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The solid state photo-CIDNP effect

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LIST OF PUBLICATIONS

- Daviso E, Prakash S, Alia, Gast P, de Groot HJM, Jeschke G and Matysik J (2005) The effect of temperature on photo-CIDNP in a bacterial RC. In: *Photosynthesis: fundamental aspects to global perspectives, Proceedings of the 13th International Congress on Photosynthesis* (van der Est A, Bruce A) pp. 134-135. Allen Press, Montréal.
- Daviso E, Jeschke G and Matysik J (2008) Photo-CIDNP MAS NMR. In: *Biophysical Techniques in Photosynthesis II* (Aartsma TJ, Matysik J) pp. 385-399, Springer, Dordrecht.
- Daviso E, Diller A, Alia A, Matysik J and Jeschke G (2008b) Photo-CIDNP MAS NMR beyond the T_1 limit by fast cycles of polarization extinction and polarization generation, *J. Magn. Reson.* 190, 43-51.
- Daviso E, Sai Sankar Gupta KB, Prakash S, Alia A, Gast P, Jeschke G and Matysik J (2005) ^{15}N photo-CIDNP MAS NMR on RCs of *Rhodobacter sphaeroides* WT and R26. In: *Energy from the sun* (Allen J, Gantt E, Golbeck J, Osmond B) pp. 63-66, Springer Dordrecht.
- Daviso E, Alia A, Prakash S, Diller A, Gast P, Lugtenburg J, Jeschke G and Matysik J (2008) Electron-nuclear spin-dynamics in a bacterial photosynthetic radical pair, *in preparation*.
- Daviso E, Alia A, Prakash S, Gast P, Jeschke G and Matysik J (2008) Electronic structure of the primary electron donor of *Rhodobacter sphaeroides* at atomic resolution, *in preparation*.

CURRICULUM VITAE

In May 1996, after finishing my schooling from Liceo Scientifico L. Cocito in Alba, I joined the faculty of Scienze Naturali Fisiche e Matematiche affiliated to the Università di Torino. There I followed the corso di laurea in Chimica Industriale. In 2000 I joined the department of Chimica Macromolecolare under the guidance of Prof. O. Chiantore where I worked on my Laurea project on the photo-oxidative properties of acrylates and fluoroacrylates polymers. In December 2001, I received the Laurea in Industrial Chemistry with a specialization in Biotechnology. From 2002 to 2004 I worked for Mondo S.p.A in Gallo d'Alba as the personal researcher for the director of the research and development department. My task was to check and eventually improve the quality of elastomeric blends to use as fillers in artificial football pitches. In February 2004, I started my PhD under the supervision of Dr. J. Matysik in the Solid State NMR group at Leiden University led by Prof. dr. H.J.M. de Groot. During my PhD time, I attended the EMBO course "Multidimensional NMR in Structural Biology" (2004) held at Il Ciocco, Italy, the AMPERE course "Solid-State NMR School" (2004) in Gandia, Spain and the "Advanced European Solid-State NMR School on Biological Solids" (2006) in Brueckentinsee, Germany. In 2005 I received a EMBO short term fellowship that allowed me to travel in Germany to work on electron-nuclear quantum programming with Prof. Dr. Gunnar Jeschke in Mainz and then in Konstanz. I had the opportunity to present my work through poster presentations at various international conferences. These include the 13th International conference on Photosynthesis (2004) in Montreal, Canada, EUROMAR (2005) in Veldhoven, The Netherlands, the Spin Chemistry Meeting (2005) in Oxford, United Kingdom, the 27th Annual Discussion Meeting of the Gesellschaft Deutscher Chemiker (GDCh) Magnetic Resonance Spectroscopy Division (2005) in Mainz, Germany, the XXIInd International Conference on Magnetic Resonance in Biological Systems (2006) in Göttingen, Germany, the Spin Chemistry Meeting (2007), in Venice. I received the poster awards at the 29th Annual Discussion Meeting GDCh (2007), Göttingen, and at the annual meeting of the Study group Theory and Spectroscopy of the Chemical society section of the NWO (2008), Lunteren. Also, through talks, I presented my work at the annual meeting of the Study group Theory and Spectroscopy of the Chemical society section of the NWO (2008) in Lunteren, at the 30th Annual Discussion Meeting GDCh (2008) in Regensburg, at "This Week's Discoveries" (2008) in Leiden and at the EUROMAR (2008) in St. Petersburg, Russia where I received the John Wiley "Magnetic resonance in Chemistry" award for young scientists.

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Looking back I realize my PhD project took me on a journey through the world, allowing me to touch on the way the lives of numerous amazing people. There are many who supported me in realizing this thesis, some by sharing a few short moments of joy or inspiration others by staying tuned in until the end of my project. I would like to mention at first Geertje, whose absolute faith in me was the primary source of all the knowledge and inspiration I poured into this thesis. The love and tenderness between us projected my soul in a new dimension of consciousness I could not even dream about before. Without her patience and beautiful smile this thesis would probably still exist, but like its author it would be different.

The knowledge needed to label and isolate reaction centers came from Peter Gast, Anna Diller, and of Alia, who is also capable to light up the energy in the complete hallway with her laughter. Shipra Prakash provided me with the natural abundance reaction center samples used for the study reported in Chapter 3 and 4. I owe my gratitude to the LIC for providing the OPO which turned out to be tremendously useful to understand the role of the carotenoid in the solid-state photo-CIDNP effect.

The unique explanations on the theory given by Gunnar Jeschke in Aachen, Bingen, Mainz, Göttingen and Konstanz allowed me to understand the quantum-mechanics behind the solid-state photo-CIDNP effect which turned out to be extremely useful to design new experiments. In Mainz and later in Konstanz I got to spend a wonderful time with Yevhen Polyhach, who showed me the beautiful Rheinfall and through his stories changed my view on the history of Europe.

NMR techniques I learned from Fons Lefeber, Kees Erkelens and Johan Hollander. Jos Disselhorst was always listening to my doubts and ready to suggest me wisely how to gain optimum control of the laser-NMR setup. I appreciate the inventiveness of Raphaël Zwier who was always ready to build any mechanical device I needed for both the laser and the NMR apparatus, his service always included a friendly smile even when it considered a less challenging job like freeing my bike.

The discussions with Anja Karawajczyk, Piotr Wawrzyniak and Francesco Buda were useful to learn the use of LINUX and to become more confident with DFT computations.

While living in Holland I have spend terrific evenings and nights with Robert, Matteo, Thomas, Oliver and Daniel, and with my two paranimphs Luca and Alessio, who enriched my life in Leiden with an Italian flavor.

Sitting in the same room as Samira, I learnt a lot about the Dutch politics and MRI. Sharing both coffee and ideas with her will be always a pleasant memory. The atmosphere in the ssNMR/BOF group, provided by Alexey, Alia, Anjali, Geerten, Karthick, Niels, Prativa, Rob & Rob, Samira, Smitha, Swapna and Thierry was very enjoyable. The professional and administrative support from Liesbeth has been deeply appreciated.

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Ilaria, mi rende felice e contento il pensiero di appartenere alla stessa famiglia e mi auguro che questo sentimento sia destinato a crescere.

Un grazie di cuore a Giacomo, Marisa e Stefano che mi hanno sempre sostenuto durante tutti questi anni. Per venire in Olanda ho lasciato molti amici che nonostante tutto hanno continuato a mostrarmi il loro affetto. Davide, Davide, Mauro, Francesco, Stefano, Oscar, Francesca, Nicola e Sara siete veramente cari amici e mi avete dato molta forza per andare avanti.

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