



CURRICULUM VITÆ

Alejandro J. Vila

IBR, the Institute of Molecular and Cell Biology of Rosario, is a research center from the Argentinean Research Council (CONICET) and the University of Rosario (UNR)

Personal Information

Name: Vila, Alejandro José

E-mail: vila@ibr-conicet.gov.ar

Web: <http://www.ibr-conicet.gov.ar/en/laboratories/vila/>

Education

1. Analytical Chemist, Universidad Católica Argentina (UCA), Rosario, Argentina, 1984.
2. Licentiate in Chemistry (with Honors), UCA, Rosario, Argentina,, 1986.
3. Ph. D. in Chemistry, University of Rosario (UNR), 1990 (*Summa cum laudæ*). Supervisor: Prof. Manuel Gonzalez-Sierra. Topic: Synthetic organic chemistry.
4. Postdoctoral Fellow, Department of Chemistry, University of Florence, Italy, 1991-1993. Supervisor: Prof. Ivano Bertini. Topic: NMR of metalloproteins.

Present Positions

1. Full Professor, Biophysics Section, Department of Biological Chemistry, UNR, 2016-.
2. Staff Researcher, CONICET (National Research Council - Argentina), since 1995. In the maximum category out of five (Superior Researcher), since 2013.
3. Director, Platform for Structural Biology and Metabolomics (PLABEM), 2013-.
4. Academic Director, Biophysics section, Department of Biological Chemistry, UNR.
5. Scientific Director, Biotech Incubator, University of Rosario (UNR).

Teaching Experience and Previous Positions

1. Ph.D. Fellow, National Research Council, 1986-1991.
2. Postdoctoral Fellow, International Centre for Genetic Engineering and Biotechnology (ICGEB) at the Department of Chemistry, University of Florence, Italy, 1991-93. Supervisor: Prof. Ivano Bertini. NMR Spectroscopy of Metalloproteins.
3. Teaching Assistant, Inorganic Section, Department of Physical Chemistry, UNR, 1986-1991.
4. Assistant Professor, Biophysics Section, Department of Biological Chemistry, UNR, 1993-1999.
5. Associate Professor, Biophysics Section, Department of Biological Chemistry, UNR, 1999-2016.
6. Full Professor of Biophysics, Department of Biological Chemistry, UNR, 2016-.
7. Associate Researcher (tenured), National Research Council, Argentina, 1995-2000.
8. Independent Researcher (tenured) National Research Council, Argentina, 2000-2005.
9. Principal Researcher (tenured), National Research Council, Argentina, 2006-2013.
10. Visiting Researcher, Beckman Institute, California Institute of Technology, 1996.
11. Visiting Professor, University of Valencia (Spain), 1998.

12. Visiting Professor, SISSA (Trieste, Italy), 2000.
13. Visiting Professor, Center for Magnetic Resonance (Florence, Italy), 2008.
14. Director, Institute of Molecular and Cell Biology of Rosario -IBR (CONICET-UNR), 2011-2020.

Honors and Awards

- Eduardo de Robertis Award for Young Researchers, Federal Secretary of Science and Technology (Argentina, 1994).
- Ernesto E. Galloni Award in Experimental Physical Chemistry, National Academy of Sciences (Argentina, 1995). This Award is given every year to an outstanding scientist under the age of 35 in the field of chemistry, physics or mathematics.
- Ranwell Caputto Award in Chemistry, National Academy of Sciences (Argentina, 2000). This Award is given yearly to an outstanding researcher in Chemistry under 40 years.
- Rafael Labriola Award, Argentinean Chemical Society, 2004. This Award is given every 3 years to an outstanding researcher in Chemistry under 45 years.
- International Research Scholar, Howard Hughes Medical Institute, USA, Selected for two periods (2002-2006 and 2007-2011).
- José Gómez Ibáñez Lecturer, Department of Chemistry, Wesleyan University, 2008.
- María Cristina Giordano Award, Argentinean Society of Physical Chemistry, 2009.
- Fellow, John Simon Guggenheim Memorial Foundation, 2009.
- Fundación Konex, Award in Biochemistry and Molecular Biology, (Argentina, 2013). Is awarded to 5 outstanding scientists in each scientific field within a decade. This award corresponds to the 2003-2013 period.
- E.P.Abraham Award, for contributions to the study of beta-lactamases, Beta-lactamase group, interscience conference on antimicrobial agents and chemotherapy (ICAAC), Washington DC, 2014.
- Ivano Bertini Award, for scientific achievements in copper research with emphasis on biological, biochemical and chemical mechanisms, International Copper Meeting, Sorrento (Italia), 2016.
- Member, National Academy of Pharmacy and Biochemistry (Argentina), since 2017.
- Member, Academy of Sciences for Latin America (ACAL), since 2017.
- Member, National Academy of Exact, Physical and Natural Sciences (Argentina). 2019
- Member, National Academy of Sciences, since 2021.
- Fellow, American Academy of Microbiology, elected in 2023.

Grant Support

Ongoing Research Funding as Principal Investigator (PI) or co-PI

His research is currently supported by grants from the following institutions: National Institutes of Health, National Agency of Science and Technology (ANPCyT), Argentina, CONICET- Swiss National Science Foundation, Ministry of Science and Technology (Argentina)-Ministero degli Affari Esteri e della Cooperazione Internazionale (MAECI, Italia), Shionogi & Co., Ltd.

He has previously received funding from the National Institutes of Health (1998-2001, 2005-2007, 2012-2023), Howard Hughes Medical Institute (2002-2011), Third World Academy of Sciences, the American Chemical Society, and regular support from the National Agency of Science and Technology (ANPCyT), Argentina.

Current Research Group Composition

Two associate researchers, four postdocs, six PhD students, three undergraduate students.

Training Experience - Alumni

He has supervised 22 completed graduate students, 17 undergraduate theses, 12 postdoctoral fellows and 5 researchers. Ten of his alumni hold tenured positions in the academic sector, eight of them being Group Leaders.

Professional Activities and Services to the Community (selected)

- Chairman of the XXXIII Meeting of the Argentinean Biophysical Society, 2006.
- Council Member, Institute of Molecular and Cell Biology, IBR.
- Member of the International Organizing Committee, First Latin American Protein Society Meeting, Angra dos Reis, Brasil, 2004.
- Chairman, Latin American Protein Society Meeting, 2010.
- Ad hoc member of study sections, CONICET, Argentinean National Funding Agency.
- Ad hoc member of study sections, ANPCyT (Argentinean National Science Foundation).
- Deputy coordinator for Biological Sciences, ANPCyT (Argentinean National Science Foundation), 2008-2010.
- Coordinator, CeBEM (Centro de Biología Estructural del Mercosur), 2011-2013.
- External reviewer, Stanford Synchrotron Radiation Lightsource (USA), National Science Foundation (USA), FAPESP (Brasil), Israel-USA Binational Foundation, Food and Health Bureau of the Hong Kong Government, European Research Council.
- Member of the External Advisory Panel, Italian Institute of Technology (IIT), Genoa, Italy; and Brazilian National Laboratory for Biosciences – LNBio, Campinas, Brazil.
- ~~Member of the External Advisory Panel, Italian Institute of Technology (IIT), Genoa, Italy; and Brazilian National Laboratory for Biosciences – LNBio, Campinas, Brazil.~~

Member of Editorial Advisory Boards in Scientific Journals

Most of them are journals linked to scientific societies, as indicated below: the Society for Biological Molecular Biology, 2013-2015; (edited by Genealogy), Early Society for Biochemistry and

Scientific Societies Memberships

- Argentinean Society of Biophysics – SAB (since 1993).
- Argentinean Society of Biochemistry and Molecular Biology – SAIB (since 1993).
- American Chemical Society – ACS (since 1994).
- Society of Biological Inorganic Chemistry – SBIC (since 1996).
- Protein Society (since 1997).
- American Society for Biochemistry and Molecular Biology – ASBMB (since 2001).
- American Society for Microbiology – ASM (since 2010).

Active Role in Scientific Societies

- Council Member, Argentinean Biophysical Society, 1997-2010.
- Member of the International NMR Consortium, WW-NMR. 2010.

- Council Member, Society of Biological Inorganic Chemistry, 2010-2013.
- Coordinator, CeBEM (Centro de Biología Estructural del Mercosur), 2011-2013.
- Member of the Nomination Committee, International Society for Magnetic Resonance (ISMAR), since 2015.

Organization of Scientific Meetings

- Co-Chair Group Science Affinity Group G-20 (S20), Rosario, 2018.
- Co-Chair, ICBIC-18 (International Conference for Biological Inorganic Chemistry), Brazil, 2017.
- Chair, 2nd Latin American Metabolic Profiling Symposium, Rosario, 2016.
- Member of the Organizing Committee, X Iberoamerican NMR Meeting, Colombia, 2016.
- Chair, Workshop on Structural Biology, EMBL, Rosario, 2015.
- Meeting of the Scientific Committee, 4th LABIC (Latin American Meeting on Biological Inorganic Chemistry), 2014.
- Member of the Scientific Committee, ISMAR (International Society for Magnetic Resonance) 2013.
- Chair, Latin American Protein Society Meeting, 2010.
- Member of the International Organizing Committee, First Latin American Protein Society Meeting, Angra dos Reis, Brazil, 2004.
- Chair, XXXIII Meeting of the Argentinean Biophysical Society, 2006.
- Member of the International Organizing Committee, First Latin American Protein Society Meeting, Angra dos Reis, Brazil, 2004.
- Chair, First Workshop of Bioinorganic Chemistry, 2004.
- Member of the Organizing Committee, XXII Meeting of the Argentinean Biophysical Society, 1993.

Outreach Activities

He has been involved actively in many outreach activities organized by the University and the National Research Council by giving talks to the community in different environments. He has delivered two TEDx talks, participated in a TEDx experience, and being part of a movie produced by TEDx Rosario "Fiction", where he performed as a scientist.

He has promoted himself, the organization of novel outreach activities at IBR, such as:

- Training Course on Molecular Biology for Journalists.
- Open Day.
- Bio-Leaders, i.e., a two-day course in which Opinion Leaders such as politicians, CEOs and journalists, are trained in the lab to learn the basics of Molecular Biology and Biotechnology.

Scientific Publications in international peer-reviewed journals

> 8000 citations, h-index: 51 (Google Scholar) (Feb 2003).

Original Articles and Reviews

162. L.J. González, G. Bahr, M.M. González, R.A. Bonomo and **A.J. Vila** "In-cell kinetic stability is an essential trait in metallo- β -lactamase evolution", *Nature Chemical Biology*, in press (2023).
161. Z. Zhao, X. Shen, S. Chen, J. Gu, H. Wang, M. F. Mojica, M. Samanta, D. Bhowmik, **A.J. Vila**, R. A. Bonomo and S. Haider "Gating interactions steer loop conformational changes in the active site of the L1 metallo- β -lactamase", *eLife*, 12:e83928. doi: 10.7554/eLife.83928 (2023).
160. P. Hinchliffe, M. F. Mojica, C. J. Schofield, G. I. Dmitrienko, R. A. Bonomo, **A. J. Vila** and J. Spencer "Preferential binding modes and stereoisomers of hydrolyzed β -lactams with the dizinc L1 metallo β -lactamase as defined by crystallography", *J. Biol. Chem.*, in press (2023).
159. C. McCann, M. Quinteros, I. Adelugba, M.N. Morgada, A. R. Castelblanco, E. Davis, A. Lanzirotti, S. J. Hainer, **A.J. Vila**, J. G. Navea and T. Padilla-Benavides "The mitochondrial Cu + transporter PiC2 (SLC25A3) is a target of MTF1 and contributes to the development of skeletal muscle in vitro", *Front. Mol. Biosci.* 9:1037941. doi: 10.3389/fmolb.2022.1037941 (2022).
158. M.A. Rossi, T. Palzill, F.C.L. Almeida and **A.J. Vila** "Slow protein dynamics elicits new enzymatic functions by means of epistatic interactions", *Mol. Biol. Evol.*, 39(10):msac194. doi: 10.1093/molbev/msac194 (2022).
157. J. Szuster, A.J. Leguto, U. A. Zitare, J.P. Rebecchi, **A.J. Vila** and D. H. Murgida "An Engineered Purple Mononuclear Copper Site Featuring Unprecedented Entropic Control of the Reduction Potential", *Bioelectrochemistry*, 146: 108095. doi: 10.1016/j.bioelechem.2022.108095 (2022).
156. C.A. Colque, P.E. Tomatis, A.G. Albarracín Orio, G. Dotta, D.M. Moreno, G. Hedemann, R.A. Hickman, L.M. Sommer Madsen, S. Feliziani, A.J. Moyano, R.A. Bonomo, H.K. Johansen, S. Molin, **A.J. Vila*** and A.M. Smania* "Longitudinal Development of Antibiotic Resistance in Cystic Fibrosis Reveals Diverse Evolutionary Pathways", *mBio*, e0166322. doi: 10.1128/mbio.01663-22 (2022). *Corresponding authors.
155. L.J. Rojas, M. Yasmin, J. Benjamino, S.M. Marshall, K.J. DeRonde, N.P. Krishnan, F. Pérez, A.A. Colin, M. Cardenas, O. Martinez, A. Pérez-Cardona, D. D. Rhoads, M.R. Jacobs, J. J. LiPuma, M.W. Konstan, **A.J. Vila**, A. Smania, A.R. Mack, K. Card, J.G. Scott, M.D. Adams, L.M. Abbo and R.A. Bonomo "Genomic heterogeneity underlies multidrug resistance in *Pseudomonas aeruginosa*: a population-level analysis beyond susceptibility testing", *PLoS ONE*, 17(3):e0265129. doi: 10.1371/journal.pone.0265129 (2022).
154. C. Le, C. Pimentel, F. Pasteran, M. R. Tuttobene, T. Subils, J. Escalante, B. Nishimura, S. Arriaga, A. Carranza, V. Mezcord, **A. J. Vila**, A. Corso, L. A. Actis, M. E. Tolmasky, R. A. Bonomo and M. S. Ramirez "Human Serum Proteins and Susceptibility of *Acinetobacter baumannii* to Cefiderocol: role of iron transport", *Biomedicines*, 10(3):600. doi: 10.3390/biomedicines10030600 (2022).
153. C. López, J. Delmonti, R.A. Bonomo and **A.J. Vila** "Deciphering the evolution of metallo- β -lactamases: a journey from the test tube to the bacterial periplasm", *J. Biol. Chem.*, 298(3):101665. doi: 10.1016/j.jbc.2022 (2022).
152. G. Bahr, L.J. González and **A.J. Vila** "Metallo- β -lactamases and a tug-of-war for the available zinc at the host-pathogen interface", *Curr. Opin. Chem. Biol.*, 66:102103 (2022). doi: 10.1016/j.cbpa.2021.102103.
151. M.F. Mojica, M.A. Rossi, **A.J. Vila*** and R.A. Bonomo* "The Urgent Need for Metallo- β -Lactamase Inhibitors: a silent global threat", *Lancet Infectious Diseases*, 22:e28-e34 (2022). doi: 10.1016/S1473-3099(20)30868-9. *Corresponding authors.
150. P. Hinchliffe, D.M. Moreno, M.A. Rossi, M.F. Mojica, V. Martinez, V. Villamil, B. Spellberg, G. Drusano, C. Banchio, G. Mahler, R. A. Bonomo, **A.J. Vila** and J. Spencer "2-Mercaptomethyl thiazolidines (MMTZs) inhibit all metallo- β -lactamase classes by maintaining a conserved binding mode", *ACS Infectious Diseases*, 7, 2697-2706 (2021).

149. C. López, A. Prunotto, G. Bahr, R.A. Bonomo, L. J. González, M. Dal Peraro and **A.J. Vila** "Specific protein-membrane interactions promote the export of metallo- β -lactamases via outer membrane vesicles", *Antimicrob. Agents Chemother.*, 65(10):e0050721 (2021). doi: 10.1128/AAC.00507-2.
148. M.M.B. Martínez, R.A. Bonomo, **A.J. Vila**, P. C. Maffía and L. J. González "On the offensive: the Role of Outer Membrane Vesicles in the successful dissemination of NDM-1 β -lactamase". *mBio*, 12(5):e0183621 (2021). doi: 10.1128/mBio.01836-21
147. J. Martinez, C. Razo-Gutierrez, C. Le, R. Courville, C. Pimentel, C. Liu, S.E. Fung, M.R. Tuttobene, K. Phan, **A.J. Vila**, P. Shahrestani, V. Jimenez, M. E. Tolmasky, S. A. Becka, K. M. Papp-Wallace, R. A. Bonomo, A. Soler-Bistue, R. Sieira and M. S. Ramirez "Cerebrospinal fluid (CSF) augments metabolism and virulence expression factors *Acinetobacter baumannii*", *Sci. Reports*, **11**, 4737 (2021).
146. M.F. Mojica, M.A. Rossi, A.J. Vila* and R.A. Bonomo* "The Urgent Need for Metallo- β -Lactamase Inhibitors: a silent global threat", *Lancet Infectious Diseases*, , 22:e28-e34 (2022). doi: 10.1016/S1473-3099(20)30868-9. * Corresponding authors.
145. M.A. Rossi, V. Martinez, P. Hinchliffe, M.F. Mojica, V. Castillo, R. Smith, B. Spellberg, G. Drusano, C. Banchio, R. A. Bonomo, J. Spencer, **A.J. Vila*** and Graciela S. Mahler* "2-Mercaptomethyl-thiazolidines utilize conserved aromatic-S interactions to achieve broad-range inhibition of metallo- β -lactamases", *Chemical Science*, , **12**, 2898-2908 (2021). *Corresponding authors.
144. A. Prunotto, G. Bahr, L.J. González, A.J. Vila* and M. Dal Peraro* "Structural bases of membrane association of New Delhi metallo- β -lactamase 1", *ACS Infectious Diseases*, **9**, 2719-2731 (2020). * Corresponding authors.
143. D. Rodgers, F. Pasteran, M. Calderon, S. Jaber, G.M. Traglia, E. Albornoz, A. Corso, **A.J. Vila**, R.A. Bonomo, M. D. Adams and M. S. Ramirez "Characterization of ST25 blaNDM-1 producing *Acinetobacter* spp. strains leading the increase in NDM-1 emergence in Argentina" *J. Glob. Antimicrob. Resist.* **23**, 108-110 (2020).
142. G.T. Antelo, **A.J. Vila**, D.P. Giedroc and D.A. Capdevila "Molecular evolution of transition metal bioavailability at the host-pathogen interface", *Trends in Microbiology*, S0966-842X(20)30213-4. doi: 10.1016/j.tim.2020.08.001, **29**, 441-457 (2021).
141. F. Huang, N. Fitchett, C. Razo-Gutierrez, C. Li, J. Martinez, G. Ra, Carolina López, L. J. González, R. Sieira, **A. J. Vila**, R. A. Bonomo, and M. S. Ramirez "The H-NS regulator plays a role in the stress induced by carbapenemase expression in *Acinetobacter baumannii*" *mSphere*, 5:e00793-20 (2020).
140. U. Zitäre; J. Szuster; M. C. Santalla; M.N. Morgada; **A.J. Vila** and D.M. Murgida "Dynamical effects in metalloprotein heterogeneous electron transfer", *Electrochimica Acta*, 342 (2020) 136095. <https://doi.org/10.1016/j.electacta.2020.136095>.
139. A. Prunotto, G. Bahr, L.J. González, **A. J. Vila*** and M. Dal Peraro* "Structural bases of membrane association of New Delhi metallo- β -lactamase 1", *ACS Infectious Diseases*, **9**, 2719-2731 (2020). *Corresponding authors.
138. J. Szuster; U. Zitäre; M. Castro; A. Leguto; M.N. Morgada; **A.J. Vila** and D.M. Murgida "Cu_A-Based Chimeric T1 Copper Sites Allow for Independent Modulation of Reorganization Energy and Reduction Potential", *Chemical Science*, **11**, 6193-6201 (2020). doi: 10.1039/d0sc01620a
137. Adams MD, Pasteran F, Traglia GM, Martinez J, Huang F, Liu C, Fernandez JS, Lopez C, Gonzalez LJ, Albornoz E, Corso A, Vila AJ, Bonomo RA, Ramirez MS. "Distinct mechanisms of dissemination of NDM-1 metallo β -lactamase in *Acinetobacter* spp. in Argentina" *Antimicrob. Agents Chemother.* pii: AAC.00324-20. doi: 10.1128/AAC.00324-20 (2020).
136. M. N. Morgada, M.E. Llases, E. Giannini, M.A. Castro, P.M. Alzari, D.H. Murgida, M.N. Lisa and **A. J. Vila** "Electron spin density on the axial Methionine ligand in Cu_A suggests electron transfer pathways", *Chem. Comm.*, **56**, 1223-1226 (2020).
135. J. Martinez, J. S. Fernandez, C. Liu, A. Hoard, A. Mendoza, J. Nakanouchi, N. Rodman., R. Courville, M.R. Tuttobene, C. Lopez, L.J. Gonzalez, P. Shahrestani, K. M. Papp-Wallace, **A. J. Vila**, M. E. Tolmasky, R.A. Bonomo, R. Sieira and M. S. Ramirez "Human pleural fluid triggers global changes in

the transcriptional landscape of *Acinetobacter baumannii* as an adaptive response to stress”, *Sci. Reports*, **9**, 17251 (2019) doi:10.1038/s41598-019-53847-2.

134. A.R. Mack, M.D. Barnes, M.A.Taracila, A.M. Hujer, K.M. Hujer, G. Cabot, M. Feldgarden, D.H. Haft, W. Klimke, F. van den Akker, **A. J. Vila**, A. Smania, S. Haider, K. M. Papp-Wallace, P.A. Bradford, G.M. Rossolini, J.-D. Docquier, J.-M. Frère, M. Galleni, N. D. Hanson, A. Oliver, P. Plésiat, L. Poirel, P. Nordmann, T.G. Palzkill, G. A. Jacoby, K. Bush and R. A. Bonomo “A standard numbering scheme for class C β -lactamases”, *Antimicrob Agents Chemother.*, pii: AAC.01841-19. doi: 10.1128/AAC.01841-19 (2019).

133. E. Giannini, L.J. González and **A. J. Vila** “A simple protocol to characterize bacterial cell-envelope lipoproteins in a native-like environment”, *Protein Sci.*, **28**, 2004-2010 (2019).

132. M.E. Llases, M.N.Morgada and **A.J. Vila** “Biochemistry of copper site assembly in heme-copper oxidases: A theme with variations”, *Int.J.Mol.Sci.*, pii: E3830. doi: 10.3390/ijms20153830 (2019).

131. M. N. Morgada, F. Emiliani, D. Álvarez-Paggi, D. H. Murgida, L. A. Abriata and **A. J. Vila** “pH-induced binding of the axial ligand in an engineered Cu_A site favors the π u state”, *Inorg.Chem.*, **58**, 15687-15691 (2019).

130. S. Soma, M. N. Morgada, M. T. Naik, A. Boulet, N. Dziuba, A. Ghosh, Q. Yu, P. A. Lindahl, J.s B. Ames, S. C. Leary, **A. J. Vila*** and V. M. Gohil* “COA6 is structurally tuned to function as a thiol-disulfide reductase in copper delivery to the mitochondrial cytochrome c oxidase”, *Cell Reports*, **29**, 4114-4126.e5 (2019).

129. M. E. Llases, M. N. Lisa, M. N. Morgada, E. Giannini, P. M. Alzari and A. J. Vila “A. *thaliana* Hcc1 is a Sco-like metallochaperone for Cu_A assembly in Cytochrome c Oxidase”, *FEBS J.*, **287**, 749-762 (2019).

128. C. López, J. A. Ayala, R. A. Bonomo, L. J. González and **A. J. Vila** “Protein determinants of dissemination and host specificity of Metallo- β -lactamases”, *Nature Communications*, **10**(1):3617 (2019).

127. M.F. Mojica, J.D. Rutter, M. Taracila, L.A. Abriata, D.E. Fouts, K.M. Papp-Wallace, J.J. LiPuma, **A. J. Vila** and Robert A. Bonomo “Population Structure, Molecular Epidemiology and β -lactamase diversity among *Stenotrophomonas maltophilia*”, *mBio*, pii: e00405-19 (2019).

126. M. Ross; O. Fisher; M.N. Morgada; M. Krzyaniak; M. Wasielewski; A.J. Vila; B.M. Hoffman; and A. Rosenzweig “Formation and electronic structure of an atypical Cu_A site”, *J. Am.Chem.Soc.*, **141**, 11, 4678-4686 (2019)

125. U.A. Zitare, J. Szuster, M. Santalla, M.E. Llases, M.N. Morgada, **A.J. Vila** and D.H. Murgida “Fine tuning of functional features of the Cu_A site by loop-directed mutagenesis”, *Inorg.Chem.*, **58**, 2149–2157 (2019).

124. A. J. Leguto, M.A. Smith, M.N. Morgada, U.A. Zitare, D.H. Murgida, K.M. Lancaster and **A.J. Vila** “Dramatic electronic perturbations of Cu_A centers via subtle geometric changes”, *J. Am.Chem.Soc.*, **141**, 1373–1381 (2019).

123. A.R. Palacios, M.F. Mojica, E. Giannini, M.A. Taracila, C.R. Bethel, P.M. Alzari, L.H. Otero, S. Klinke, L.I. Llarrull, R.A. Bonomo and **A.J. Vila** “The Reaction Mechanism of Metallo- β -lactamases is Tuned by the Conformation of an Active Site Mobile Loop”, *Antimicrob Agents Chemother.* doi: 10.1128/AAC.01754-18. (2018).

122. U. A. Zitare, J. Szuster, M.F. Scocozza, A.Espinoza-Cara, A.J.Leguto, M.N.Morgada, **A.J. Vila** and D.H. Murgida “The Role of Molecular Crowding in Long-Range Metalloprotein Electron Transfer: Dissection into Site- and Scaffold-Specific Contributions”, *Electrochimica Acta*, **294**, 117-125 (2018).

121. A. Espinoza-Cara, U.A. Zitare, D. Alvarez-Paggi, S. Klinke, L.H. Otero, D.H. Murgida and **A.J. Vila** “Engineering a bifunctional copper site in the cupredoxin fold by loop-directed mutagenesis”, *Chemical Science*, **9**, 6692 – 6702. (2018).

120. L. J. González, C. Stival, J.L. Puzzolo, D.M. Moreno and **A.J.Vila** “Shaping substrate selectivity in a broad spectrum metallo- β -lactamase”, *Antimicrobial Agents and Chemotherapy*, pii: AAC.02079-17 (2018).

119. G. Bahr, L. Vitor-Horen, C. Bethel, R.A. Bonomo, L.J. González and **A.J. Vila** "Clinical evolution of New Delhi Metallo-beta-lactamase (NDM) optimizes resistance under Zn(II) deprivation", *Antimicrobial Agents and Chemotherapy*, **61** e00716-17 (2017).
118. A. Timon-Lopez, E. Nyvltova, L.A. Abriata, **A.J. Vila**, J. Hosler and A. Barrientos "Mitochondrial Cytochrome c Oxidase Assembly: New Developments", *Sem. Cell. Dev. Biol.*, **17**, 30275-6 (2017).
117. D. Alvarez-Paggi, U.A. Zitare, J. Szuster, M. N. Morgada, A. J. Leguto, **A. J. Vila**, D. H. Murgida "Tuning of enthalpic/entropic parameters of a protein redox center through manipulation of the electronic partition function", *J. Am. Chem. Soc.*, 2017, **139**, 9803–9806 (2017).
116. M. Mojica, K. Papp-Wallace, M. Taracila, M. Barnes, J. Rutter, M. Jacobs, J. LiPuma, T.s Walsh, **A. J. Vila**, and R. Bonomo "Avibactam restores the susceptibility of aztreonam against clinical isolates of *Stenotrophomonas maltophilia*", *Antimicrobial Agents and Chemotherapy*, **61**, e00777-17 (2017).
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Book Chapters

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2. C.O.Fernández and **A.J.Vila** "Paramagnetic NMR of Electron Transfer Copper Proteins", in "Paramagnetic Resonance of Metallobiomolecules" (J.Telser, editor), ACS Symposium Series, *American Chemical Society*, pp. 287-303 (2003).
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Selected 10 most relevant publications

1. L.J. González, G. Bahr, M.M. González, R.A. Bonomo and **A.J. Vila** “*In-cell* kinetic stability is an essential trait in metallo β -lactamase evolution”, *Nature Chemical Biology*, en prensa (2023) doi: 10.1038/s41589-023-01319-0. **Highlighted in Nature Briefings.**
2. C. López, J. A. Ayala, R. A. Bonomo, L. J. González and **A.J. Vila** “Protein determinants of dissemination and host specificity of Metallo- β -lactamases”, *Nature Communications*, 10(1):3617. 10.1038/s41467-019-11615-w (2019).
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4. P.Hinchliffe, M.M. González, M. F. Mojica, J. M. González, V. Castillo, C. Saiz, M. Kosmopoulou, C. L. Tooke, L. I. Llarrull, G. Mahler , R. A. Bonomo , **A.J. Vila***, J. Spencer* “Cross-class metallo- β -lactamase inhibition by bisthiazolidines reveals multiple binding modes”, *Proc.Natl.Acad.Sci USA*, **111**, E3745-54 (2016). *Shared corresponding authorship.
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9. P.E.Tomatis, R.M. Rasia, L.Segovia and **A.J.Vila** “Mimicking natural evolution in metallo- β -lactamases through second-shell ligand mutations”, *Proc.Natl.Acad.Sci.USA*, **102**, 13761-13766 (2005). **Highlighted in the cover.**
10. E.G. Orellano, J.E.Girardini, J.A.Cricco, E.A.Ceccarelli, and **A.J.Vila** “Spectroscopic Characterization of the Binuclear Metal Site in *Bacillus cereus* β -lactamase II”, *Biochemistry*, **37**, 10173-80 (1998).

Conferences

He has been invited to give seminars and lectures at > 200 meetings. He has delivered lectures at the most important conferences within his research field, such as: International Conference on Biological Inorganic Chemistry (ICBIC), American Chemical Society (ACS), International Conference on Magnetic Resonance in Biological Systems (ICMRBS), Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC), ECCMID, ASM Microbe (American Society for Microbiology), European Congress of Clinical Microbiology & Infectious Diseases (ECCMID), International Society for Magnetic Resonance (ISMAR), International Conference on Coordination Chemistry (ICCC), Chianti Workshop on Magnetic Resonance, European Conference on Biological Inorganic Chemistry (EuroBIC), Latin American Conference on Biological Inorganic Chemistry (LABIC), Howard Hughes Medical Institute (HHMI) meetings, International Copper Meeting, β -lactamase Workshop, ID Week, Protein Society Meeting, Workshops from the Biophysical Society. He has been invited to give talks to the following Gordon Research Conferences: "Metals in Biology", "Cell Biology of Metals", "Drug Resistance" and "Microbial Population Biology".

He has been invited to present research > 150 seminars at different institutions worldwide, such as: Department of Chemistry, Oxford University (UK); Department of Chemistry and Chemical Engineering, California Institute of Technology (Pasadena, USA); European Molecular Biology Laboratory (Heidelberg); Department of Chemistry, MIT; BIOMAC Research School, Leiden Institute of Chemistry (University of Leiden, Holanda); Departamento de Química Inorgánica, Universitat de València (España); University of California at Fullerton; International Centre for Theoretical Physics (Trieste, Italia); International School for Advanced Studies-SISSA (Trieste, Italia); Departamento de Bioquímica, Università di Roma "Tor Vergata"; Centro de Estudios Atómicos - Sección de Bioenergética (Saclay, Francia); Instituto Pasteur (París, Francia); Novo Nordisk Foundation Center for Biosustainability (Danish Technical University, Dinamarca); Instituto Rocasolano-CSIC (Madrid, España); Hospital Ramón y Cajal (Madrid, España); Department of Chemistry, University of Florianopolis (Brazil); Center of Magnetic Resonance & Department of Chemistry (Universidad de Firenze, Italia); Department of Chemistry y Department of Biochemistry and Microbiology (University of Sydney, Australia); Department of Chemistry and Biochemistry (University of Michigan, Ann Arbor); Department of Chemistry (Yale University); Department of Chemistry (Penn State University); Biochemistry (University of California, Los Angeles, USA); Instituto de Biotecnología (Universidad Autónoma de México, Cuernavaca); Instituto de Química (Universidad Autónoma de México); University of Düsseldorf (Alemania); Max Planck Institute for Biophysical Chemistry (Goettingen, Alemania); German Research School for Simulation Sciences, Aachen University (Alemania); Max Planck Institute for Bioinorganic Chemistry (Muelheim, Alemania); Department of Chemistry and Biochemistry (University of Miami at Ohio, USA), Department of Biochemistry, University of Frankfurt); Department of Chemistry (University of California, San Diego, USA); Department of Chemistry (University of Rochester, USA); Department of Biophysics (Medical School, Johns Hopkins University, USA); Department of Pharmacology (Western Case University, Cleveland, USA); Department of Chemistry (University of Arizona, Tucson, USA); Department of Chemistry and Biochemistry (University of Illinois at Urbana-Champaign, USA); Department of Pharmacology, Baylor College of Medicine (Texas, USA); Department of Chemistry (Northwestern University, USA). Departament de Química, University of Siena. Instituto de Tecnologia Química e Biológica (ITQB) Lisboa; Department of Chemistry, Wesleyan University (Middletown, Connecticut, USA); Center for Biomembrane Physics (Memphys) Odense, Denmark; Universidade Federal do Rio de Janeiro; Howard Hughes Medical Institute (HHMI) meetings, Australia, Estonia, Mexico, Janelia Farm, Lisbon; Instituto de Química (University of Sao Paulo, Brasil), Cornell University, Ithaca, USA; Department of Chemistry, University of Zurich; Department of Chemistry and Biochemistry, Worcester Polytechnic Institute; EMBL at Heidelberg; Dipartimento di Scienze Farmaceutiche (Universidad de Firenze, Italia); Institut de Microbiologie de la Méditerranée (Marseille, France); Department of Biochemistry, University of Notre Dame (USA).

Scientific Contributions

Vila's main interest is to unravel the role of metal ions in biology, mainly using NMR. His work has allowed elucidating the determinants of substrate recognition and catalytic mechanism of metallo- β -lactamases, not only in vitro, but also identifying the active species of these enzymes in the bacterial periplasm. These contributions allowed demonstrating that this family of enzymes has a common reaction mechanism, despite a large structural diversity. Based on this, he has designed mechanistic-inspired inhibitors with a potent bactericidal action.

His group has used metallo- β -lactamases as a model system to study protein evolution, having identified the biochemical and biophysical aspects that allow these enzymes to improve their activity and stability in the bacterial cell. This approach allowed him to develop a strategy that fills the gap between molecular studies of purified proteins and the resistance phenotype when lactamases are expressed in bacteria.

Recently, his group reported that NDM-1, the metallo- β -lactamase of widest and largest clinical impact, is a membrane-bound protein, which allows it to resist the immune system's response during the infectious process, and allows protein transfer through vesicles, which has led him to postulate a new paradigm in the dissemination of antibiotic resistance in which the transfer of genetic material would be coupled to the transfer of proteins as resistance elements. These findings have also allowed the development of novel diagnostic tests, enabling the fast detection of this enzyme in bacterial pathogens, avoiding false negative results that lead to incorrect therapy.

Vila has studied electron transfer copper sites in proteins, focusing in the last decade in those present in cytochrome oxidases. He has elucidated the electronic structure of the copper center acting as electron entry port in these terminal oxidases (CuA) and, by using different spectroscopic techniques, he has shown how the protein structure fine tunes the reactivity of this metal site by changes on the electronic structure. He proposed and later demonstrated that the high efficiency of this copper site is due to the presence of low-lying excited states which become populated at room temperature, and can switch during turnover, providing two alternative electron transfer pathways, a fact that constitutes a new paradigm in biological electron transfer. Indeed, this copper site is endowed with transistor-like properties, and its modulation may be exploited for the development of protein-based molecular electronic devices.

He has also dissected the molecular mechanism by which copper is transported and delivered into cytochrome oxidase by different proteins, such as specific metallochaperones, characterizing the mechanism of copper insertion at atomic level by using NMR spectroscopy. Understanding the detailed mechanism of this copper site has shed light in the understanding of fatal genetic disorders that lead to the incorrect assembly of this copper site.