Learning (PIL), *Teaching and Learning in Higher Education 2: Science*, HPE 102, 2 lecture hours per semester
 - Fall 2009: PhD level reading course in *Advanced quantum dynamics*
- Instructor, Department of Physics, University of Colorado, USA
 - Fall 2006: *Optics*, PHYS 4510, 4th year undergraduate level, 42 lecture hours, overall course responsibility
 - Spring 2007: *Physics II*, PHYS 1120, 1st year undergraduate level, 45 lecture hours, overall course responsibility
- Instructor, Austin Community College, USA
 - Summer 2002: *Engineering Physics II*, PHYS 2426, 1st year undergraduate level, 45 lecture hours, 22 lab hours, overall course responsibility
- Teaching assistant (grading and tutorials), Department of Astronomy, University of Texas at Austin, USA
 - Fall 1997, *Time*, AST 309, 1st year undergraduate level
 - Spring 1998, *Positional, Dynamical, and Kinematical Astronomy*, AST 352L, 3rd year undergraduate level

- Spring 1998, *Galaxies, Quasars, and Cosmology*, AST 309R, 1st year undergraduate level

Awards:

- Swedish Chemical Society traveling stipend, May 2009
- Knut and Alice Wallenberg traveling stipend, June 2008
- Award for outstanding student paper: Fall meeting of the Texas section of the American Physical Society, Texas Christian University, Fort Worth, October 2001
- Member of the honor society Phi Kappa Phi, University of Texas at Austin
- Professional Development Award, The office of Graduate Studies at The University of Texas at Austin, November 1999

Scientific committee:

- International Conference on Spectral Line Shapes, June 2008 – present

Society memberships:

- Swedish Chemical Society
- Swedish Physical Society
- European Physical Society

Journal reviews:

- Chemical Physics
- Chemical Physics Letters
- Journal of Physical Chemistry
- Journal of Chemical Physics
- Journal of Atomic, Molecular, and Optical Physics

Textbook reviews:

- C.A. Bennett: Physical Optics
- P. Atkins & J. de Paula: Physical Chemistry 9th edition

Departmental service:

- PhD defense committee, stand-in member: Mauritz Ryding, October 28th, 2011
- PhD defense committee, stand-in member: Erik Abrahamsson, April 1st, 2008
- Organizer of Thursday Seminar Series, August 2009 – December 2010
- Coordinating an interactive teaching effort with clickers, August 2009 –

Non-academic work experience:

- Engineer, Televerket (Swedish Telecom), June 1990 – August 1992
- Engineer, Military service, The Swedish Army, August 1989 – June 1990