

Julien Roche, Ph.D.

Roy J. Carver Department of Biochemistry, Biophysics and Molecular Biology
Iowa State University
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Current rank

Assistant Professor, Roy J. Carver Department of Biochemistry, Biophysics & Molecular Biology, Iowa State University (2016 - present)

Education

University of Montpellier (France)	Biophysics	Ph.D. 2012
University of Montpellier (France)	Biophysics	M.S 2008
University of Montpellier (France)	Biology	B.S. 2006

Research Experience

June 2016 - present

Assistant Professor, Roy J. Carver Department of Biochemistry, Biophysics & Molecular Biology, ISU

Research focus: Structure, function and assembly of large scaffold proteins. Order/Disorder transitions.

Other affiliations: Bioinformatics & Computational Biology, Molecular, Cellular and Developmental Biology

September 2012 – June 2016

Postdoctoral Research Associate, The National Institutes of Health, Bethesda, MD

In the laboratory of Dr. Adriaan Bax

September 2008 – June 2012

Graduate Research Assistant, Centre de Biochimie Structurale, Montpellier, France

In the laboratory of Dr. Christian Roumestand and Dr. Catherine A. Royer

January 2008 – June 2008

Undergraduate Research Assistant, Rensselaer Polytechnic Institute, Troy, NY

In the laboratory of Dr. Angel E. Garcia

Funding

National Institutes of Health, NIGMS R01 (1R01GM132561-01): \$1,624,518

Structure and Function of DISC1 in the cAMP pathway

9/1/2019-8/31/2024,

Role: Sole PI.

Publications (total: 35, first author: 16, corresponding author: 6)

1. Publications after joining ISU

Roche J, Potoyan D.A. (2019) Disorder mediated oligomerization of DISC1 proteins revealed by coarse-grained molecular dynamics simulations. **J. Phys. Chem. B.** 45: 9567-9575

Roche J.* (2019) High-pressure NMR of biological systems in solution. **eMagRes** 8: 121-126 **corresponding author*

Andrews R, **Roche J**, Moss W. (2018) ScanFold: an approach for genome-wide discovery of local RNA structural elements – applications to Zika virus and HIV. **PeerJ**. 6: e6136

Roche J, Royer C.A, Roumestand C. (2019) Exploring protein conformational landscapes using high-pressure NMR. **Methods in Enzymology** 614:293-320

Roche J, Royer C.A (2018) Lessons from Pressure Denaturation of Proteins. **J. R. Soc. Interface** 15: pii 20180244

Baweja L.K, **Roche J.*** (2018) Pushing the limits of structure-based models: prediction of non-globular protein folding and fibrils formation with Go-model simulations. **J. Phys. Chem. B**. 122: 2525-2535 **corresponding author*

Roche J, Royer C.A, Roumestand C. (2017) Monitoring protein folding through high pressure NMR. **Prog. Nucl. Magn. Reson. Spectrosc.** 102-103: 15-31

Nguyen L.M, **Roche J.*** (2017) High-pressure NMR techniques for the study of protein dynamics, folding and aggregation. **J. Magn. Reson.** 277: 179-185 **corresponding author*

Agniswamy J, Louis J.M, **Roche J**, Harrison R.W, Weber I.T (2016) Structural studies of a rationally selected multi-drug resistant HIV-1 protease reveal synergistic effect of distal mutations on flap dynamics. **PLoS One**. 11: e0168616

2. Publications before joining ISU

Alderson R.T, **Roche J**, Gastall H.Y, Pristisanac I, Bax A, Benesch J.L.P, Baldwin A.J. (2019) Local unfolding of the HSP27 monomer regulates chaperone activity. **Nature Commun.** 10: 1068

Shen Y, **Roche J**, Grishaev A, Bax A. (2017) Prediction of nearest neighbor effects on backbone torsion angles and NMR scalar coupling constants in disordered proteins. **Protein Sci.** 27: 146-158

Louis J.M, Baber J.L, Ghirlando R, Aniana A, Bax A, **Roche J.*** (2016) Insights into the conformation of the membrane proximal regions critical to the trimerization of the HIV-1 gp41 ectodomain bound to dodecyl phosphocholine micelles. **PLoS One**. 11: e0160597 **corresponding author*

Louis J.M, **Roche J.*** (2016) Evolution under drug pressure remodels the folding free-energy landscape of mature HIV-1 protease. **J. Mol. Biol.** 428: 2780-2792 **corresponding author*

Roche J, Ying J, Shen Y, Torchia D.A, Bax A. (2016) ARTSY-J: convenient and precise measurement of $^3J_{\text{HNH}\alpha}$ couplings in medium-size proteins from TROSY-HSQC spectra. **J. Magn. Reson.** 268: 73-81

Roche J, Shen Y, Jung Ho L, Jinfa Y, Bax A. (2016) Monomeric A β^{1-40} and A β^{1-42} peptides in solution adopt very similar ramachandran map distributions that closely resemble random coil. **Biochemistry** 55: 762-775

Roche J, Ying J, Bax A. (2015) Accurate measurement of $^3J_{\text{HNH}\alpha}$ couplings in small or disordered proteins from WATERGATE-optimized TROSY spectra. **J. Biomol. NMR** 64: 1-7

Roche J, Louis J.M, Bax A, Best R. (2015) Pressure-induced structural transition of mature HIV-1 Protease from a combined NMR/MD simulation approach. **Proteins**. 83: 2117-2123

Roche J, Dellarole M, Royer C.A, Roumestand C. (2015) Exploring the protein folding pathway with high-pressure NMR: steady-state and kinetics studies. **High pressure Bioscience: basic concepts, applications and frontiers (Subcell Biochem.)** 72: 261-278

Tugarinov V, Libich D.A, Meyer V, **Roche J**, Clore G.M. (2015) The energetics of a three-state protein folding system probed by high-pressure relaxation NMR from 1 to 2500 bar. **Angew. Chem. Int. Ed.** 54: 11157-11161

Dellarole M, Caro J.A, **Roche J**, Fossat M, Barthe P, Garcia-Moreno B, Royer C.A, Roumestand C (2015) Evolutionary conserved pattern of interactions in a protein revealed by local thermal expansion properties. **J. Am. Chem. Soc.** 137: 9354-9362

Roche J, Louis J.M, Aniana A, Ghirlando R, Bax A. (2015) Complete dissociation of the HIV-1 gp41 ectodomain and membrane proximal regions upon phospholipid binding. **J. Biomol. NMR** 61: 235-248

Roche J, Louis J.M, Bax A. (2014) Conformation of inhibitor-free HIV-1 protease derived from NMR spectroscopy in a weakly oriented solution. **Chembiochem.** 16: 214-218

Louis J.M, Aniana A, Lohith K, Sayer J.M, **Roche J**, Bewley C.A, Clore G.M. (2014) Binding of HIV-1 gp41-directed neutralizing and non-neutralizing fragment antibody binding domain (Fab) and single chain variable fragment (ScFv) antibodies to the ectodomain of gp41 in the pre-hairpin and six-helix bundle conformations. **PLoS One.** 9: e104683

Maltsev A.S, Grishaev A, **Roche J**, Zasloff M, Bax A. (2014) Improved cross validation of a static ubiquitin structure derived from high precision residual dipolar couplings measured in a drug-based liquid crystalline phase. **J. Am. Chem. Soc.** 136: 3752-3755

Roche J, Louis J.M, Grishaev A, Ying J, Bax A. (2014) Dissociation of the trimeric gp41 ectodomain at the lipid-water interface suggests an active role in HIV-1 Env-mediated membrane fusion. **Proc. Natl. Acad. Sci. USA.** 111: 3425-3430

Ying J, **Roche J**, Bax A. (2013) Homonuclear decoupling for enhancing resolution and sensitivity in NOE and RDC measurements of peptides and proteins. **J. Magn. Reson.** 241: 97-102

Louis. J.M, Tozser J, **Roche J**, Matuz K, Aniana A, Sayer J.M. (2013) Enhanced stability of monomer fold correlates with extreme drug resistance of HIV-1 Protease. **Biochemistry** 52: 7678-7688

Roche J, Dellarole M, Caro J.A, Norberto D.E, Garcia A.E, Garcia-Moreno B, Roumestand C, Royer C.A. (2013) Effect of internal cavities on folding rates and routes revealed by real-time pressure-jump NMR spectroscopy. **J. Am. Chem. Soc.** 135: 14610-14618

Roche J, Ying J, Maltsev A.S, Bax A. (2013) Impact of hydrostatic pressure on an intrinsically disordered protein: a high-pressure NMR study of α -synuclein. **Chembiochem.** 14: 1754-1761

Dellarole M, Kobayashi K, Rouget J-B, Caro J.A, **Roche J**, Islam M.M, Garcia-Moreno B, Kuroda Y, Royer C.A. (2013) Probing the physical determinants of thermal expansion of folded proteins. **J. Phys. Chem. B.** 117: 12742-12749

Roche J, Caro J.A, Dellarole M, Guca E, Royer C.A, Garcia-Moreno B, Garcia A.E, Roumestand C. (2013) Structural, energetic and dynamic responses of the native state ensemble of staphylococcal nuclease to cavity-creating mutations. **Proteins** 81: 1069-1080

Roche J, Dellarole M, Caro J.A, Guca E, Norberto D.E, Yang T, Garcia A.E, Roumestand C, Garcia-Moreno B, Royer C.A. (2012) Remodeling of the folding free-energy landscape of staphylococcal nuclease by cavity-creating mutations. **Biochemistry** 51: 9535-9546

Roche J, Caro J.A, Norberto D.E, Barthe P, Roumestand C, Schlessman J.L, Garcia A.E, Garcia-Moreno B, Royer C.A. (2012) Cavities determine the pressure unfolding of proteins. **Proc. Natl. Acad. Sci. USA**. 109: 6945-6950

Rouget J-B, Aksel T, **Roche J**, Saldana J.L, Garcia A.E, Barrick D, Royer C.A. (2011) Size and sequence and the volume change of protein folding. **J. Am. Chem. Soc.** 133: 6020-6027

Kitahara R, Hata K, Maeno A, Akasaka K, Chimenti M.S, Garcia-Moreno B, Schroer M.A, Jeworrek C, Tolan M, Winter R, **Roche J**, Roumestand C, Montet de Guillen K, Royer C.A. (2011) Structural plasticity of staphylococcal nuclease probed by perturbation with pressure and pH. **Proteins** 79: 1293-1305

Conferences

- Extreme Biophysics RCN, 2019 (San Diego, USA): **Talk**
- RESOLV, 2019 (Bochum, Germany): **Invited talk**
- GRASP NMR, 2018 (Lawrence, KS, USA): **Invited talk**
- 62nd Biophysical Society Meeting, 2018 (San Francisco, CA, USA): **Poster**
- 61st Biophysical Society Meeting, 2017 (New Orleans, LA, USA): **Talk**
- 252nd ACS National Meeting, 2016 (Philadelphia, PA, USA): **Invited Talk**
- 60th Biophysical Society Meeting, 2016 (Los Angeles, CA, USA): **Talk**
- DCO workshop on extreme biophysics, 2015 (Washington, DC, USA): **Invited talk**
- 56th ENC, 2015 (Pacific Grove, USA): **Poster**
- 59th Biophysical society meeting, 2015 (Baltimore, MD, USA): **Talk**
- 7th IMBP, 2014 (Montpellier, France): **Invited talk**.
- Biomolecular structure, dynamics and function: membrane proteins, 2014 (Nashville, TN, USA): **Talk**
- 58th Biophysical society meeting, 2014 (San Francisco, CA, USA): **Poster**
- 51st EHPRG, 2013 (London, UK): **Invited talk**.
- 56th Biophysical Society meeting, 2012 (San Diego, CA, USA): **Talk**.
- 6th IMBP, 2011 (Otsu, Japan): **Talk**.
- 49th EHPRG, 2011 (Budapest, Hungary): **Poster**
- 8th EBSA, 2011 (Budapest, Hungary): **Talk**.
- GERM conference, 2011 (Sitges, Spain): **Talk**.

Awards

Young researcher award from the French Biophysical Society (2014)

Intramural AIDS Research Fellowship, NIH, renewal, one-year funding (2014)

Intramural AIDS Research Fellowship, NIH, one-year funding (2014)

Fellows Award for Research Excellence, NIH, travel grant (2013)

Fulbright scholarship, 6 months stay in Prof. Angel E. Garcia's lab, RPI, NY (2011)

Grant for Excellency, University of Montpellier, France (2007)

Teaching Activities

Instructor for BBMB 221 – Structure and Reactions in Biochemical Processes (F17, S19, F19)

Instructor for HON 322V – Biochemistry of Drug Addiction (S19)

Other Teaching Activities

Guest Lecturer for the Life Skills Curriculum. Iowa Correctional Institution for Women in Mitchellville, IA.

Lecture on Biochemistry of Drug Addiction (Summer 19)

Advising Activities

Research Advisor

Graduate Students

- Luan Nguyen (F17 – Summer 19). Master Thesis: “*Conformational change upon phosphorylation at S713 site of Disrupted-in-schizophrenia-1 (DISC1) leads to a change in the oligomeric state*”.
Graduated 07/10/19
- Steven Siang (F17 – present)
- Tung Mei Khu (Summer 20 – present)

Undergraduate Students

- Mai Huong (F16)
- Sam Kuhn (F16 – S17)
- Bete Ranzi (F16 – S17)
- Steven Siang (F16 - S17)
- Isaac Stine (F18)
- Richard Weerts (S19)
- Henry Anderson (F18 – present)

Doctoral Committees

- Timothy Egner (Chemistry Dept. Pr: Vincenzo Venditti) “*Nuclear Magnetic Resonance Methodologies for the Study of Nanoparticle Surface Adsorbed Ligands*” Graduated 11/15/19
- Trang Nguyen (Chemistry Dept. Pr: Vincenzo Venditti)
- Phan Phong Tuan (BBMB. Pr: Sashital Dipali)
- Suresh Shravanti (BBMB. Pr: Sashital Dipali)
- Philip Dershwitz (BBMB, Pr. Alan Dispirito)
- Jake Peterson (BBMB, Pr. Walter Moss)
- Kristin Roach (BBMB, Pr. Reuben Peters)

Institutional Service

BBMB Oral Research Proposition Exam (ORPE) Committee (2019 – present)

BBMB Postdoctoral Committee (2019 – present)

BBMB Graduate Affairs Committee (2018 – present)

BBMB Seminar Committee (2016 – present)