UNIVERSITÀ
DEGLI STUDI
FIRENZE

DIPARTIMENTO
DI CHIMICA
"UGO SCHIFF"

CURRICULUM VITAE ET STUDIORUM
Dr. EMILIANO CARRETTI

- May 10, 1972: born in Florence, Italy.
- April 1999 Chemistry Degree, University of Florence, 110/110 *cum laude*.
- April 2003: PhD in Cultural Heritage Conservation Science.
- 2003-2015: Post Doc and Research fellowship at the Chemistry Department & CSGI of the University of Florence.
- 2015-present: Researcher at the Chemistry Department of the University of Florence.
- 2001-2002: guest at the Chemistry Department of the Georgetown University, Washington, DC, USA, under the supervision of Prof. R.G. Weiss.
- Member of the Italian Chemical Society.
- Invited lecturer at Georgetown University (WDC, USA), Lafayette College (PA, USA) and Vilnius University (Lituania), Zaragoza University (Spain), Croatian Conservation Institute, Zagreb (Croatia).
- The scientific research mainly deals with the chemistry of dispersed systems and interfaces and of nanomaterials. In particular, the attention has been focused on nanoscience and nanotechnology, especially concerning synthesis, characterization, technological application and analytical evaluation of the performances of dispersed systems like microemulsions, micellar solutions and gels with particular emphasis to the potentialities of these systems in the field of cultural heritage conservation. Part of the research activity of Dr. Emiliano Carretti is also dedicated to the study of the rheological properties of materials both in the linear and in the non-linear viscoelastic range.
  Dr. Carretti is author of 68 scientific publications and Reviews on Peer Reviewed high qualified Scientific Journals and of an Italian Patent.

List of Publications

73. **E. Carretti**, C. Miliani, L. Dei, P. Baglioni, Oil-in-Water Microemulsions to solubilize Acrylic Copolymers: Application in Cultural Heritage Conservation, *Progress in Colloid and Polymer Science*, **2001**, *118*, 63-67.

74. P. Baglioni, **E. Carretti**, L. Dei and R. Giorgi, Nanotechnology for Wall Paintings Conservation, in Self-Assembly, B. H. Robinson Ed., IOS Press Ohmsha, Amsterdam, **2003**, pp. 32-41.
75. **E. Carretti**, L. Dei, P. Baglioni, Solubilization of Acrylic and Vynil Polymers in Nanocontainer Solutions. Application of Microemulsions and Micelles to Cultural Heritage Conservation, *Langmuir*, **2003**, *19*, 7867-7872.
76. **E. Carretti**, L. Dei, P. Baglioni, R. G. Weiss, Synthesis and Characterization of Gels from Polyallylamine and Carbon Dioxide as Gellant, *J.Am.Chem.Soc.*, **2003**, *125*, 5121-5129.
77. **E. Carretti**, L. Dei, Physicochemical Characterization of Acrylic Polymeric Resins coating Porous Materials of Artistic Interest, *Progr. Org. Coat.*, **2004**, *49*, 282-289.
78. **E. Carretti**, A. Macherelli, L. Dei, R. G. Weiss, Rheoreversible Polymeric Organogels: The Art of Science for Art Conservation, *Langmuir*, **2004**, *20*, 8414-8418.
79. **E. Carretti**, L. Dei, P. Baglioni, Aqueous Polyacrylic Acid Based Gels: Physicochemical Properties and Applications in Cultural Heritage Conservation, *Progress in Colloid and Polymer Science*, **2004**, *123*, 280-283.
80. **E. Carretti**, F. Rosi, C. Miliani, L. Dei, Monitoring of Pictorial Surfaces by midFTIR Reflectance Spectroscopy: Evaluation of the Performance of Innovative Colloidal Cleaning Agents, *Spectroscopy Letters*, **2005**, *38*, 459-475.
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82. M. George, C. Luo, C. Wang, **E. Carretti**, L. Dei, R. G. Weiss, Chemically and Physically Induced (Reversible) Gelation of Organic Liquids by Monomeric and Polymeric Gelators, *Macromolecular Symposia*, **2005**, *227*, 173-182.
83. G. Palazzo, D. Fiorentino, G. Colafemmina, A. Ceglie, **E. Carretti**, L. Dei, P. Baglioni, Nanostructured fluids based on propylene carbonate/water mixtures, *Langmuir*, **2005**, *21*, 6717-6725.
84. **E. Carretti**, L. Dei, Gels as Cleaning Agents in Cultural Heritage Conservation, in Molecular Gels: Materials with Self-Assembled Fibrillar Networks, P. Terech and R. G. Weiss Eds., Springer, **2005**, New York, USA, pp. 929-938.
85. **E. Carretti**, L. Dei, R. G. Weiss, Soft matter and art conservation. Rheoreversible gels and beyond, *Soft Matter*, **2005**, *1*, 17-22.
86. B. Rosenzweig, **E. Carretti**, M. Picollo, P. Baglioni, L. Dei, Use of Mid-Infrared Fiber-Optic Reflectance Spectroscopy (FORS) to evaluate efficacy of

nanostructured systems in wall painting conservation, *Applied Physics A*, **2006**, *83*, 669-673.

87. **E. Carretti**, R. Giorgi, D. Berti, P. Baglioni, Oil-in-water nanocontainers as low environmental impact cleaning tools for works of art: two case studies, *Langmuir*, **2007**, *23*, 6396-6403.
88. S. Grassi, **E. Carretti**, P. Pecorelli, F. Jacopini, P. Baglioni, L. Dei, The conservation of the Vecchietta's wall paintings in the Old Sacristy of Santa Maria della Scala in Siena: chemical characterization and innovative cleaning methodology, *Journal of Cultural Heritage,* **2007**, *8*, 119-125.
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90. P. Lo Nostro, R. Ramsch, E. Fratini, M. Lagi, F. Ridi, **E. Carretti**, M. Ambrosi, B. W. Ninham, P. Baglioni, Organogels from a Vitamin C-based Surfactant, *J. Phys. Chem. B*, **2007**, *111*, 11714-11721.
91. P. Lo Nostro, M. Ambrosi, E. Fratini, F. Ridi, **E. Carretti**, M. Lagi, V. Alfredsson, B.W. Ninham, P. Baglioni, Nanoassemblies from Vitamin C Derivatives, Nanotech 2007, Technical Proceedings of the 2007 NSTI Nanotechnology Conference and Trade Show, Santa Clara, CA, USA, May 20-24, **2007**, Volume 2, pp. 9-12.
92. **E. Carretti**, L. Dei, R. G. Weiss, P. Baglioni, A new class of gels for the conservation of painted surfaces, *Journal of Cultural Heritage,* **2008**, *9*, 386-393.
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96. P. Matteini, L. Dei, **E. Carretti**, N. Volpi, A. Goti, R. Pini, Structural behavior of highly concentrated hyaluronan, *Biomacromolecules,* **2009**, *10*, 1516–1522.
97. P. Baglioni, E. Braccalenti, **E. Carretti**, R. Germani, L. Goracci, G. Savelli, M. Tiecco, Surfactant-based Photorheological Fluids: Effect of the Surfactant Structure, *Langmuir,* **2009***, 25,* 5467–5475.

98. **E. Carretti**, L. Dei, M. Milano, P. Baglioni, Noninvasive physicochemical characterization of two 19th century English ferrotypes, *Journal of Cultural Heritage,* **2009**, *10*, 501-508.
99. **E. Carretti**, E. Fratini, D. Berti, L. Dei, P. Baglioni, Nanoscience for Art Conservation: Oil-inWater microemusions embedded in a Polymeric Network for the Cleaning of Works of Art, *Ang. Chem. Int. Ed.,* **2009**, *48*, 8966-8969.
100. **E. Carretti**, M. Bonini, L. Dei, B. H. Berrie, L. V. Angelova, P. Baglioni, R. G. Weiss, New Frontiers in Materials Science for Art Conservation: Responsive Gels and Beyond, *Accounts of Chemical Research*, **2010**, *43*, 751-760.
101. **E. Carretti**, I. Natali, C. Matarrese, P. Bracco, R. G. Weiss, P. Baglioni, A. Salvini, L. Dei, A new family of high viscosity polymeric dispersions for cleaning easel paintings, *Journal of Cultural Heritage*, **2010**, *11*, 373-380.
102. **E. Carretti**, M. George, R. G. Weiss, Insights into Mechanical Properties of a Silicone Oil Gel with a 'Latent' Gelator, 1-Octadecylamine, and CO_2 as an 'Activator, *Beilstein Journal of Organic Chemistry*, **2010,** *6,* 984–991.
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104. L. Angelova, P. Terech, I. Natali, L. Dei, **E. Carretti**, R. G. Weiss, Cosolvent Gel-like Materials from Partially Hydrolyzed Poly(vinyl acetate)s and Borax, *Langmuir,* **2011**, *27*, 11671–11682.
105. I. Natali, **E. Carretti**, L. Angelova, P. Baglioni, R. G. Weiss, L. Dei, Structural and mechanical properties of "peelable" organoaqueous dispersions with partially hydrolyzed poly(vinyl acetate)-borate networks: applications to cleaning painted surfaces, *Langmuir*, **2011**, *27*, 13226–13235.
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113. R. Giorgi, **E. Carretti,** Cleaning III: Applications and Case Studies, Nanoscience for the Connservation of Works of Art, P. Baglioni and D. Chelazzi Eds., RSC, **2013**, Cambridge, UK, pp. 225-251.
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117. C. Venturini, C. Pomposi, M. Ambrosi, **E. Carretti**, E. Fratini, P. Lo Nostro, P. Baglioni, Effect of the Alkyl Chains and of the Headgroups on the Thermal Behavior of Ascorbic Acid Surfactants Mixtures, *J. Phys Chem. B*, **2014**, *118*, 3053-3062.
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119. F. Giambi, **E. Carretti**, P. Baglioni, L. Dei, Micro-layers of polystyrene film preventing metal oxidation: implications in cultural heritage conservation, *Applied Physics A*, **2014**, *117*, 2025-2032.
120. I. Natali, P. Tempesti, **E. Carretti**, M. Potenza, S. Sansoni, P. Baglioni, L. Dei, Aragonite Crystals Grown on Bones by Reaction of CO_2 with Nanostructured

$Ca(OH)_2$ in Presence of Collagen. Implications in Archaeology and Palaeontology, *Langmuir*, **2014**, *30,* 660-668.

121. P. Baglioni, D. Berti, M. Bonini, **E. Carretti**, L. Dei, E. Fratini, R. Giorgi, Micelle, microemulsions, and gels for the conservation of cultural heritage, *Advances in Colloid and Interface Science*, **2014**, *205*, 361-371.
122. **E. Carretti**, C. Matarrese, E. Fratini, P. Baglioni, L. Dei, Physicochemical characterization of partially hydrolyzed poly(vinyl acetate)-borate aqueous dispersions, *Soft matter*, **2014**, *10*, 4443-4450.
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124. P. Baglioni, **E. Carretti**, D. Chelazzi, Nanomaterials for Art Conservation, *Nature Nanotechnology*, **2015**, *10*, 287-290.
125. P. Lo Nostro, B.W. Ninham, **E. Carretti**, L. Dei, P. Baglioni, Specific anion effects in Artemia salina, *Chemosphere*, **2015**, *135*, 335-340.
126. C. Zafferoni, G. Cioncoloni, M.L. Foresti, L. Dei, E. Carretti, F. Vizza, A. Lavacchi, M. Innocenti, Synergy of cobalt and silver microparticles electrodeposited on glassy carbon for the electrocatalysis of the oxygen reduction reaction: An electrochemical investigation, *Molecules*, **2015**, *20*, 14386-14401.
127. **E. Carretti**, V. Mazzini, E. Fratini, M. Ambrosi, L. Dei, P. Baglioni, P. Lo Nostro, Structure and rheology of gel nanostructures from a vitamin C-based surfactant, *PCCP*, **2016**, *18,* 8865-8873.
128. S. Scarano, **E. Carretti**, L. Dei, P. Baglioni, M. Minunni, Coupling non invasive and fast sampling of proteins from work of art surfaces to surface plasmon resonance biosensing: Differential and simultaneous detection of egg components for cultural heritage diagnosis and conservation, *Biosensors and Bioelectronics*, **2016**, *85*, 83-89.
129. S. Del Buffa, E. Rinaldi, **E. Carretti**, F. Ridi, M. Bonini, P. Baglioni, Injectable composites via functionalization of 1D nanoclays and biodegradable coupling with a polysaccharide hydrogel, *Colloids and Surfaces B: Biointerfaces*, **2016**, *145*, 562-566.
130. **E. Carretti**, V. Mazzini, E. Fratini, M. Ambrosi, L. Dei, P. Baglioni, P. Lo Nostro, Structure and rheology of gel nanostructures from a vitamin C-based surfactant, *PCCP*, **2016**, *18*, 8865-8873.
131. A. Cincinelli, T. Martellini, A. Amore, L. Dei, G. Marrazza, **E. Carretti**, F. Belosi, F. Ravegnani, P. Leva, Measurement of volatile organic compounds (VOCs) in libraries and archives in Florence (Italy), *Science of the Total Environment*, **2016**, *572*, 333-339.

132. C. Berlangieri Chiara, E. Elisabetta, C. Matarrese, **E. Carretti**, R. Traversi, M. Severi, D. Chelazzi, L. Dei, P. Baglioni Piero, Chelators confined into 80pvac-borax highly viscous dispersions for the removal of gypsum degradation layers, *Pure and Applied Chemistry*, **2017**, *89*, 97-109.
133. D. Tatini, F. Sarri, P. Maltoni, M. Ambrosi, **E. Carretti**, B. W. Ninham, P. Lo Nostro, Specific ion effects in polysaccharide dispersions, *Carbohydrate Polymers*, **2017**, *173*, 344-352.
134. S. Scarano, C. Berlangieri, **E. Carretti**, L. Dei, M. Minunni, Tunable growth of gold nanostructures at a PDMS surface to obtain plasmon rulers with enhanced optical features, *Mikrochimica Acta*, **2017**, *184*, 3093-3102.
135. F. Sarri, D. Tatini, M. Ambrosi, **E. Carretti**, B. W. Ninham, L. Dei, P. Lo Nostro, The curious effect of potassium fluoride on glycerol carbonate. How salts can influence the structuredness of organic solvents, *Journal of Molecular Liquids*, **2018**, *255*, 397-405.
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137. A. Suzuki, S. Vettori, S. Giorgi, **E. Carretti**, F. Di Benedetto, L. Dei, M. Benvenuti, S. Moretti, E. Pecchioni, P. Costagliola, Laboratory study of the sulfation of carbonate stones through SWIR hyperspectral investigation, *Journal of Cultural Heritage*, **2018**, 1-3.
138. A. Atrei, F. Benetti, M. Potenza, L. Dei, **E. Carretti**, V. Niccolucci, N. Marchettini, Characterization of organic binders in a 13th century painted woodenpanel: Comparison of ToF-SIMS and Dot-ELISA results, *International Journal of Mass Spectrometry*, **2018**, *430*, 63-68.
139. M. Baglioni, J. Domingues, **E. Carretti**, E. Fratini, D. Chelazzi, R. Giorgi, P. Baglioni, Complex Fluids Confined into Semi-Interpenetrated Chemical Hydrogels for the Cleaning of Classic Art: a Rheological and SAXS Study, *ACS Applied Marterials and Interfaces*, **2018**, *in press*. Doi: 10.1021/acsami.8b01841.
68. C. Berlangieri, G. Poggi, S. Murgia, M. Monduzzi, L. Dei, Luigi, E. Carretti, Structural, rheological and dynamics insights of hydroxypropyl guar gel-like systems, *Colloids and Surfaces B, Biointerfaces*, 2018, *in press*. Doi: 10.1016/j.colsurfb.2018.02.025.
69. L.V. Angelova, C. Matarrese, E. Fratini, R.G. Weiss, L. Dei, E. Carretti, Chelating agents in aqueous, partially-hydrolyzed, poly(vinyl acetate) dispersions crosslinked with borax. Physicochemical characterization and an application, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, *556*, 2018, 61-71. DOI: 10.1016/j.colsurfa.2018.07.044. IF: 2.852 (corresponding author)

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71. T. Lotti, E. Carretti, D. Berti, M.R. Martina, C. Lubello, F. Malpei, Extraction, recovery and characterization of structural extracellular polymeric substancs from anammox granular sludge, *Journal of Environmental Management*, *236*, **2019**, 649-656. DOI: 10.1016/j.jenvman.2019.01.054. IF: 4.449
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73. M. Mamusa, P. Tempesti, A. Bartolini, E. Carretti, A. F. Ghobadi, J. Smets, Y. G. Aouad, P. Baglioni, Associative Properties of Poly(ethylene glycol)-Poly(vinyl acetate) Comb-like Graft Copolymer in Water, *Nanoscale*, **2019**. DOI: 10.1039/C8NR10453K. IF: 7.233

Some of the above-mentioned papers have been highlighted by many scientific journals, websites and newspapers:

- **E. Carretti**, L. Dei, P. Baglioni, Solubilization of Acrylic and Vynil Polymers in Nanocontainer Solutions. Application of Microemulsions and Micelles to Cultural Heritage Conservation, *Langmuir*, **2003**, *19*, 7867-7872.
  This paper was highlighted by:
  -"Restoring the Conserved – Micellar systems remove damaging polymer layers from works of art", by Jane Morris, Nature, Materials Update - 21 August 2003.
- **E. Carretti**, A. Macherelli, L. Dei, R. G. Weiss, Rheo-reversible Polymeric Organogels: The Art of Science for Art Conservation, *Langmuir*, **2004**, *20*, 8414-8418.
  This paper was highlighted by:
  -Nature: "The art of restoration", by David Erhardt, Nature – 23 september 2004;
  -Science News: "Reversible gel restores artwork" by Alexandra Goho, Science News, Vol. 166, No. 17, Oct. 23, 2004;
  -Today's Chemist at Work: "The Art of Oragnogels", by Mark S. Lesney, Today's Chemist at Work, November 2004;
  -Corriere della Sera "Il gel per il restauro che non rovina I dipinti", by Marina Caporlingua, Corriere della Sera Scienza, Dec. 12, 2004.

- **E. Carretti**, L. Dei, R. G: Weiss, Soft matter and art conservation: rheoreversible gels and beyond, *Soft Matter*, **2005**, *1*, 17-22.
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  -Chemical technology "Softly-softly approach to art conservation", Chemical Technology, 2005, 2, T17.
- **E. Carretti**, R. Giorgi, D. Berti, P. Baglioni, Oil-in-water nanocontainers as low environmental impact cleaning tools for works of art: two case studies *Langmuir*, **2007**, *23*, 6396-6403.
  This paper was highlighted by:
  -Nature Nanotechnology. Research Highlights. "Art restoration: Keeping it clean" by Ros Portman Disponibile online sul sito www.nature.com;
  -Softpedia "Nanotechnology recovers renaissance masterpieces" by L. Dorneanu, Science Editor. Disponibile online sul sito http://news.softpedia.com.
  - www.physorg.com: "Nanotechnology restores art masterpieces".
  -www.nanowerk.com: "Nanotechnology to restore Renaissance wall paintings".
  -www.livescience.com: "New potions to clean old masterpieces" by C.Q. Choi.
  -www.foxnews.com: "Fancy salad dressing utilized to clean renaissance art" by C.Q. Choi.
  - www.msnbc.msn.com "Cleaning ancient frescos with salad dressing" by C.Q. Choi.
- **E. Carretti**, S. Grassi, M. Cossalter, I. Natali,G. Caminati, R. G. Weiss, P. Baglioni, L. Dei, Poly(vinyl alcohol)-borax hydro/cosolvent gels. Viscoelastic properties, solubilizing power, and application to art conservation, *Langmuir*, **2009**, *25* , 8656–8662.
  This paper was highlighted by:
  -Nature Materials **2009**, *8*, 446.
- **E. Carretti**, E. Fratini, D. Berti, L. Dei, P. Baglioni, Nanoscience for Art Conservation: o/w microemusions embedded in a Polymeric Network for the Cleaning of Works of Art, *Angewandte Chemie*, **2009**, *48*, 8966-8969.
  This paper was highlighted by:
  -http://www.rsc.org/chemistryworld/News/2009/October/22100901.asp
  -http://www.nature.com/nnano/reshigh/2009/1009/full/nnano.2009.350.html (30 October 2009) | doi: 10.1038/nnano.2009.350. "Nanocontainers: Clean and spotless art" by Ai Lin Chun.
- Natali, **E. Carretti**, L. Angelova, P. Baglioni, R. G. Weiss, L. Dei, Structural and mechanical properties of "peelable" organoaqueous dispersions with partially hydrolyzed poly(vinyl acetate)-borate networks: applications to cleaning painted surfaces, *Langmuir*, **2011**, *27*, 13226–13235.

-The cover of the issue #21 (vol 27) of the journal *Langmuir* had this paper as subject.

- Natali, P. Tempesti, **E. Carretti**, M. Potenza, S. Sansoni, P. Baglioni, L. Dei, Aragonite crystals grown on bones by reaction of CO_2 with nanostructured $Ca(OH)_2$ in presence of collagen implications in archaeology and palaeontology, *Langmuir*, **2014**, *30, 660-668*.
  -This paper was selected by the American Chemical Society in the frame of **ACS Editor's Choice**.
  This paper was highlighted by:
  -ACS News Service Weekly PressPac: "Seashells inspire new way to preserve bones for archeologists, paleontologists", January 22, **2014**.
  -"A New Way To Preserve Old Bones by Neil Savage", Chemical and Engineering News, January 23, **2014**.
  -"Seashells inspire new way to preserve bones for archeologists, paleontologists", Phys Org News, May 3, **2014**.
  -"Scientists mimic seashells' technique to preserve ancient bones", Science News, January 22, **2014**.
  -"Dalla chimica un aiuto all'archeologia", La Nazione Firenze, 28 Gennaio **2014**.
  -"Come rinforzare le ossa di santi e animali estinti", by Simona Regina, il Venerdi di Repubblica, 28 Febbraio **2014**.

Italian Patent

E. Carretti, L. Dei, P. Baglioni, "Microemulsioni ed emulsioni di olio in acqua, loro uso per la solubilizzazione di resine polimeriche e impacchi contenenti dette microemulsioni ed emulsioni" Italian Patent, n° FI / 99A000071.

Invited Lecturers

1. **E. Carretti**: "Nanotechnologies based cleaning systems: an innovative tool in cultural heritage conservation", Chemistry Department, Georgetown University, Washington, DC, USA, 27 March **2007**.
2. **E. Carretti:** "The contribution of nanotechnologies in Cultural Heritage Conservation" Scuola: "Scientific Research of the Materials and Technologies of the Cultural Heritage" Vilnius, Lituania, 3-7 March **2008**.
3. **E. Carretti,** P. Baglioni, L. Dei, I. Natali: "Innovative gels for the cleaning of gilded surfaces" in the frame of the workshop "Reflected Metals. Metallic foils in

mural paintings. Technique, Degradation and Conservation. Some case study" Ferrara, Salone del restauro, 25-28 March **2009**.

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Sesto Fiorentino March 21, 2018

Dott. Emiliano Carretti