

# Muammar El Khatib

## EDUCATION

### Ph.D. in Theoretical Chemical Physics.

July 2012 to July 2015.

*Université Paul Sabatier III, Toulouse, France.*

Thesis: "Characterization of metallic and insulating properties of low-dimensional systems." I was awarded with funding from L'Agence Nationale de la Recherche to work in a bilateral project between France and Germany.

Supervisors: Prof. Stefano EVANGELISTI, and Prof. Thierry LEININGER.

Laboratory: Laboratoire de Chimie et Physique Quantiques.

Group: Méthodes et outils de la Chimie Quantique.

### Master on Theoretical Chemistry and Computational Modeling.

September 2010 to July 2012.

*Université Paul Sabatier III, Toulouse, France. 31062.*

Thesis: "An *ab initio* potential energy surface for quantum reactive scattering calculations."

I was awarded with an Erasmus Mundus Scholarship.

### Bachelor of Science, Chemistry.

May 2010.

*Universidad del Zulia, Maracaibo, Venezuela.*

Thesis: "Determination of the linear and nonlinear optical properties of the nitrogenous bases of DNA, RNA and their respective tautomers".

### Technician in Computer Repair and Troubleshooting.

2003.

*Instituto Los Próceres, Maracaibo, Venezuela.*

### Secondary Education, Bachelor of Science.

2000.

*Colegio San Vicente de Paúl, Maracaibo, Venezuela.*

## LANGUAGES

**Spanish**, Mother language.

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**English**, Advanced English for Adults.

2006 to 2008.

Centro Venezolano Americano del Zulia (CEVAZ).

Maracaibo, Venezuela.

**French**, Elemental Course.

2010.

Alliance Française.

Maracaibo, Venezuela.

**French**, Advanced Course.

2013.

Alliance Française.

Toulouse, France.

## WORK EXPERIENCE

### Laboratoire de Chimie et Physique Quantiques

Université Paul Sabatier III. Toulouse, France. 31000.

April 2011 to July 2015.

(Master and Ph.D. candidate)

- **Former activities**

– **Master student: April 2011 to June 2012**

- \* Intern and collaborator in the area of Quantum Chemical Physics doing a theoretical study of the electronic and magnetic properties of graphenes of finite sizes using post Hartree-Fock Methods (CASSCF and NEVPT2), and the suite of programs provided in the MOLPRO package.
- \* This work was carried out as part of an internship needed to accomplish the first year of the European Master on Theoretical Chemistry and Computational Modeling under the supervision of Prof. Stefano EVANGELISTI, and Prof. Thierry LEININGER.

– **Ph.D. student: July 2012 to July 2015**

- \* PhD Thesis: “Characterization of metallic and insulating properties of low-dimensional systems.”
- \* Implementation of the Position Spread Tensor in the CASSCF module of the MOLPRO code.

**Institut für Chemie und Biochemie - Physikalische und Theoretische Chemie.**

October to November 2013.

Freie Universität Berlin.

(Guest scientist)

Takustraße 3. 14195 Berlin, Germany.

- Different polyacenes of interest have been studied using the method of the increments.

**Gruppo di Dinamica dei Processi Chimici Elementari**

February 2012 to May 2012.

Università degli Studi di Perugia. Via Elce di Sotto, 8, 06123. Perugia, Italy.

(Master Student)

- Quantum scattering study of a collision reaction between a diatomic molecule and a proton. We performed the construction of the potential energy surfaces by using the MOLPRO package. Then, the Schrödinger equation dependent on the time was solved in order of studying the wave packets of the reaction.
- This work was carried out as part of my Master’s Degree Thesis under the supervision of Prof. Antonio Laganà and Ph.D. Leonardo Pacifici.

**Laboratorio de Química Inorgánica Teórica (LQIT)**

2004 to 2010.

La Universidad del Zulia, Maracaibo, Venezuela.

- I carried out a dissertation in the area of Quantum Chemistry calculating the Optical Response of materials making use of computational and numerical approaches.
- Thesis: “Determination of the Linear and Nonlinear Optical Properties of the Nitrogen Basis of DNA, RNA and Their Tautomers.”  
Supervisor: Prof. Humberto Soscún.
- Volunteer and maintainer of the computers in the Laboratory.

**Laboratory of Computational Catalysis of PDVSA - Intevep**

May 2008 to August 2008.

attached to the project R &D of HDHPLUS® and RIRP.

PDVSA-Intevep, S.A. Los Teques, Miranda.

Postal Code: 76343,

Caracas 1070A, Venezuela.

Phones: +58 (0) 212 33 06 011- fax: +58 (0) 212 33 06 448

- Intern in the area of petroleum refining.
- It was carried out a study of some asphaltenes which were from Kuwait making use of semi - empirical and DFT methods. Asphaltenes that were causing problems in Venezuelan oil refineries (such as residuals from Merey, Merey - Mesa and Zuata), were characterized, modeled and optimized in order to understand their chemical and physical behaviors.

**TEACHING EXPERIENCE**

**Département de Physique**

2013 to 2015.

Faculté des Sciences et de l’Ingénierie

(Teaching Assistant)

Université Paul Sabatier III. Toulouse, France. 31000.

## Courses

- Physique 1 et outils informatiques (EDST2BCM).
  - Geometrical Optics.
  - Focométrie (measure of focal distances).
  - Fluid mechanics.
  - Capillarity.
- Physique 2 (EDST1ABM): Prolongement de l'enseignement de physique de terminale S avec approfondissement et acquis des bases de modélisation de différents phénomènes sous forme de thèmes:
  - Basic notions of electricity.
  - Kinematics, Newton's laws, and ballistics.
  - Harmonic and damped oscillators.
  - Circular movement.
  - Energy and electrical power.

## IT EXPERIENCE

### Debian Project

2006 to present.

<http://www.debian.org>

- Debian Developer ([muammar@debian.org](mailto:muammar@debian.org)). For a list of packages maintained by me you can visit:  
<http://qa.debian.org/developer.php?login=muammar>

### Github projects

present.

<https://github.com/muammar/>

- For a list of developed software, my portfolio is available online.

### SEGECOM Zulia

May 2009 to June 2010.

3H avenue, Salto Angel Mall, Office 1. Maracaibo, Venezuela

- Sysadmin and network admin.
- Configuration of the gateway server using Astaro Firewall.
- Maintainer of the app server and following services: Apache2 web server, Mysql database server, Samba server, and FTP server.
- Free software consultant for SEGECOM branch in Caracas.

### Cooperative Association. GEEKCORP

October 2008 to July 2009.

Las Margaritas street, La Asunción.

Margarita Island, Venezuela.

- Free software consultant and software developer in the area of packaging for Debian Specific Linux Distributions. We carried out the Development of a modified distribution based on Debian for the Venezuelan government.

## COURSES & WORKSHOPS

### Quantum Chemistry

- Ph.D. Workshop of the EU Joint Doctorate Program in Theoretical Chemistry and Computational Modeling. Oral communication: “Metal-insulator Transition in low-dimensional systems”. 1<sup>st</sup> July, 2014. Badajoz, Spain.
- CECAM TCCM Winter School on Large Systems (QCLAMS 2014). Saint-Lary-Soulan in the French Pyrenees. January 20<sup>th</sup>-24<sup>th</sup>, 2014.
- European Summer School in Quantum Chemistry (ESQC 2013). Torre Normanna, Sicily.
- Ph.D. Workshop of the EU Joint Doctorate Program in Theoretical Chemistry and Computational Modeling. Oral communication: “On the total position spread tensor”. 5<sup>th</sup> September, 2013. Sopron, Hungary.
- Ph.D. Workshop of the EU Joint Doctorate Program in Theoretical Chemistry and Computational Modeling. Oral communication: “A Theoretical Study of Closed Polyacene Structures”. 26<sup>th</sup> June, 2012. University of Barcelona.
- 6<sup>th</sup> edition of the International Intensive Course of the European Master in Theoretical Chemistry and Computational Modelling. September 2011. Universitat de València. Valencia, Spain.
- Gaussian Workshop, July 2011. Santiago de Compostela, Spain.
- European school on the dynamics of excited states induced by ultra short pulses. (Zaragoza Scientific Centre for Advanced Modelling, ZCAM). Zaragoza, Spain. 2011.
- Intensive Course: An introduction to Nonlinear Wave Equations. It was carried out by Ph.D. David Amundsen from Carleton University in Canada in the Physics Department of La Universidad del Zulia.

### IT and others

- ‘C’ Language Course. (Universidad del Zulia. Experimental Faculty of Sciences.). Department of Special Programs.
- FORTRAN 90. Language Course. (Universidad del Zulia. Experimental Faculty of Sciences.)
- Course: “Reparación, Mantenimiento y Ensamblaje de Computadoras” (Repair, assembly and maintenance of computers) (Los Próceres Institute. Maracaibo, Venezuela).
- Study of Classical Guitar. Musical center and academy: “Clavier”.

## EVENTS & SEMINARS

### Quantum Chemistry

- Member of the organizing committee, teacher and web master of the TCCM Winter School *Tutorials in Theoretical Chemistry* organized by the Université Paul Sabatier in February 2016. Saint-Lary-Soulan in the French Pyrenees. <http://www.irsamc.ups-tlse.fr/lttc/>.
- Member of the organizing committee, teacher and web master of the TCCM Winter School *Tutorials in Theoretical Chemistry* organized by the Université Paul Sabatier in February 2015. Luchon Superbagnères, France. <http://www.irsamc.ups-tlse.fr/lttc/2015>.
- Attendee participating with a poster called: “Total Position Spread tensor in mixed-valence systems: an indicator of charge transfer processes” in the 50<sup>th</sup> *Symposium on Theoretical Chemistry 2014 (STC 2014)* held from 14<sup>th</sup> to 18<sup>th</sup> September, 2014. Vienna, Austria.
- Member of the organizing committee, and web master of the 9<sup>th</sup> edition of the Intensive Course of the European Master in Theoretical Chemistry and Computational Modelling (TCCM) held at the Université Paul Sabatier in September 2014. Toulouse, France. <http://www.irsamc.ups-tlse.fr/tccm2014/>.
- Attendee participating with a poster called: “Total Position Spread tensor in mixed-valence systems: an indicator of charge transfer processes” in the 9<sup>th</sup> *Congress on Electronic Structure: Principles and Applications (ESPA)* held from 2<sup>nd</sup> to 4<sup>th</sup> July, 2014. Badajoz, Spain.

- Seminar in the group of Prof. Beate Paulus during my scientific visit to her group. Name of the talk: “On the total position spread tensor in some model systems” held on 22<sup>nd</sup> October 2013 in the Freie Universität Berlin. Takustraße 3. 14195 Berlin, Germany.
- Attendee participating with a poster called: “The behavior of the Position-Spread Tensor in Diatomic Systems” in the 9<sup>th</sup> edition of the *European Conference of Computational Chemistry* held from 1<sup>st</sup> to 5<sup>th</sup> September, 2013. Sopron, Hungary.
- Attendee participating with a poster called: “The behavior of the Position-Spread Tensor in Diatomic Systems” in the *NEXT DAYS* of “Le projet Nano, mesures Extrêmes & Théorie (NEXT)” held from 6<sup>th</sup> to 7<sup>th</sup> June, 2013. Le Barcarès, France.
- Attendee participating with a poster called: “The behavior of the Position-Spread Tensor in Diatomic Systems” in the 7<sup>th</sup> Molecular Quantum Mechanics (MQM) congress held from the 2<sup>nd</sup> to the 7<sup>th</sup> June, 2013. Lugano, Switzerland.
- Attendee to the “Theoretical Chemistry For Periodic Systems: Systematically Improvable Electronic Structure Methods (SIMPS 2013)” held from the 11<sup>th</sup> to the 15<sup>th</sup> February, 2013. Ax-les-Thermes, France.
- Attendee participating with a poster called: “A Theoretical Study of Closed Polyacene Structures” in the 48<sup>th</sup> *Symposium on Theoretical Chemistry (STC 2012)* held from the 23<sup>rd</sup> to the 27<sup>th</sup> September, 2012. Karlsruher Institut für Technologie. Institut für Physikalische Chemie. Abteilung für Theoretische Chemie. Karlsruhe, Germany.
- Attendee participating with a poster called: “A Theoretical Study of Closed Polyacene Structures” in the 8<sup>th</sup> *Congress on Electronic Structure: Principles and Applications (ESPA)* held from the 2<sup>th</sup> to 29<sup>th</sup> June, 2012. University of Barcelona. Barcelona, Spain.
- Attendee participating with a poster called: “On the electronic structure of cyclic oligocenes” in *The World Association of Theoretical and Computational Chemists (WATOC 2011)*, Santiago de Compostela, Spain 2011.
- Attendee with a poster called “Determinación de las Propiedades Ópticas Lineales y No Lineales de las Bases Nitrogenadas del ADN, ARN y sus Respetivos Tautómeros” (Determination of the Linear and Nonlinear Optical Properties of the Nitrogen Basis of DNA, RNA and Their Tautomers) to the “II Congreso de Físico Química Teórica” (Second Congress of Theoretical Physical Chemistry). Place: Choróní, Aragua. Venezuela. December 2008.
- Aplicación de Software para Científicos y Reacciones ene-retro ene (Application of Scientific Software for Retro-ene Reactions). ENEC. Facultad Experimental de Ciencias. La Universidad del Zulia. Maracaibo, Zulia, Venezuela. 2006.
- Attendee of the “XXXI Congreso de Químicos Teóricos de Expresión Latina” (Congress of Theoretical Chemists). QUITEL 2005. Altagracia. Nueva Esparta, Venezuela. October 2005.

## IT and others

- Attendee, in quality of Developer, to the 8<sup>th</sup> International Conference of Debian Developers (Debconf). Place: Mar del Plata, Argentina. August 2008.
- Invited speaker in the “Terceras Jornadas Regionales de Conocimiento Libre” (Third Regional Congress of Free Software). Place: Universidad de Oriente. Margarita Island, Nueva Esparta. Venezuela. December 2008.
- Invited speaker to the “Festival Latinoamericano de Instalación de Software Libre 2008” (Latin American Festival of Free Software Installation of 2008). Place: University Dr. José Gregorio Hernández. Address: 15th Av. Delicias with 89B St. “Facultad de Ingeniería, FING”.
- Attendee, in quality of Developer, to the 7th International Conference of Debian Developers (Debconf). Place: Teviot Row House (University of Edinburgh). Edinburgh, Scotland. June 2007.
- Invited speaker to the event: “Debian: Comunidad, Desarrollo e Integración”. Place: Esquina Avenida Guajira con Circunvalación 2. Universidad Rafael Belloso Chacín (URBE). Maracaibo. Zulia, Venezuela. February 2007.
- Attendee to the “2do Congreso Nacional de Software Libre” (Second National Free Software Congress). Venezuela 2006.

- Invited speaker, to the “Debian Day Maracaibo”. Place: Maracaibo. PDVSA 5 de Julio. Maracaibo. Zulia, Venezuela. August 2006.
- Invited speaker to the “4to Foro Mundial de Conocimiento Libre” (Fourth Free Knowledge International Forum). Maturín. Monagas, Venezuela. October 2006.
- Attendee to the “3er Foro Mundial de Conocimiento Libre” (Third Free Knowledge International Forum)
- Attendee to the “X Jornadas Científicas de La Universidad del Zulia”. Seminario de las Primeras Olimpiadas Petroleras del CENAMEC (First Oil Olympics Seminar).

### TECHNICAL SKILLS

- Skills in writing in the high-quality typesetting system, L<sup>A</sup>T<sub>E</sub>X.
- Skills in computational programs such as: MOLPRO, Gaussview, Gaussian, Molden, Chimera, Jmol, Materials Studio, Molekel, gOpenMol.
- Knowledge in programming languages such as: FORTRAN 77, FORTRAN 90, BASH scripting, Python, some notions of C.
- Skills in Debian Packaging Programs like: Debhelper, and CDBS.
- Wide experience in technical service and installation of software in personal computers.
- Basic Knowledge on installation and configuration of networks.
- Practical Knowledge in the use of Microsoft Office.
- Practical Knowledge in the use of Open Office and Libre Office.
- Knowledge in Operating Systems such as: LINUX, in most of its distributions based on Red Hat Package Manager (RPM) and Advanced Package Tool (APT), especially in Debian; Windows; macOS, and basic skills on Free BSD.
- Skills in the compilation and configuration of the Linux Kernel from its source code.
- Skills in the configuration of calculus servers, web servers, FTP servers, SAMBA servers and mail servers (POSTFIX).
- Installation and configuration of ASTARO Security Gateway.

### LIST OF PUBLICATIONS

1. M. El Khatib, S. Evangelisti, T. Leininger, G.L. Bendazzoli, “A Theoretical Study of Closed Polyacene Structures”, *Phys. Chem. Chem. Phys.*, 14, 15666 (2012).  
DOI: 10.1039/C2CP42144E.
2. O. Brea, M. El Khatib, C. Angeli, G.L. Bendazzoli, S. Evangelisti, T. Leininger, “Behavior of the Position-Spread Tensor in Diatomic Systems”, *J. Chem. Theory Comput.*, 9, 5286 (2013).  
DOI:10.1021/ct400453b
3. M. El Khatib, T. Leininger, G.L. Bendazzoli, S. Evangelisti., “Computing the Position-Spread tensor in the CAS-SCF formalism”, *Chem. Phys. Lett.*, 591, 58 (2014).  
DOI:10.1016/j.cplett.2013.10.080.
4. G.L. Bendazzoli, M. El Khatib, S. Evangelisti, T. Leininger, “The Position Spread Tensor in Mixed-Valence Compounds: a Study on the H<sub>4</sub><sup>+</sup> Model System”, *J. Comput. Chem.*, 35, 802 (2014). (Cover image is shown below).  
DOI: 10.1002/jcc.23557
5. M. El Khatib, S. Evangelisti, T. Leininger, G.L. Bendazzoli, “Partly Saturated Polyacene Structures: a Theoretical Study”, *J. Mol. Model.* 20, 2284 (2014).  
DOI: 10.1007/s00894-014-2284-7
6. M. El Khatib, G. L. Bendazzoli, S. Evangelisti, W. Helal, T. Leininger, L. Tenti, C. Angeli, “Beryllium-Dimer: a Bond based on non-Dynamical Correlation”, *J. Phys. Chem. A*, 6664 (2014).  
DOI: 10.1021/jp503145u.

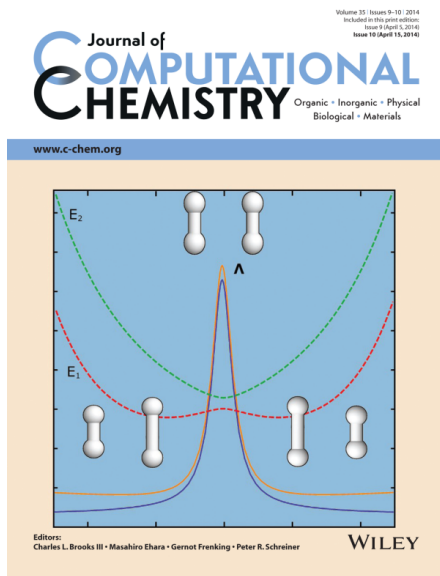


Figure 1: The  $(\text{H}_2-\text{H}_2)^+$  system exhibits a mixed-valence character when the two hydrogen dimers are sufficiently apart, with the hole localized on the dimer with the longest bond. The cover shows energies of the two lowest electronic states (dashed lines) as a function of a reaction coordinate  $\xi$  that connects the two ground-state minima. On page 802, Gian Luigi Bendazzoli et al. find that the total position-spread tensor  $\Lambda$  is a powerful indicator of the electron delocalization within the two molecules. A spectacular peak of  $\Lambda$  is found for both the ground and the excited states in the transition state region.

7. M. El Khatib, O. Brea, E. Fertitta, G.L. Bendazzoli, S. Evangelisti, T. Leininger, B. Paulus, "Spin delocalization in hydrogen chains described with the spin-partitioned Total-Position Spread tensor", *Theor. Chem. Acc.*, 134, 1 (2015).  
DOI: 10.1007/s00214-015-1625-7
8. M. El Khatib, O. Brea, E. Fertitta, S. Evangelisti, T. Leininger, G.L. Bendazzoli, "The total position-spread tensor: spin partition", *J. Chem. Phys.* 142, 094113 (2015).  
DOI: 10.1063/1.4913734
9. E. Fertitta, M. El Khatib, G.L. Bendazzoli, S. Evangelisti, T. Leininger, B. Paulus, "The Spin-Partitioned Total-Position Spread tensor: an application to Heisenberg spin chains", *J. Chem. Phys.*, 143, 244308 (2015).  
DOI: 10.1063/1.4936585
10. O. Brea, M. El Khatib, C. Angeli, G.L. Bendazzoli, S. Evangelisti, T. Leininger, "The Spin-Partitioned Total-Position Spread: an application to diatomic molecules", accepted in *J. Phys. Chem. A* (2016).  
DOI: 10.1021/acs.jpca.6b01043
11. M. Morales-Toyo, M. El Khatib, D. Choquesillo, Y. Alvarado, J. Restrepo, "Synthesis, Crystal Structure and Theoretical Studies of the hydrazine salts of carboxyphenyl derivatives", in preparation.

## OTHER ACTIVITIES

Founder and member of a project called "Proyecto Ciencia" which is conformed by a group of professionals and students who are aiming to contribute to the development of the science in Latin America.  
<http://www.proyectociencia.org>

## INTERESTS

Classical guitar, free software community, physics, quantum field theory, electronic structure theory, technologies.