



Sacha De Carlo



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Personal Data:

Civil stand : married

Origin : Swiss and Italian

Birth date : September 27th, 1974

Birth place : Locarno (Ticino), Switzerland

U.S. Visa status : Lawful Permanent Resident

Education:

- 1979 – 1989 : School in Minusio, Switzerland
- 1989 – 1993 : Scientific high-school in Locarno, Switzerland
- 1993 – 1998 : B. Sc. in biology and physics, Université de Lausanne, Switzerland
- 1998 – 1999 : Diploma work at the Lab. d'Analyse Ultrastructurale, Bât. de Biologie de l'Université de Lausanne, Switzerland
- 1999 – 2002 : PhD in Biophysics, Centre de Microscopie Electronique, Centre 1, Université de Lausanne, Switzerland

Obtained degrees:

- November 2002 : PhD (biophysics), UNI Lausanne, Switzerland
- March 1999 : Biology diploma, UNI Lausanne, Switzerland
- July 1998 : Double-degree B. Sc in biology and physics, UNI Lausanne
- June 1993 : High-school living certificate, scientific type, Switzerland

Work Experience:

- September 08 – : Assistant Professor, Chemistry Department, City College and CUNY Graduate Center, New York
Structural Biology and Biophysics Programs, Transcription, its regulation and activation in Bacteria and Archaea
- October 06 – August 08 : Senior post-doctoral fellow, Mol., Cell and Developmental Biology Department, University of Colorado, Boulder
- January 04 – Sept. 06 : Visiting post-doctoral fellow with Howard Hughes Medical Institute, Molecular and Cell Biology Department, University of California, at Berkeley, USA
Structural characterization of prokaryotic enhancer-binding Proteins, the σ^{54} -dependent transcriptional activators NtrC (*S. typhimurium*) and NtrC1 (*A. aeolicus*)

- April '99 – November 02 : PhD work in the Electron Microscopy Center of Lausanne University, Switzerland
The major interests were the development and applications of the cryo-negative staining technique in biological 3D EM
- August '98 – March '99 : Diploma work in cryo-electron microscopy, studies of the effect of trehalose and sucrose on thin layer preparations for cryo-electron microscopy – UNI Lausanne, Switzerland
- November '97 – June '98 : Practical work in atomic force microscopy (AFM) applied in biology; supervised by Dr. Sandor Kasas, at the Institut de Physique de la Matière Condensée (IPMC), group of living matter directed by Professor Giovanni Dietler Bâtiment des Sciences Physiques – Lausanne, Switzerland
- July – October 1997 : Short research fellowship in cryo-electron microscopy supervised by Dr. Marc Adrian and Professor Jacques Dubochet – Lausanne, Switzerland
- February – June 1997 : Practical work in microbiology and electron microscopy supervised by Prof. E. Kellenberger and D. Karamata at the Institute of Genetics and Biology of Microbs, Lausanne, Switzerland

Teaching:

Undergraduate

- Spring 2009, 2010: Physical Biochemistry [CHEM 33500], P. Biochem. Lab
Ranked #1 in Chemistry Dept. Assessment 2009
Ranked #1 in Student evaluation 2009
- Fall 2009, 2010: Biochemistry I [CHEM 45902]

Graduate

- Spring 2009, 2010: Physical Biochemistry [BCIM 77000], guest lecturer
- Fall 2009: Molecular Biophysics [U 87901], guest lecturer

Extra-professional Activities:

October 2000 : Parabolic Flight Project organized by the European Space Administration (ESA), in Bordeaux, France

General microscopy and image processing consultant

September 2000 : EMBO Practical Course on Cryo-electron Microscopy and Three Dimensional Image Reconstruction, EMBL Heidelberg, Germany

July 1998 : EMBO Practical Course on Atomic Force Microscopy in Biology, Biozentrum der Universität, Basel, Switzerland

Awards and honors:

Graduate: 2003, PhD thesis excellence awarded by Société Académique Vaudoise, Lausanne, Switzerland.

Post-graduate: 2007, BioCAT Research Highlight, Advanced Photon Source, Argonne National Laboratory.

Journal covers: JSB 6/2002, JSB 1/2004, Genes & Dev 6/2006, Structure 4/2007.

Journal reviews: Nature Structural & Molecular Biology, J. of Structural Biology, Micron, Ultramicroscopy

Active collaborations:

- **Prof Tracy Nixon** – Department of Biochemistry and Molecular Biology at Penn State University, University Park, PA 16802
- **Prof David Dubnau, Prof Matt Neiditch** – UMDNJ, New Jersey Medical School Newark, NJ 07103
- **Prof Dylan Taatjes** – Department of Chemistry and Biochemistry, University of Colorado, Boulder, CO 80309

References:

- **Prof Andreas Hoenger** (post-doc supervisor, PhD evaluation committee)
Dept. of Molecular, Cell and Developm. Biology, University of Colorado
Boulder, CO 80309-0347
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- **Prof Eva Nogales** (post-doc supervisor)
Howard Hughes Medical Institute
University of California at Berkeley
Berkeley, CA 94720
Phone: (510) 642-0557
E-mail : ENogales@lbl.gov
- **Prof Jacques Dubochet** (retired, PhD supervisor)
Laboratoire d'Analyse Ultrastructurale, Bâtiment de Biologie – Niveau 1
Université de Lausanne, CH-1015 Lausanne
Phone: +41 21 6924280
E-mail : Jacques.Dubochet@unil.ch
- **Prof B. Tracy Nixon** (collaborator)
Dept. of Biochemistry and Molecular Biology
The Pennsylvania State University, University Park, PA 16802
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E-mail : btn1@psu.edu
- **Prof David Wemmer** (collaborator)
Department of Chemistry, 531 Stanley Hall
University of California at Berkeley
Berkeley, CA 94720
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Social activities:

- Microscopy Society of America
- American Society of Biochemistry and Molecular Biology
- Biophysical Society of America
- Swiss Society of Biochemistry, also member of biophysics section
- Swiss Society for Optics and Microscopy

Supplementary knowledge:

Informatics:

Hardware & Software: PC, Macintosh and UNIX Workstations

System administration: PC Windows 95-98, ME, NT/2000, XP, PC Linux; Macintosh OS 7-9, OS X; UNIX (SGI Irix, Digital Unix)

Networking: WEB applications (Macromedia Dreamweaver), LAN network maintenance

Image Processing:

SPIDER & WEB, IMAGIC, EMAN, Adobe Photoshop, NIH Image, ImageJ, Adobe Photoshop Lightroom

Languages

Italian: mother tongue,

French and English: fluently spoken and written,

German: good knowledge.

Burmese: beginner.

Other responsibilities

2008 - present: *CUNY representative for the NYSBC Cryo-EM Operations Committee*

2009 - present: *CCNY pre-major faculty adviser*

2010 - present: *CCNY EM Committee, member*

2010 - present: *CCNY Core Facilities Committee, member*

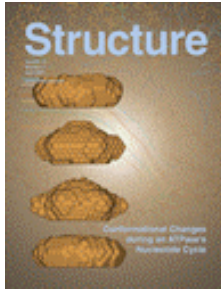
Publications:

1. De Carlo S., Lin S.-C., Taatjes D., and A. Hoenger (2010). Molecular Basis of Transcription Initiation in Archaea. *Transcription* **1**(2). In press.
2. S. De Carlo and H. Stark (2010). Cryo-negative staining of biological macromolecules. *Methods in Enzymology* **481**. In press.
3. S. De Carlo and R. Harris (2010). Negative staining and cryo-negative staining of macromolecules and viruses for TEM. *Micron* **41**. In press.
4. B. Vijai Shankar, S. R. Jadhav, P. Pradhan, S. De Carlo and G. John (2010). Adhesive Vesicles through Adaptive Response of a Biobased Surfactant. *Angew. Chemie*. In press.
5. J. Batchelor, M. Doucleff, C. Lee, K. Matsubara, S. De Carlo, C. J. Heideker, M. Lamers, J. G. Pelton, D. E. Wemmer (2008). Structure and regulatory mechanism of *A. aeolicus* NtrC4: variability and evolution in bacterial transcriptional regulation. *J. Mol. Biol.* **384**: 1058-1075.
6. De Carlo S., Boisset N., and A. Hoenger (2008). High-resolution Single-particles 3-D Analysis on GroEL prepared by Cryo-negative Staining. *Micron* **39**: 934-943.
7. De Carlo S. Cryo-electron microscopy: plunge freezing. In: ***Handbook of Cryopreparation Methods for Electron Microscopy***. Ed. CRC Press (2008). ISBN: 9780849372278.
8. De Carlo S. Cryo-negative staining. In: ***Handbook of Cryopreparation Methods for Electron Microscopy***. Ed. CRC Press (2008). ISBN: 9780849372278.
9. Chen B., Doucleff M., Wemmer D., De Carlo S., Huang H., Nogales E., Hoover T., Kondrashkina E., Guo L., and B. T. Nixon (2007). ATP Ground- and Transition States of the Enhancer Binding AAA+ ATPases Support Complex Formation with their Target Protein, σ^{54} . *Structure* **15**: 429-440.

10. Kostek S., Grob P., De Carlo S., Lipscomb S., Garczarek F., and E. Nogales (2006). Molecular Architecture and Conformational Flexibility of human RNA Polymerase II. *Structure* **14**: 1691-1700.
11. De Carlo S., Chen B., Hoover T., Kondrashkina E., Nogales E., and B. T. Nixon (2006). The structural basis of regulated assembly and function of the transcriptional activator NtrC. *Genes & Dev.* **20**: 1485-1495.
12. Jawhari A., Uhring M., De Carlo S., Crucifix C., Tocchini-Valentini G., Moras D., Schultz P. and Poterszman A. (2006). Structure and oligomeric state of human transcription factor TFIIE. *EMBO Rep.* **7**: 500-505.
13. Jonić S., Sorzano C. O. S., Thévenaz P., El-Bez C., De Carlo S. and Unser M. (2005). Spline-based image-to-volume registration for three-dimensional electron microscopy. *Ultramicroscopy* **103**: 303-317.
14. Unser M., Sorzano C. O. S., Jonić S., El-Bez C., De Carlo S., Thévenaz P., Conway J., Steven A. C. and Trus B. L. (2005). Spectral Signal-to-Noise Ratio and Resolution Assessment of 3-D Reconstructions. *J. Struct. Biol.* **149**: 243-255.
15. De Carlo S., Fiaux H., and A Marca-Martinet C. (2004). Electron Cryo-Microscopy Reveals the Mechanism of Action of Propranolol on Artificial Membranes. *J. Lip. Res.* **14**: 61-76.
16. Spehner D., De Carlo S., Drillien R., Weiland F., Mildner K., Hanau D. and Rziha H.-J. (2004). The appearance of the *bona fide* spiral tubule of Orf virus is dependent on an intact viral 10 kDa protein. *J. Virol.* **78**: 8085-8093.
17. Sorzano C. O. S., Jonić S., El-Bez C., Carazo J. M., De Carlo S., Thévenaz P. and Unser M. (2004). A multiresolution approach to orientation assignment in 3-D electron microscopy of single particles. *J. Struct. Biol.* **146**: 381-392.
18. De Carlo S., Carles C., Riva M. and Schultz P. (2003). Cryo-negative staining reveals conformational flexibility within yeast RNA Polymerase I. *J. Mol. Biol.* **329**: 891-902.

19. Donnet M., Bowen P., Jongen N., Lemaître J., Hofmann H., Schreiner A., Jones A. G., Schenk R., Hofmann C. and De Carlo S. (2002). Successful scale-up from milliliter batch optimization to a small scale continuous production using the segmented flow Tubular reactor. Example of calcium carbonate Precipitation. In: *Proceedings of the 15th International Symposium on Industrial Crystallization*; Sept. 15th-18th, Sorrento, Italy. Associazione Italiana di Ingegneria Chimica, 2002: 1353-1358.
20. De Carlo S., El-Bez C., Alvarez-Rúa C., Borge J. and Dubochet J. (2002). Cryo-negative staining reduces electron beam sensitivity of vitrified biological particles. *J. Struct. Biol.* **138**: 216-226.
21. Bellon P. L., Cantele F., De Carlo S. and Lanzavecchia S. (2002). A trajectory-based algorithm to determine and refine Euler angles of projections in three-dimensional microscopy: improvements and tests. *Ultramicroscopy* **93**: 111-121.
22. Braissant O., Perez A., De Carlo S., Morel M., Borruat G. and Roten C.-A. (2001). CENTRIFUGE: A Microgravity Experiment realized by Lausanne University and Federal Institute of Technology in Lausanne students during the European Space Agency (ESA) Parabolic Flight Campaign. *Bull. Soc. Vaud. Sc. Nat.* **87**: 203-209.
23. Roten C.-A. [S. De Carlo: micrographs]. (1999). Origine Extraterrestre? *Pour la Science* **261**: 29 [french edition of Scientific American].
24. De Carlo S., Adrian M., Kálin P., Mayer J. M. and Dubochet J. (1999). Unexpected property of trehalose as observed by cryo-electron microscopy. *J. Microsc.* **196**: 40-45.

Journal covers:



Chen B., Doucleff M., Wemmer D., De Carlo S., Huang H., Nogales E., Hoover T., Kondrashkina E., Guo L., and B. T. Nixon (2007). ATP Ground- and Transition States of the Enhancer Binding AAA+ ATPases Support Complex Formation with their Target Protein, σ^{54} . *Structure* **15**: 429-440.



De Carlo S., Chen B., Hoover T., Kondrashkina E., Nogales E., and B. T. Nixon (2006). The structural basis of regulated assembly and function of the transcriptional activator NtrC. *Genes & Dev.* **20**: 1485-1495.



Sorzano C. O. S., Jonić S., El-Bez C., Carazo J. M., De Carlo S., Thévenaz P. and Unser M. (2004). A multiresolution approach to orientation assignment in 3-D electron microscopy of single particles. *J. Struct. Biol.* **146**: 381-392.



De Carlo S., El-Bez C., Alvarez-Rúa C., Borge J. and Dubochet J. (2002). Cryo-negative staining reduces electron beam sensitivity of vitrified biological particles. *J. Struct. Biol.* **138**: 216-226.

Poster presentations:

De Carlo S. (2009). Imaging large macromolecular assemblies involved in bacterial transcription activation. *NRAMM Workshop on Advanced Topics in EM Structure Determination*, San Diego (CA), USA.

De Carlo S., Taatjes D., and A. Hoenger (2009). Molecular basis of transcription initiation in *Archaea*. Poster session at the *Gordon Research Conference on Three Dimensional Electron Microscopy*, New London (NH), United States.

De Carlo S., Taatjes D., and A. Hoenger (2008). Molecular Architecture of the *Archaea* Transcription Pre-Initiation and Elongation Complexes. *4th International Conference on Structural Analysis of Supramolecular Assemblies with Hybrid Methods*, Granlibakken in Tahoe (CA), USA.

De Carlo S., Boisset N., and A. Hoenger (2007). High-Resolution Cryo-Negative Staining. Poster session at the *Gordon Research Conference on Three Dimensional Electron Microscopy*, New London (NH), United States.

De Carlo S., Chen B., Hoover T., Kondrashkina E., Nogales E., and B. T. Nixon (2005). Structural basis for regulated assembly and function of the transcriptional activator NtrC, Asilomar (USA).

De Carlo S. and Schultz P. (2003). Cryo-negative staining reveals conformational flexibility within yeast RNA polymerase I. Poster session at the *French Society for Crystallography Meeting*, Caen (F).

Spehner D., De Carlo S., Drillien R., Hanau D., Büttner M. and Rziha H.-J. (2002). Cryo-electron microscopy of ORF virus. Poster session at the *International Meeting on POX viruses*, Lake Placid (USA).

De Carlo S., Dubochet J. and Boisset N. (2002). Cryo-negative staining allows high-resolution single-particles analysis. Poster session at the *Joint Microscopy Meeting*, Lille (F).

De Carlo S., El-Bez C. and Dubochet J. (2002). Cryo-negative staining reduces electron beam sensitivity of vitrified biological samples. Poster session at the *USGEB*, Lugano (CH).

De Carlo S., El-Bez C., Navaza J. and Dubochet J. (2001). GroEL as revealed by cryo-negative staining. Poster session at the *Gordon Research Conference on Three Dimensional Electron Microscopy*, Bristol (RI), Unites States.

De Carlo S., El-Bez C., Adrian M. and Dubochet J. (2001). Cryo-negative staining of single particles. Poster session at the *Young Investigator Meeting*, Lausanne (CH).