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EDUCATION

Habilitation to supervise research, Aix Marseille University, 2010

PhD, cellular biology & microbiology, Aix Marseille University, 1991

M. S., microbiology (molecular biology), Aix Marseille University, 1986

B. S., biochemistry, Aix Marseille University, 1984

PROFESSIONAL EXPERIENCE

09/2016- Head of the Biosciences laboratory, ISM2, Aix Marseille University, France

2014- CNRS research director (DR2), Aix Marseille University, France

1998-2014 CNRS researcher (CR1), Aix Marseille University, France

1994-1998 CNRS researcher (CR2), Aix Marseille University, France

1991-1994 Human Frontier PostDoc research fellow, Dartmouth Medical School, USA

1991 FEBS research fellow (3 months), Biochemistry Dept., Bologna University, Italy

1991 Fondation pour la Recherche Médicale PostDoc (7 months), CNRS Marseille, France

1988-1990 European Union Mobility fellow, Catholic University, Louvain la Neuve, Belgium

TEACHING EXPERIENCE

PhD level: Doctorate School of Industrial Biotechnology, Federico II University, Napoli : lectures on heterologous expression of metalloenzymes, artificial enzymes, 2012, 2014, 2016.

M. S.level: EU FP7 funded summer schools, ChemBioMeme (2010-2012) and BioMaSolUti (2013-2014) : lectures on heterologous expression of metalloenzymes, artificial enzymes, hybrid photocatalysts.

AWARDS AND HONORS

1) European Union Mobility fellowship, Catholic University, Louvain la Neuve, Belgium (1988) ; 2) Fondation pour la Recherche Médicale fellowship, CNRS Marseille, France (1991) ; 3) FEBS research fellowship, Biochemistry Dept., Bologna University, Italy (1991) ; 4) Human Frontier fellowship, Dartmouth Medical School, USA (1991).

MAIN DOMAIN OF RESEARCH

My research interests focus in the area of biochemistry at the interface between biological, catalytic and inorganic chemistry. With my group we are interested in studying metalloenzymes, in particular copper containing oxidases, that we functionalize with different nano-objects (e. g. transition metal complexes) to obtain hybrid catalysts with original properties. We are currently developing the following research topics: 1) bioinspired photo-oxidases allowing a renewable Oxygen Atom Transfer Reaction, 2) original hybrid Pd-based oxygenases as novel catalysts for environmentally friendly industrial processes, 3) surface-ordered enzyme for high performance bio-cathodes, and 4) surface-oriented enzyme grafted nanoparticles for renewable bio-catalysts with an efficient control of the selectivity.

INTERNATIONAL ACTIVITIES, MEMBERSHIPS

Chairman of OxiZymes in Marseille (09/2012) ; co-founder of ArtZymes, the 1st international congress on artificial enzymes (09/2011) ; co-president of the scientific committee of OxiZymes in Leipzig (06/2010) ; co-organizer of the Laccase Academy in Porto (03/2010) ; executive committee member of the EU FP6 STREP QUORUM (2006-2009) ; executive committee member of the EU FP6 IP SOPHIED (2004-2008) ; co-founder of OxiZymes, the international congress dedicated to oxydoreductases (06/2004); organizer and chairman of the International meeting on laccases in Cassis (F) (01/2002).

Member of international committees for the evaluation of research projects and Ph.D./Postdoctoral fellowships presented to: the National Institute of Health (USA), the Italian Ministry for Education, University and Research (MIUR), the French National Agency for Research (ANR) and several Universities.

Reviewer for Inorganic Chemistry; Journal of Biotechnology; Biochimie; FEBS Journal; Applied and Environmental Microbiology; Environmental and Microbial Technology; Journal of Molecular Catalysis B ; Biotechnology and Applied Biochemistry ; New Journal of Chemistry...

Member of the American Chemical Society (since 2013); member of the Société Chimique de France (since 2014).

External advisor to the PhD School in Industrial Biotechnology, Federico II University Napoli (It).

HIGHLIGHTS FROM THE LAST FIVE YEARS**LEADERSHIP, PI ACTIVITIES, MENTORING/SUPERVISION OF STUDENTS/RESEARCHERS**

Leadership: head of the BiosCiences laboratory (4 CNRS research directors, 5 CNRS researchers, 6 Professors, 13 assistant professors, 3 engineers, 2 technicians, 12 PhDs, 3 postdocs).

Principal Investigator: head of a group of 2 CNRS researchers (Y. Mekmouche, P. Rousselot Pailley), 1 assistant Professor (V. Robert).

Postdocs: 3 researchers (R. Salacha, 2010-2011 ; R. Papadakis, 2012-2013 ; L. Tarago, 2014-2017); S. Zhou (2016-present).

PhD students: 4 students (E. Npetgat-Goutane, 2010-2012 ; L. Schneider, 2011-2014 ; C. Modolo, 2012-present ; A. Hautier, 2015-present, L. Ren, 2016-present)

Master students: 3 students (M. Kafentzi, 2013 ; S. Mohamed, 2014 ; A. Nikiforou, 2015)

Undergraduates (Bachelor, Summer internships, and Erasmus research projects): 10 students.

GRANTS/PROJECTS

11/2015-10/2019, **ANR MULTIPLET**, ANR-15-CE07-0021: « Multielectronic Light Driven Water Activation for Oxygen Atom Transfer Reactions under Mild Conditions », coordinator.

07/2014-06/2016, **AMIDEX DYNACCO**, « Dynamic of enzyme folding in ACCO », partner.

10/2013-04/2017, **ANR COMEBAC**, ANR-13-BS07-0018 : « Mixed valence Bis(μ -oxo)CuII CuIII complexes for C-H bond activation », partner.

10/2010-09/2012, **APEX PACA REGION PhotoLAC**, DEB10-924 2010-12144: «Hybrid Systems photosensitizer – cuproenzyme for water photo-oxidation », coordinator.

10/2009-09/2012, **ANR BiCAB**, ANR-09-BLAN-0176 : « Bi-Components Artificial Biocatalysts », coordinator.

PUBLICATIONS, PATENTS, BOOK CHAPTERS

1. Visible Light-Driven O₂ Reduction by a Porphyrin-Laccase System. Lazarides, T., Sazanovich, I. V., Simaan, A. J., Kafentzi, M. C., Delor, M., Mekmouche, Y., Faure, B., Réglier, M., Weinstein, J. A., Coutsolelos, A. G., Tron, T. *J. Am. Chem. Soc.* **2013**, 135, 3095-3103.
2. Structural and magnetic characterization of a tetranuclear copper(II) cubane stabilized by intramolecular metal cation- π interactions. Papadakis, R., Riviere, E., Giorgi, M., Jamet, H., Rousselot-Pailley, P., Réglier, M., Simaan, A. J., Tron, T. *Inorg. Chem.* **2013**, 52, 5824–5830.
3. Gram-scale production of a basidiomycetous laccase in *Aspergillus niger*. Mekmouche, Y., Zhou, S., Cusano, A. M., Record, E., Lomascolo, A., Robert, V., Simaan, A. J., Rousselot-Pailley, P., Ullah, S., Chaspoul, F., Tron, T. *J. Biosc. Bioeng.*, **2013**, 117, 25-27.
4. Laccases. T. **Tron** in Encyclopedia of Metalloproteins, (Eds.: R. H. Kretsinger, V. N. Uversky, E. A. Permyakov), Springer, New York, **2013**, pp. 1066-1070.
5. Crystallization and preliminary X-ray crystallographic analysis of the heterodimeric laccase POXA3 small subunit from *Pleurotus ostreatus*. Ferraroni, M., Scozzafava, A., Ullah, S., Tron, T., Piscitelli, A., Sannia, G. *Acta Cryst. Section F*, **2014**, 70 (Pt 1), 76-79.
6. Characterization of C-terminally engineered laccases. Liu Y, Cusano AM, Wallace EC, Mekmouche Y, Ullah S, Robert V, Tron T. *Int J Biol Macromol.* **2014**, 69, 435-41
7. A preliminary study on the development and characterisation of enzymatically grafted P(3HB)-ethyl cellulose based novel composites. Iqbal, H. M. N., Kyazze G., Tron, T., Keshavarz, T. *Cellulose*, **2014**, 21, 3613-3621.
8. Laccase-assisted grafting of poly(3-hydroxybutyrate) onto the bacterial cellulose as backbone polymer: Development and characterisation, Iqbal, H. M. N., Kyazze G., Tron, T., Keshavarz, T. *Carbohydrate polymers*, **2014**, 113, 131-137.
9. "One-pot" synthesis and characterisation of novel P(3HB)-ethyl cellulose based graft composites through lipase catalysed esterification. Iqbal, H. M. N., Kyazze G., Tron, T., Keshavarz, T., *Polymer Chem.*, **2014**, 5, 7004-7012.
10. Development of bio-composites with novel characteristics: Evaluation of phenol-induced antibacterial, biocompatible and biodegradable behaviours. Iqbal, H. M. N., Kyazze, G., Locke, I.C., Tron, T., Keshavarz, T., *Carbohydr Polym.*, **2015**, 131, 197-207.
11. Poly(3-hydroxybutyrate)-ethyl cellulose based bio-composites with novel characteristics for infection free wound healing application. Iqbal, H. M. N., Kyazze, G., Locke, I.C., Tron, T., Keshavarz, T., *Int. J. Biol. Macromol.*, **2015**, 24, 552-559.
12. In situ development of self-defensive antibacterial biomaterials: phenol-g-keratin-EC based bio-composites with characteristics for biomedical applications. Iqbal, H. M. N., Kyazze, G., Locke, I.C., Tron, T., Keshavarz, T., *Green Chem.*, **2015**, 17, 3858-3869.
13. Laccases as palladium oxidases. Mekmouche, Y., Schneider, L., Rousselot-Pailley, P., Faure, B., Simaan, A. J., Bochot, C., Reglier, M., Tron, T., *Chem. Science*, **2015**, 6, 1247-1251.
14. Visible-Light-Driven Oxidation of Organic Substrates with Dioxygen Mediated by a [Ru(Bpy)₃]⁽²⁺⁾/Laccase System Schneider, L., Mekmouche, Y., Rousselot-Pailley, P., Simaan, A. J., Robert, V., Reglier, M., Aukauloo, A., Tron, T., *Chem. Sus. Chem.*, **2015**, 8, 3048-3051.
15. Poly(3-Hydroxybutyrate)-Ethyl Cellulose Based Bio-Composites with Novel Characteristics for Infection Free Wound Healing Application. Iqbal, H.M.N.; Kyazze, G.; Locke, I.C.; Tron, T.; Keshavarz, T. *Int J Biol Macromol*, **2015**, 81, 552–559.
16. Development of novel antibacterial active, HaCaT biocompatible and biodegradable CA-g-P(3HB)-EC biocomposites with caffeic acid as a functional entity. H. M. N. Iqbal, G. Kyazze, I. C. Locke, T. Tron, T. Keshavarz. *Express Polymer Letters*, **2015**, 9, 764-772.

17. Direct electron transfer between a site-specific pyrene-modified laccase and carbon nanotube/gold nanoparticle supramolecular assemblies for bioelectrocatalytic dioxygen reduction. Lalaoui, Noémie; Rousselot Pailley, Pierre; Robert, Viviane; Mekmouche, Yasmina; Villalonga, Reynaldo; Holzinger, Michael; Cosnier, Serge; Tron, Thierry; Le Goff, Alan, *ACS Catalysis*, **2016**, 6, 1894.
18. Probing the Surface of a Laccase for Clues towards the Design of Chemo-Enzymatic Catalysts. V. Robert, E. Monza, L. Tarrago, F. Sancho, A. De Falco, L. Schneider, E. Npetgat Ngoutane, Y. Mekmouche, P. Rousselot Pailley, A. J. Simaan, V. Guallar, T. Tron, *Chem Plus Chem*, **2017**, 82, 607.
19. Characterization of Cu(II)-reconstituted ACC Oxidase using experimental and theoretical approaches. N. El Bakkali-Taheri, S. Tachon, M. Orio, S. Bertaina, M. Martinho, V. Robert, M. Reglier, T. Tron, P. Dorlet, A. J. Simaan. *Arch. Biochem. Biophys.* **2017**, 623-624, 31.
20. Electrochemical Water Oxidation and Stereoselective Oxygen Atom Transfer Mediated by a Copper Complex. M.C. Kafentzi, R. Papadakis, F. Gennarini, A. Kochem, O. Iranzo, Y. Le Mest, N. Le Poul, T. Tron, B. Faure, A. J. Simaan, M. Réglier, *Chem. Eur. J.*, **2018**, DOI: 10.1002/chem.201704613.

INVITED TALKS

- *ArtZymes based on a multicopper oxidase*. Panonia University, Veszprem, 13/10/10.
- *Engineered laccases: artificial enzymes with new properties*. University of Sao Paulo, Sao Paulo, 17/11/10.
- *Engineered laccases: artificial enzymes with new properties*. CEA Saclay, 1/12/10.
- *Bio & bio-inspired catalysts: a case of study*. Università Federico II, Napoli, grad students master class, 10/06/11.
- *Visible Light-Driven O₂ Reduction by Sensitizer-Laccase Systems*. PARISTECH, ENSCP, 15/05/2013.
- *Artificial Metalloenzymes & Photo-metalloenzymes*. Ecole Polytechnique, Palaiseau, LABEX Chamm, 03/07/2013.
- *Bio-inspired material for solar energy utilization*. University of Heraklion, BioMaSolUti summer school, 10/07/13.
- *Artificial enzymes and enzymes-conjugates: new tools for biocatalysis*. Federico II, University, Napoli, 06/2015.
- *Chemo-enzymatic catalysis with a grafted laccase*. Berlin Technical University, UNICAT meeting, 03/2015.
- *A laccase as engine for chemo-enzymatic catalysis*. ICP, CSIC, Madrid, 01/06/2015.
- *An oxidase as engine for chemo-enzymatic catalysis*. Barcelone Supercomputer Center, 03/06/2015.
- *Functionalized and artificial enzymes: new bio-derived catalysts*. Università Federico II, Napoli, 14/01/201
- *Engineering laccases: in search for new biocatalysts*. Universidad de Morelos, dept. Biotechnology, Cuernavaca, 10/10/16
- *New chemo-enzymatic and photobio-catalysts derived from a multi-copper oxidase*. Universidad de Morelos, dept. Chimie, Cuernavaca, 12/10/16
- *Synthetic Biology*. Universidad National de Mexico, Mexico City, 13/10/16
- *New chemo-enzymatic and photobio-catalysts derived from a multi-copper oxidase*. Universidad National de Mexico, Mexico City, 14/10/16
- *Controlling the orientation of laccases at the surface of materials. Does it matter?* Université de Bordeaux, 12/12/17

ORAL PRESENTATIONS

- *Engineering laccases: in search for new biocatalysts*. Invited speaker, 10th International Interdisciplinary Meeting on Bioanalysis, Pécs, Hungary, 27/04/13.
- *Visible Light-Driven O₂ Reduction by Sensitizer-Laccase Systems*. COST CM1003 meeting, Mainz, Germany, 29/05/2013.
- *Visible Light-Driven O₂ Reduction by Sensitizer-Laccase Systems*. 16th International Conference on Bioinorganic Chemistry, Grenoble, France, 22/07/2013.

- *New biocatalysts based on functionalized laccases.* UNICAT-AMU bi-lateral symposium, Marseille, France, 03/04/2014.
- *Catalysis with a multi-copper oxidase functionalized with transition metal complexes.* SCF 2015 Chemistry and Energetic Transition, Lille, France July 04-09 2015.
- *Light Driven Oxygen Atom Transfer Reactions under Mild Conditions.* LABIC V, Queretaro, Mexico, 20/10/2016.
- *Catalysis based on surface finctionalized laccases.* 18th International Conference on Bioinorganic Chemistry, Florianopolis, Brazil, 01/08/2017.