



## CURRICULUM VITAE ET STUDIORUM

**First Name and Surname:** ARMIDA TORREGGIANI  
**Place and Date of Birth:** Bologna 27 Dicembre 1967  
**Marital Status:** Married in 1997; two children born in 1999 and 2003  
**Official Address:** Istituto Sintesi Organica e Fotoreattività (ISOF) -  
Consiglio Nazionale delle Ricerche (CNR)  
Via P. Gobetti 101  
40129 Bologna, Italy  
Tel.: +39-051-6399821  
Fax: +39-051-6399844  
E-mail: torreggiani@isof.cnr.it

### Education and Professional Experiences:

- **1986: Maturità Classica** (58/60).
- **1992: Laurea in Chemistry** (Bio-Organic Chemistry), University of Bologna (Italy) - grade 110/110. Thesis' title: "*Cryptates of lanthanide ions as luminescence probes*". The experimental work has been performed in the lab. of Prof. V. Balzani
- **1993: Qualification to Chemist Profession** (96/100).
- **1993: Fellowship** from **Consiglio Nazionale delle Ricerche** for studying: "*Radicals of biological interest: their characterisation and chemical-physical properties*" at Istituto di Fotochimica e Radiazioni ad Alta Energia (FRAE - now ISOF) under the supervision of Dr. Maurizio Tamba .
- **1994-1997: Ph.D in Biochemistry**, University of Bologna. Thesis' title: "*Study of model system of antigen-antibody interactions by means of Raman spectroscopy*" under the supervision of Prof. Giancarlo Fini.
- **1994-1997: External Collaborator** at FRAE Institute (CNR, BO) on the Research Project entitled: "*Molecular mechanisms induced by ionizing radiations in bio-molecules*".
- **1998: Fellowship from Office of International Programs (OIP)**, to carry out researches at Brown University, Providence, Rhode Island (USA).
- **1998: Fellowship** from **CNR** for studying: "*Radiation-induced processes in molecules of biological and pharmacological interest*" at FRAE Institute.
- **1999: External Professional Collaborator** of FRAE Institute (CNR) in characterisation of both radiolysis products of antioxidant compounds by HPLC chromatography and metal-ligand complexes of antioxidants by Raman spectroscopy.
- **1999-2000: Post-Doctoral Fellowship** at Biochemistry Department, University of Bologna on Medical Sciences for studying "*Protein Complexes with substances of biological and/or pharmacological interest with low molecular weight by Raman spectroscopy*".
- **2000-2001: External Collaborator** at FRAE Institute (CNR) in the Research Project entitled: "*Ionizing radiation in the study of biomolecules and in environment research*".
- **2001: Researcher** at ISOF Institute (ex-FRAE), CNR.
- **2005-2007: Italian person in charge in the biennial Project of Cooperation CNR /CSIC** (Spain)
- **2006: Member of the Organizing Committee of XIII National Congress of Italian Society for Researches on Radiations (SIRR)**, Bologna, november 21-24, 2006.
- **2007: Member of the Examination Committee of the PhD thesis** entitled "*Study of the structure/function relationship in metallothioneins of invertebrates, plants and protozoans*" presented by Dr. J. Domenech (for the European Doctor title) at the **University of Barcelona** (Spain) in January 2007.

▪ **2008: Member of the Scientific Committee of the Italian Society of Researches on Radiations (SIRR)**

▪ She acts as **reviewer** for the following international journals:

Journal of Molecular Structure;  
Inorganica Chimica Acta;  
Journal of Raman Spectroscopy;  
Analytical Chemistry;  
Journal of Inorganic Biochemistry;  
Pesticide Biochemistry and Physiology;  
Chemical Physics Letters;  
Journal of Chemical Physics

▪ Author of **78 publications** in qualified journals and **61 communications to Congresses**.

#### **Didactic Activity:**

- **Tutor** in Chemistry in the Medicine degree, Medical Sciences, University of Bologna (AA 2000/2001)
- **Professor of Chemistry** in the Orthopaedic-Technician degree, Medical Sciences, University of Bologna from 2000 to 2002 .
- From 2004 till now, she is **Promoter of the "Research Language" Project** for popularising sciences such as chemistry, biology, etc, in the Secondary Schools.

#### **Research Activity :**

She has carried out (and carries) researches in the following fields:

##### *i) Radiation Chemistry (Pulse Radiolysis and steady-state irradiation) :*

Steady-state irradiation (gamma rays from a Co-60 source) and pulse-irradiation (electrons from a 12 MeV linear accelerator), have been used to generate, in aqueous solutions, specific radical species and to study their interactions with molecules of biological and /or pharmacological interest.

In particular, she has carried out studies on :

- **Radical-induced damages on sulfur-containing proteins.** Structural and functional radical-induced changes in proteins such as lysozyme and ribonuclease have been evaluated as well as the possible post-translational mechanism of the damage to another cell compartment, such as lipid domain. The protein degradation due to radical exposure has been evaluated by Raman spectroscopy.
- **Molecular mechanisms of action of antioxidants** (i.e. thiols, oligopeptides).
- **Reactivity of potential antioxidant compounds** (i.e. carnosine, captopril, ambroxol, etc.) **towards radiation-induced oxidizing radicals and identification of the transient species.**

##### *ii) Spectroscopic field (UV-Vis, Raman and IR techniques):*

- **Structural characterisation of metal-ligand complexes** i.e. His-containing oligopeptides, or natural antioxidants, such as flavonoids, and transition metal ions (i.e. Zn and Cu).
- **Structural study of auto-assembling oligopeptides potentially useful as biomimetic material.** The prevailing conformation of the peptides has been evaluated as a function of the sequence and solubilisation/liophilisation procedures.

- **Structural characterisation of metallothioneins**, low molecular weight cysteine-rich proteins with an exceptional heavy metal coordination capacity
- **Systems composed by proteins and ligands of low molecular weight**, i.e. avidin/streptavidin and vitamin H (and its derivatives)

### Papers recently published (from 2005 up to now)

1. *Raman and Pulse Radiolysis studies on antioxidant properties of quercetin: Cu(II) chelation and oxidizing radical scavenging*  
**A. Torreggiani**, A. Trincherò, M. Tamba, P. Taddei  
Journal of Raman Spectroscopy, (2005) 36, 380
2. *Radiation damage of lysozyme in a biomimetic model: some insights by Raman spectroscopy*  
**A. Torreggiani**, M. Tamba, I. Manco, M.R. Faraone-Mennella C. Ferreri, C. Chatgililoglu  
Journal of Molecular Structure (2005) 744-747, 767
3. *Copper(II)-Quercetin complexes in aqueous solutions: spectroscopic and kinetic properties*  
**A. Torreggiani**, M. Tamba, A. Trincherò, S. Bonora  
Journal of Molecular Structure (2005) 744-747, 759
4. *DSC study on the interactions between DDT and model membranes*  
M. Reggiani, S. Bonora, and **A. Torreggiani**  
The Italian Journal of Biochemistry, 54 (1-2) (2005), 134.
5. *Free radical scavenging and metal chelating activity of some therapeutic heterocyclic agents*,  
M. Tamba and **A. Torreggiani**,  
Trends in Heterocyclic Chemistry, 10 (2005) 115.
6. *Investigation on radical-based damage of RNase A in aqueous solution and lipid vesicles*  
**A. Torreggiani**, M. Tamba, I. Manco, M.R. Faraone-Mennella C. Ferreri, C. Chatgililoglu  
Biopolymers (2006); 81, 39.
7. *Experimental and theoretical Raman investigation on interactions of Cu(II) with histamine*  
**A. Torreggiani**, A. Degli Esposti, M. Tamba, G. Marconi and G. Fini  
J. Raman Spectrosc. (2006) 37, 291.
8. *Di-n-propylsulfoxide (DPSO) effect on the thermal transitions of liposomes*,  
M. Reggiani, S. Bonora, and **A. Torreggiani**  
The Italian Journal of Biochemistry, 55 (2006), 115
9. *Study of radical-induced damages on RNase A transferable to membranes: some insights by Raman spectroscopy*,  
**A. Torreggiani**, M. Tamba, I. Manco, M.R. Faraone-Mennella, C. Ferreri and C. Chatgililoglu,  
The Italian Journal of Biochemistry, 55, (2006) 155
10. *pH-sensitive copper(II) binding mode of carcinine: some insights by vibrational spectroscopy*,  
M. Reggiani, **A. Torreggiani**, A. Tinti, and S. Bonora,  
The Italian Journal of Biochemistry, 55, (2006) 81
11. *The reaction of hydrogen atoms with methionine residues: a model of reductive radical stress causing tandem protein-lipid damage*,  
C. Ferreri, I. Manco, M. R. Faraone-Mennella, **A. Torreggiani**, M. Tamba, S. Manara and C. Chatgililoglu,

ChemBioChem (2006), 7, 1738

12. *Vibrational Investigation on the copper(II) binding mode of carcinine and its pH dependence*,  
**A. Torreggiani**, M. Reggiani, I. Manco, A. Tinti,  
J. Mol. Struct. (2007) 834-836, 294-301
13. *Structural Study of the Zinc and Cadmium Complexes of a Type 2 Plant (Quercus suber) Metallothionein: Insights by Vibrational Spectroscopy*,  
J. Domenèch, A. Tinti, M. Capdevila, S. Atrian, **A. Torreggiani**,  
Biopolymers, (2007) 86, 240-248
14. *A DSC and Raman study of the interaction between tricresyl phosphates (TCP) and phospholipid liposomes*,  
Sergio Bonora, Andrea Trincherò, **Armida Torreggiani**, Maurizio Tamba,  
Croatica Chemical Acta (2007) 80, 81-89.
15. *Radical damage involving sulfur-containing enzymes and membrane lipids*,  
**A. Torreggiani**, M. Tamba, C. Ferreri,  
Protein and peptide letters, (2007), 14, 716-722
16. *Effect of Lysozyme and Bovine Serum Albumine on the thermal behaviour of DMPC liposomes*,  
M. Di Foggia, S. Bonora, and **A. Torreggiani**,  
The Italian Journal of Biochemistry (2007), 56, p. 139.
17. *Raman study of the sulfoxide effect on the thermal denaturation of Lysozyme*,  
M. Di Foggia, S. Bonora, **A. Torreggiani**, I. Manco,  
The Italian Journal of Biochemistry (2007), 56, p. 187.
18. *Calorimetric and spectroscopic study on different  $\gamma$ -irradiated poly- $\epsilon$ -caprolactone / hydroxyapatite (PCL/HA) composite biomaterials*,  
Di Foggia M, Corda U, **Torreggiani A**, Taddei P, Fagnano C,  
Nanotechnology for Functional Repair and Regenerative Medicine, eds. A. Ravaglioli, A. Krajeski,  
CNR (2007), Rome, pp. 174-181.
19. *Vibrational spectroscopy characterization of self-assembling oligopeptides*  
Di Foggia M, Fagnano C, Taddei P, **Torreggiani A**, Dettin M, Tinti A  
Nanotechnology for Functional Repair and Regenerative Medicine, eds. A. Ravaglioli, A. Krajeski,  
CNR (2007), Rome, pp. 286-291.
20. *Research progress on metallothioneins: insights into structure, metal binding properties and molecular function by spectroscopic investigations*  
J. Domenèch, A. Tinti, **A. Torreggiani**,  
Biopolymer Research Trends, eds. T.S. Nemeth, Nova Science Publishers Inc (NY) (2008), 11-48
21. *Comparative insight into the Zn(II)-, Cd(II)- and Cu(I)-binding features of the protozoan Tetrahymena pyriformis MT1 metallothionein*  
J. Domènèch, R. Bofill, A. Tinti, **A. Torreggiani**, S. Atrian, M. Capdevila,  
BBA – Proteins and Proteomics (2008) 1784, 693-704.
22. *The reductive desulfurisation of Met and Cys residues in bovine RNase A is associated with trans lipids formation in a mimetic model of biological membranes*,  
C. Ferreri, C. Chatgililoglu, **A. Torreggiani**, A. M. Salzano, G. Renzone, A. Scaloni  
Journal of Proteome Research (2008) 7, 2007–2015.

23. *Spectroscopic and pulse radiolysis studies of the antioxidant properties of (+) catechin: metal transition chelation and oxidizing radical scavenging*,  
**A. Torreggiani**, Z. Jurasekova, S. Sanchez-Cortes, M. Tamba  
 J. Raman Spectrosc. 2008; 39: 265–275
24. *Vibrational study of auto-assembling oligopeptides for biomedical applications*,  
 A. Tinti, M. Di Foggia, P. Taddei, **A. Torreggiani**, M. Dettin, C. Fagnano,  
 J. Raman Spectrosc. 2008; 39: 250–259
25. *Effect of sulfoxides on the thermal denaturation of hen Lysozyme: a calorimetric and Raman study*  
**A. Torreggiani**, M. Di Foggia, I. Manco, A. De Maio, S.A. Markarian, and S. Bonora  
 J. Mol. Struct. (2008) DOI10.1016/j.molstruc.2008.03.007
26. *Structural lesion to RNase A caused by reductive stress: assessment by Raman Spectroscopy*  
**A. Torreggiani**  
 Spectroscopy 2008; 22: 279-286.
27. *Raman and Surface-Enhanced Raman Scattering (SERS) investigation of the quercetin interaction with metals: evidence of structural changing processes in aqueous solution and on metal nanoparticles*  
 Z. Jurasekova, **A. Torreggiani**, M. Tamba, S. Sanchez-Cortes, J.V. Garcia-Ramos  
 J. Mol. Struct. (2008) , DOI: 10.1016/j.molstruc.2008.07.025
28. *Raman study of in vivo synthesized Zn(II)-metallothionein complexes: structural insight into metal clusters and protein folding*  
**A. Torreggiani**, J. Domènech, S. Atrian, M. Capdevila, A. Tinti  
 Biopolymers (2008) DOI 10.1002/bip.21063
29. *Biomimetic chemistry on tandem protein/lipid damages under reductive radical stress*  
 S.Atrian, K.Bobrowski, M. Capdevila, C. Chatgililoglu, C. Ferreri, C. Houée-Levin, A. M.Salzano, A. Scaloni, **A. Torreggiani**  
 Chimia 62 (2008) 1-7 (DOI 10.2533/chimia.2008.1)

### **Communications to National and International Congresses (from 2005 up to now)**

- 8<sup>TH</sup> EUROPEAN CONFERENCE ON MOLECULAR ELECTRONICS (ECME8), CNR Area della Ricerca, Bologna, Italy, 29 June-2 July 2005, pg. 221.  
**Cu(II)-histamine polymer: a joint experimental and theoretical Raman investigations**  
**A. Torreggiani** and A. Degli Esposti.
- EUCMOS XXVIII (European Congress on Molecular Spectroscopy), Krakow (Poland), September 3-8, 2006,  
**Vibrational study of the copper(II)-carcine complexes and tautomerism of imidazole side chain.**  
**A. Torreggiani**, M. Reggiani, and A. Tinti
- 3<sup>RD</sup> INTERNATIONAL CONFERENCE ON POLYPHENOLS APPLICATIONS IN NUTRITION AND HEALTH, October 26-27 2006, Malta, Book of Abstracts p.88  
**Structure-property studies on the antioxidant activity of the flavonoid quercetin**  
 M. Tamba, **A. Torreggiani**, M. D'Angelantonio, J.V. García-Ramos, S. Sánchez-Cortés
- XIII CONGRESSO NAZIONALE DELLA SOCIETÀ ITALIANA PER LE RICERCHE SULLE RADIAZIONI (SIRR), 21-24 novembre 2006, Bologna, Book of Abstracts p. 61

**Nanoparticelle di Ag generate mediante radiolisi gamma: applicazioni nella spettroscopia SERS**

M. Tamba, A. Torreggiani, M. D'Angelantonio, S. Sánchez-Cortés, J. V. García-Ramos

5. XIII CONGRESSO NAZIONALE DELLA SOCIETÀ ITALIANA PER LE RICERCHE SULLE RADIAZIONI (SIRR), 21-24 novembre 2006, Bologna, Book of Abstracts p. 35  
**Danno radicalico di proteine contenenti residui solforati e conseguente alterazione delle membrane lipidiche**  
A. Torreggiani, I. Manco, J. Domenech, M. Tamba, C. Ferreri and C. Chatgililoglu.
6. 4<sup>TH</sup> NANOSPAIN WORKSHOP, 12-15 March 2007, Sevilla, Spain  
**Preparation of Ag nanoparticles by  $\gamma$ -irradiation: Application to Surface-enhanced Raman Detection of fungicides**  
S. Sanchez-Cortes, A. Torreggiani, M. D'Angelantonio, J. V. Garcia-Ramos, M. Tamba
7. CONGRESSO NAZIONALE BIOMATERIALI, Bologna 28-29 maggio 2007  
**Caratterizzazione infrarossa e Raman di oligopeptidi autoassemblanti**  
M. Di Foggia, C. Fagnano, P. Taddei, A. Torreggiani, M. Dettin, A. Tinti
8. XX CONGRESSO GNSR, Catania, 25-29, June 2007, Book of Abstracts p. 71  
**Role of oxidizing radicals in damaging flavonoids and their metal complexes: some insights by spectroscopic and pulse radiolysis technique**  
A. Torreggiani, M. Tamba, M. D'Angelantonio, Z. Jurasekova, S. Sanchez-Cortes, J.V. Garcia-Ramos
9. XX CONGRESSO GNSR, Catania, 25-29, June 2007, Book of Abstracts p. 35  
**Sulfur-containing proteins under radical stress: damage selectivity and tandem radical potential**  
A. Torreggiani, J. Domènech, C. Ferreri, C. Chatgililoglu
10. XX CONGRESSO GNSR, Catania, 25-29, June 2007, Book of Abstracts p.74  
**Effect of metal binding ( $Zn^{+2}$  or  $Cd^{+2}$ ) on the secondary structure and metal clusters of *in vivo*-synthesized plant QsMT metallothionein**  
A.Tinti, J. Domènech, S. Atrian, M. Capdevila, A. Torreggiani
11. XX CONGRESSO GNSR, Catania, 25-29, June 2007, Book of Abstracts p. 38  
**Vibrational study of autoassembling oligopeptides for biomedical applications**  
A. Tinti, M. Di Foggia, P. Taddei, A. Torreggiani, M. Dettin, C. Fagnano
12. XX CONGRESSO GNSR, Catania, 25-29, June 2007, Book of Abstracts p. 73  
**IR and Raman study of the tautomeric equilibrium of carcinine: influence of copper binding and pH**  
A. Torreggiani, M. Reggiani, I. Manco, V. Tugnoli, A. Tinti
13. XII EUROPEAN CONFERENCE ON SPECTROSCOPY OF BIOLOGICAL MOLECULES (ECSBM) Paris, 1-6 September 2007. Book of Abstracts p. 314  
**Interactions between Metals and Flavonoids: Spectroscopic and Pulse Radiolysis Studies**  
A. Torreggiani, M. Tamba, Z. Jurasekova, M. D'Angelantonio, J.V. Garcia-Ramos and S. Sanchez-Cortez
14. XII EUROPEAN CONFERENCE ON SPECTROSCOPY OF BIOLOGICAL MOLECULES (ECSBM) Paris, 1-6 September 2007, Book of Abstracts p. 153  
**Structural Lesions of Sulfur-containing Proteins caused by Radical Stress: Assessment and Tandem Radical Potential**  
A. Torreggiani, J. Domènech, C. Ferreri, C. Chatgililoglu

15. 11° ANNUAL SEMINAR AND MEETING ON CERAMICS CELLS AND TISSUES Faenza 2-5 ottobre 2007  
**Vibrational spectroscopy characterisation of self-assembling oligopeptides**  
M. Di Foggia, C. Fagnano, P. Taddei, **A. Torreggiani**, M. Dettin, A. Tinti
16. 11° ANNUAL SEMINAR AND MEETING ON CERAMICS CELLS AND TISSUES, Faenza 2-5 ottobre 2007,  
**Spectroscopic and calorimetric study on different gamma-irradiated poly-epsilon-caprolattone/hydroxyapatite (PCL/HA) composite biomaterials.**  
M. Di Foggia, U. Corda, **A. Torreggiani**, P. Taddei, C. Fagnano
17. SIGMA-ALDRICH Young Chemists Symposium - 7° SAYCS - Riccione, 22-24 ottobre 2007,  
Pagina P25  
**Analisi spettroscopica e calorimetrica di biomateriali composti a base di poli-ε caprolattone/idrossiapatite trattati con raggi gamma**  
U. Corda, M. Di Foggia, **A. Torreggiani**, P. Taddei, C. Fagnano
18. XIV CONVEGNO NAZIONALE DELLA SOCIETÀ ITALIANA PER LE RICERCHE SULLE RADIAZIONI (SIRR) Trieste, 24-27 Giugno 2008, p. 11.  
**Effetti del trattamento con raggi gamma su biomateriali a base di poli-ε-caprolattone / idrossiapatite**  
M. Di Foggia, U. Corda, P. Taddei, C. Fagnano, **A. Torreggiani**
19. XIV CONVEGNO NAZIONALE DELLA SOCIETÀ ITALIANA PER LE RICERCHE SULLE RADIAZIONI (SIRR) Trieste, 24-27 Giugno 2008, p. 13  
**“Il linguaggio della ricerca”: un progetto di divulgazione che trasforma gli studenti in comunicatori scientifici”**  
S. Albertazzi, U. Corda, C. Ferreri, **A. Torreggiani**, V. Vitale, M. D'Angelantonio.
20. XIV CONVEGNO NAZIONALE DELLA SOCIETÀ ITALIANA PER LE RICERCHE SULLE RADIAZIONI (SIRR) Trieste, 24-27 Giugno 2008, p. 12  
**Metallothioneine sottoposte a stress radicalico: alterazione della struttura e induzione di processi di desolforizzazione**  
**A. Torreggiani**, J. Domènech, R. Orihuela, C. Ferreri, M. Tamba, S. Atrian, M. Capdevila, C. Chatgialiloglu
21. XXI INTERNATIONAL CONFERENCE ON RAMAN SPECTROSCOPY (ICORS), 17th-22<sup>nd</sup> August 2008, London, pp. 825-826  
**Metal-Metallothionein complexes: insights into structural features by Raman spectroscopy**  
**A. Torreggiani**, A. Tinti, J. Domènech, M. Capdevila, S. Atrian
22. XXI International Conference on Raman Spectroscopy (ICORS), 17th-22<sup>nd</sup> August 2008, London, pp. 836-837  
**Structural damages of sulfur-containing proteins caused by radical stress: assessment by Raman spectroscopy and tandem radical potential**  
**A. Torreggiani**, C. Ferreri, C. Chatgialiloglu
23. XXI INTERNATIONAL CONFERENCE ON RAMAN SPECTROSCOPY (ICORS), 17th-22<sup>nd</sup> August 2008, London, pp. 709-710  
**Metal chelation and radical scavenging ability of catechin: spectroscopic and pulse radiolysis studies**  
**A. Torreggiani**, Z. Jurasekova, S. Sanchez-Cortes, S. Bonora, M. Tamba
24. XXIX EUROPEAN CONGRESS ON MOLECULAR SPECTROSCOPY (EUCMOS), Opatija (Croatia), August 31-September 5 (2008), p. 99

**Vibrational characterisation of self-assembling oligopeptides for tissue engineering on TiO<sub>2</sub> surfaces**

M. Di Foggia, C. Fagnano, P. Taddei, **A. Torreggiani**, M. Dettin, S. Sanchez-Cortes, A. Tinti.

25. XXIX EUROPEAN CONGRESS ON MOLECULAR SPECTROSCOPY (EUCMOS), Opatija (Croatia)  
August 31-September 5 (2008), p. 141

**Raman spectroscopy investigation on metal-Metallothionein complexes**

A. Tinti, J. Domènech, S. Atrian, M. Capdevila, **A. Torreggiani**