

# Carrie L. Partch

## Curriculum vitae

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Dept. of Chemistry and Biochemistry  
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### Vision

Our lab works to identify the structural and biochemical underpinnings of biological timekeeping by circadian clocks, which synchronize physiology and behavior with the day/night cycle. By developing a mechanistic understanding of how molecular circadian clocks function, we aim to capitalize on the temporal regulation of physiology and behavior to develop innovative strategies to treat a broad spectrum of human diseases.

### Positions and Employment

- 2019 – Professor, Chemistry and Biochemistry Department, UC Santa Cruz
- 2017 – 2019 Associate Professor, Chemistry and Biochemistry Department, UC Santa Cruz
- 2011 – 2017 Assistant Professor, Chemistry and Biochemistry Department, UC Santa Cruz
- 2010 – 2011 Postdoc research with Dr. Joseph Takahashi, Howard Hughes Medical Institute and University of Texas Southwestern Medical Center
- 2006 – 2010 Postdoc research with Dr. Kevin Gardner, University of Texas Southwestern Medical Center
- 2000 – 2006 Graduate research with Nobel Laureate Dr. Aziz Sancar, University of North Carolina Chapel Hill; Ph.D. thesis: "Signal transduction mechanisms of cryptochrome"
- 1997 – 2000 Research Technician with Dr. Daniel Carr, Oregon Health Sciences University

### Education

- 2000 – 2006 Ph.D., Biochemistry and Biophysics, University of North Carolina Chapel Hill
- 1992 – 1997 B.S., Biochemistry with minor in Italian, University of Washington

### Honors, Fellowships and Awards

- 2020 Finalist, UCSC Distinguished Teaching Award
- 2018, 2019 Finalist, UCSC Excellence in Teaching Award
- 2018 Aschoff's Rule, a top award in the field handed down annually between circadian biologists
- 2018 Margaret Oakley Dayhoff Award, Biophysical Society
- 2016 Junior Faculty Research Award, Society for Research on Biological Rhythms
- 2016 EMBO Symposium on Molecular Machines: Integrative Structural and Molecular Biology, first place research prize
- 2010 Dean's Award for Excellence in Postdoctoral Research, UTSW Graduate Division
- 2008 – 2010 Postdoctoral National Research Service Award, National Cancer Institute
- 2007 Chilton-Bell Fellowship, A.L. Chilton Foundation and Dept. of Biochemistry, UTSW
- 2007, 2008 Sigma Xi Award, University of Texas Southwestern Postdoctoral Association Symposium
- 2003 – 2006 Predoctoral National Research Service Award, National Institute of Mental Health
- 2005 Lineberger Graduate Fellow in Basic Sciences (highest thesis honor), UNC
- 2000 Irvin R. Logan Fellowship, Dept. of Biochemistry and Biophysics, UNC

### Invited Seminars and Presentations since 2011:

- 2022 Royal Society (UK) Interdisciplinary workshop: "Time to start taking time seriously: circadian rhythms in infection and immunity" (London, England)
- 2021 Gordon Research Conference on Chronobiology (Lewiston, Maine)
- 2021 ASBMB Enzymology Interest Group (virtual meeting)
- 2021 IDP Seminars online (hosts Alex Holehouse and Magnus Kjærsgaard)
- 2020 "Sleep and Clocks Symposium", Chinese Institute for Brain Research (Beijing, China; postponed due to COVID-19)
- 2020 Asian Forum on Chronobiology (Kaifeng, China; postponed due to COVID-19)

2020 Emory University, Dept. of Biochemistry  
 2020 Keynote Address, Chilean Society for Biochemistry and Molecular Biology (virtual; Santiago, Chile)  
 2020 California State University, San Marcos, Dept. of Chemistry and Biochemistry  
 2020 Karolinska Institute, Dept. of Neuroscience  
 2020 Gordon Research Conference on Intrinsically Disordered Proteins (Les Diablerets, Switzerland; canceled due to COVID-19)  
 2020 Society for Research on Biological Rhythms Biennial Meeting (Amelia Island, FL; virtual due to COVID-19)  
 2020 Symposium on Shape-Shifting Proteins, Experimental Biology 2020 (San Diego, CA; meeting canceled due to COVID-19, presented virtual webinar)  
 2020 Symposium on Protein Structure and Conformation I, Biophysical Society (San Diego, CA)  
 2019 Keynote address, UCSC Science Internship Program, Moffett Place, Google  
 2019 Leonardo Art/Science Evening (LASER) Seminar, UCSC  
 2019 Keynote address, Annual Symposium of the Arkansas IDeA Network of Biomedical Research Excellence  
 2019 UCSF, Basic Science Seminar Series  
 2019 Symposium on Circadian Proteins, Japanese Biochemical Society Annual Meeting (Yokohama, Japan)  
 2019 Nagoya University, Institute of Transformative Bio-Molecules (Nagoya, Japan)  
 2019 University of Tokyo, Dept. of Biophysics and Biochemistry (Tokyo, Japan)  
 2019 Duke-NUS Medical Center, Programme in Cancer and Stem Cell Biology (Singapore)  
 2019 Gordon Research Conference on Chronobiology (Barcelona, Spain)  
 2019 UNC Chapel Hill, Dept. of Biochemistry and Biophysics  
 2019 Bay Area Sleep & Circadian Research Meeting, NASA Ames Research Center (Mountain View, CA)  
 2018 Timelines in Biology Symposium, Weizmann Institute of Science (Rehovot, Israel)  
 2018 DFG Research Network on "Molecular Switches in Spatiotemporal Control of Cellular Signaling" (Heidelberg, Germany)  
 2018 Novartis, Protein Science Group (Basel, Switzerland)  
 2018 FMI, Quantitative Biology Group (Basel, Switzerland)  
 2018 LMU, Institute of Medical Psychology (Munich, Germany)  
 2018 MRC Laboratory of Molecular Biology Seminar, Neurobiology / Cell Biology Groups (Cambridge, UK)  
 2018 IMB Workshop on Molecular Circadian Clocks (Mainz, Germany)  
 2018 NCI Chronomedicine Interest Group Webinar, National Institutes of Health  
 2018 University of California Irvine, Dept. of Biological Chemistry  
 2018 International Conference on Magnetic Resonance in Biological Systems (ICMRBS), (Dublin, Ireland)  
 2018 Leonardo Art/Science Evening (LASER) Seminar, Stanford University  
 2018 Protein Society Annual Meeting, Symposium on Triggered Conformational Changes (Boston, MA)  
 2018 UT Southwestern Medical Center, Dept. of Biophysics  
 2018 EMBO | EMBL Symposium: Biological Oscillators: Design, Mechanism, Function (Heidelberg, Germany)  
 2018 Keynote address, University of California Chemical Symposium (Lake Arrowhead, CA)  
 2018 Lorne Conference for Protein Structure and Function (Lorne, Australia)  
 2018 Salk Institute / Ipsen Foundation / Science Magazine Symposium on Biological Complexity, "Biology of Time" (La Jolla, CA)  
 2017 Latin America Symposium on Chronobiology (Valparaiso, Chile)  
 2017 Society for Experimental Biology and Medicine "Biological Clocks: Mechanisms and Application" (Rijeka, Croatia)  
 2017 UC Davis, NIH Cell Biology Training Program Student Invitee  
 2017 University of Chicago, Dept. of Molecular Genetics and Cell Biology  
 2017 West Coast Protein Crystallography Workshop (Asilomar, CA)  
 2017 UC San Diego Center for Circadian Biology Symposium  
 2017 University of Pennsylvania, Dept. of Systems Pharmacology and Translational Therapeutics

2016 Johns Hopkins University, Dept. of Biology  
 2016 University of Massachusetts, Amherst, Dept. of Chemistry  
 2016 Colorado State University, Dept. of Cell and Molecular Biology  
 2016 Center for Chronobiology Inaugural Symposium, Cincinnati Children's Hospital Medical Center (Cincinnati, OH)  
 2016 Google SciFoo Conference Lightning Talk (Mountain View, CA)  
 2016 Society for Research on Biological Rhythms (Tampa, FL)  
 2016 Rensselaer Polytechnic Institute, Dept. of Biological Sciences  
 2016 San Jose State University, Dept. of Chemistry  
 2016 UCSF, Dept. of Pharmaceutical Chemistry  
 2015 American Chemical Society / Pacificchem, Symposium on Advances in Biological NMR (Honolulu, HI)  
 2015 California State University Los Angeles, Dept. of Chemistry  
 2015 UC Berkeley, Structural and Quantitative Biology Seminar Program  
 2015 ALS User's Meeting – Biological SAXS Workshop (Berkeley, CA)  
 2016 UC Davis, Dept. of Chemistry  
 2015 UC Merced, Dept. of Natural Sciences  
 2015 UC San Diego Center for Circadian Biology Symposium  
 2014 Texas A&M University, Dept. of Biology  
 2014 Society for Research on Biological Rhythms (Big Sky, MT)  
 2014 International Council on Magnetic Resonance in Biological Systems (Dallas, TX)  
 2013 ACS Western Regional Meeting, Symposium on Advances in Biological NMR (Santa Clara, CA)  
 2013 Virginia Tech University, Dept. of Biological Sciences  
 2013 Gordon Research Conference on Chronobiology (Newport, RI)  
 2013 EMBO Conference on Allosteric Interactions in Cell Signaling and Regulation (Paris, France)  
 2013 Stanford Linear Accelerator Center Colloquium  
 2012 San Francisco State University, Dept. of Chemistry and Biochemistry  
 2012 UC San Diego Center for Circadian Biology Fall Workshop  
 2012 California State University Fullerton, Dept. of Biological Sciences  
 2011 SACNAS Annual Meeting, Symposium on Chemical Biology (San Jose, CA)

## Publications

### Peer Reviewed Journal Articles

\* Equal contributions

<sup>Δ</sup> Co-corresponding authors

31. Koronowski, K.B., Greco, C.M., Huang, H., Kim, J.-K., Fribourgh, J.L., Crosby, P.C., Partch, C.L., Qiao, F., Zhao, Y., Sassone-Corsi, P. (2021) Ketogenesis impact on liver metabolism revealed by proteomics of lysine  $\beta$ -hydroxybutyrylation. *BioRxiv* <https://doi.org/10.1101/2021.01.21.427645>
30. Chan, A., Parico, G.C.G., Fribourgh, J.L., Ibrahim, L.H., Bollong, M.J., Partch, C.L., Lamia, K.A. (2021) *CRY2* missense mutations suppress P53 and enhance cell growth. *bioRxiv* <https://doi.org/10.1101/2021.01.08.425994>
29. Chavan, A., Ernst, D.C., Fang, M., Sancar, C., Partch, C.L., Golden, S.S., LiWang, A. (2020) Reconstitution of an intact clock that generates circadian DNA binding *in vitro*. *bioRxiv* <https://doi.org/10.1101/2020.06.18.158576>
28. Heisler, J.\*, Swan, J.A.\*, Palacios, J.G., Sancar, C., Ernst, D.C., Spangler, B.K., Bagshaw, C.R., Tripathi, S., Crosby, P., Golden, S.S., Partch, C.L.\* (2020) Structural mimicry confers robustness to the cyanobacterial circadian clock. *bioRxiv* <https://doi.org/10.1101/2020.06.17.158394>
27. Shen, Y., Wang, W., Endale, M., Francey, L.J., Harold, R.L., Hammers, D.W., Huo, Z., Partch, C.L., Hogenesch, J.B., Wu, Z.-H., Liu, A.C. (2020) NF- $\kappa$ B modifies the mammalian circadian

26. Parico, G.C.G., Perez, I., Fribourgh, J.L., Hernandez, B.N., Lee, H.-W., Partch, C.L. (2020) The CRY1 tail controls circadian timing by regulating its association with CLOCK:BMAL1. *Proc Natl Acad Sci USA* 117: 27971-27979
25. Fribourgh, J.L.\* , Srivastava, A.\* , Sandate, C.R.\* , Michael, A.K., Hsu, P.L., Rakers, C., Nguyen, L.T., Torggrimson, M., Parico, G.C., Tripathi, S., Zheng, N., Lander, G.C., Hirota, T., Tama, F. <sup>Δ</sup>, Partch, C.L. <sup>Δ</sup> (2019) Dynamics at the serine loop underlie differential affinity of cryptochromes for CLOCK:BMAL1 to control circadian timing. *Elife*, doi: 10.7554/eLife.55275
24. Philpott, J.\* , Narasimamurthy, R.\* , Ricci, C.G.\* , Freeberg, A., Hunt, S.R., Yee, L., Pelofsky, R., Tripathi, S., Virshup, D.V. <sup>Δ</sup>, Partch, C.L. <sup>Δ</sup> (2019) Casein kinase 1 dynamics underlie substrate selectivity and the PER2 circadian phosphoswitch. *Elife*, doi: 10.7554/eLife.52343
- Featured in NIH Director's Blog "Early riser or night owl? New study may help to explain the difference" (Feb. 25, 2020)
23. Narasimamurthy, R., Hunt, S.R., Lu, Y., Fustin, J.M., Okamura, H., Partch, C.L., Kim, J.K., Forger, D.B., Virshup, D.M. (2018) CK1δ/ε protein kinases prime the PER2 circadian phosphoswitch. *Proc Natl Acad Sci USA* 115: 5986-91
22. Fong, J.C., Rogers, A., Michael, A.K., Parsley, N.C., Cornell, W., Lin, Y., Singh, P.K., Hartmann, R., Drescher, K., Vinogradov, E., Dietrich, L., Partch, C.L. <sup>Δ</sup>, Yildiz, F.H. <sup>Δ</sup> (2017) Structural dynamics of RbmA governs plasticity of *Vibrio cholerae* biofilms, *Elife* 6:e26163 DOI: 10.7554/eLife.26163
- Featured in Pierrat, X. and Persat, A. (2017) Biofilms: Flipping the switch. *Elife* 2017; 6:e31082; York, A. (2017) The architect of the biofilm. *Nat Rev Microbiol*, doi:10.1038/nrmicro.2017.127
21. Gustafson, C.L., Parsley, N.C., Asimgil, H., Lee, H.W., Ahlback, C., Michael, A.K., Xu, H., Williams, O.L., Davis, T.L., Liu, A.C., Partch, C.L. (2017) A slow conformational switch in the BMAL1 transactivation domain modulates circadian rhythms, *Molecular Cell*, 66: 447-457
- Cover Article; featured in Narasimamurthy, R. and Virshup, D.M. (2017) A flick of the tail keeps the circadian clock in line. *Molecular Cell* 66: 437-438; Miura, G. (2017) Switching periods. *Nat Chem Biol* 13: 693.
20. Tseng, R.\* , Goularte, N.F.\* , Chavan, A.\* , Luu, J., Cohen, S.E., Chang, Y.G., Heisler, J., Li, S., Michael, A.K., Tripathi, S., Golden, S.S., LiWang, A. <sup>Δ</sup>, Partch, C.L. <sup>Δ</sup> (2017) Structural basis of the day/night transition in the cyanobacterial circadian clock, *Science*, 355: 1174-1180
- Featured in York, A. (2017) The tick-tock of circadian clocks. *Nature Rev Micro* 15: 256
19. Michael, A.K., Fribourgh, J.L., Chelliah, Y., Sandate, C.R., Hura, G.L., Schneidman-Duhovny, D., Tripathi, S., Takahashi, J.S., Partch, C.L. (2017) Formation of a repressive complex in the circadian clock is mediated by the secondary pocket of cryptochromes. *Proc Natl Acad Sci USA*, 114: 1560-65
18. Mili, S.\* , Maywood, E.S.\* , Sandate, C.R., Chesham, J.E., Barnard, A.R., Parsons, M.J., Joynson, G., Partch, C.L., Hastings, M.H., Nolan, P.M. (2015) The *early doors* (*Edo*) mutant mouse reveals the importance of PER2 PAS domain structure for circadian pacemaking, *Proc Natl Acad Sci USA* 113: 2756-61

17. Xu, X.<sup>\*</sup>, Gustafson, C.L.<sup>\*</sup>, Sammons, P.J., Khan, S.K., Parsley, N.C., Ramanathan, C., Lee, H.-W., Liu, A.C.<sup>Δ</sup>, Partch, C.L.<sup>Δ</sup> (2015) Cryptochrome 1 regulates the circadian clock through dynamic interactions with the BMAL1 C-terminus. *Nature Structural and Molecular Biology* 22: 476-84
  - Cover Article; featured in Hui, K.Y. and Ripperger, J.A. (2015) Grab the wiggly tail: new insights into the dynamics of circadian clocks, *Nature Structural and Molecular Biology* 22: 436-36
16. Michael, A., Harvey, S., Sammons, P.J., Anderson, A.P., Kopalle, H.M., Banham, A.H., Partch, C.L. (2015) Cancer/testis antigen PASD1 silences the circadian clock. *Molecular Cell* 15: 743-54
  - Focus of Quanta Magazine feature, "How the Body's Trillions of Clocks Keep Time" –Nikki Greenwood
15. Guo, Y., Scheuermann, T.H., Partch, C.L., Tomchick, D.R., Gardner, K.H. (2015) Coiled-coil coactivators play a structural role in mediating interactions in hypoxia-inducible factor heterodimerization. *J Biological Chemistry* 290: 7707-21
14. Mukherjee, S., Zheng, H., Derebe, M., Partch, C.L., Rollins, D., Rizo, J., Jiang, Q.-X., Hooper, L.V. (2014) Antibacterial membrane attack by a pore-forming intestinal C-type lectin. *Nature* 505: 103-7
13. Guo, Y., Partch, C.L., Key, J., Card, P.B., Wurdak, H., Gardner, K.H. (2013) Regulating the ARNT-TACC3 axis: multiple approaches to manipulating protein-protein interactions with small molecules. *ACS Chemical Biology* 8: 626-35
12. Huang, N.<sup>\*</sup>, Chelliah, Y.<sup>\*</sup>, Taylor, C.A., Yoo, S.H., Shan, Y., Partch, C.L. Green, C., Zhang, H.<sup>Δ</sup>, Takahashi, J.S.<sup>Δ</sup> (2012) Crystal structure of the heterodimeric CLOCK:BMAL1 transcriptional activator complex of the mammalian circadian clock. *Science* 337: 189-94
  - Featured in Crane, B. (2012) Nature's Intricate Clockwork. *Science* 337:165-166
11. Partch, C.L. and Gardner, K.H. (2011) Coactivators necessary for transcriptional output of the hypoxia inducible factor, HIF, are directly recruited by ARNT PAS-B. *Proc Natl Acad Sci USA* 108: 7739-44
10. Lehotzky, R.E.<sup>\*</sup>, Partch, C.L.<sup>\*</sup>, Mukherjee, S., Cash, H., Goldman, W.E., Gardner, K.H., Hooper, L.V. (2010) Molecular basis for peptidoglycan recognition by a bactericidal lectin. *Proc Natl Acad Sci USA* 107: 7722-7
9. Partch, C.L., Card, P.B., Amezcua, C.A., Gardner, K.H. (2009) Molecular basis of coiled coil coactivator recruitment by the aryl hydrocarbon receptor nuclear translocator (ARNT). *J Biological Chemistry* 284: 15184-92
8. Mukherjee, S.<sup>\*</sup>, Partch, C.L.<sup>\*</sup>, Lehotzky, R.E., Whitham, C., Chu, H., Bevins, C., Gardner, K.H., Hooper, L.V. (2009) Regulation of C-type lectin antimicrobial activity by a flexible N-terminal propeptide. *J Biological Chemistry* 284: 4881-86
7. Öztürk, N., Kao, Y.T., Selby, C.P., Kavakli, I.H., Partch, C.L., Zhing, D., Sancar, A. (2008) Purification and characterization of a Type III Photolyase from *Caulobacter crescentus*. *Biochemistry* 47: 10255-61
6. Huang, Y., Baxter, R., Smith, B.S., Partch, C.L., Colbert, C.L., Deisenhofer, J. (2006) Crystal structure of cryptochrome 3 from *Arabidopsis thaliana*: a novel MTHF binding mode and implications for photolyase activity. *Proc Natl Acad Sci USA* 103: 17701-06
5. Partch, C.L., Shields, K.F., Thompson, C.L., Selby, C.P., Sancar, A. (2005) Posttranslational regulation of the mammalian circadian clock by cryptochrome and protein phosphatase 5. *Proc Natl Acad Sci USA* 103: 10467-72

4. Partch, C.L., Clarkson, M.W., Özgür, S., Lee, A.L., Sancar, A. (2005) Role of structural plasticity in signal transduction by the cryptochrome blue-light photoreceptor. *Biochemistry* 44: 3795-3805
3. Thompson, C.L.\*, Selby, C.P.\*, Partch, C.L., Plante, D.T., Thresher, R.J., Araujo, F., Sancar, A. (2004) Further evidence for the role of cryptochromes in retinohypothalamic photoreception/phototransduction. *Brain Research: Molecular Brain Research* 122: 158-66
2. Carr, D.W., Fujita, A., Stentz, C.L., Liberty, G.A., Olson, G.A., Narumiya, S. (2001) Identification of sperm-specific proteins that interact with A-Kinase anchoring proteins in a manner similar to the Type II regulatory subunit of PKA. *J Biological Chemistry* 276: 17332-38
1. Kasyapa, C.S., Stentz, C.L., Davey, M.P., Carr, D.W. (1999) Regulation of IL-15-stimulated TNF $\alpha$  production by Rolipram. *J Immunology* 163: 2836-43

#### **Invited reviews, commentaries and book chapters**

19. Philpott, J.M., Torgirson, M.R., Harold, R.L., and Partch, C.L. (2021) Biochemical mechanisms of period control within the mammalian circadian clock. *Seminars in Cell and Developmental Biology* (Ed. John Davey; editor for special edition on circadian rhythms, Ethan Buhr); in revision.
18. Parico, G.C.G. and Partch, C.L. (2020) The tail of cryptochromes: an intrinsically disordered cog within the mammalian circadian clock. *Cell Commun Sig* 18: 182
17. Crosby, P.R. and Partch, C.L. (2020) New insights into post-transcriptional regulation of mammalian circadian timekeeping. *J Cell Science*, 133: jcs241174
16. Partch, C.L. (2020) Orchestration of circadian timing by macromolecular protein assemblies. *J Molecular Biology* 432: 3426-3448
15. Ceh-Pavia, E. and Partch, C.L. (2019) Flipping behavior with the flip of a translational switch. *Proc Natl Acad Sci USA*, 115: 13151-13153
14. Swan, J.A., Golden, S.S., LiWang, A., Partch, C.L. (2018) The core circadian clock in cyanobacteria: structure and mechanism. *J Biological Chemistry MiniReview*, 293:5026-5034
13. Fribourgh, J.L. and Partch, C.L. (2017) Assembly and function of bHLH-PAS complexes. *Proc Natl Acad Sci USA*, 114: 5330-5332
12. Michael, A.K.\*, Fribourgh, J.L.\*, Van Gelder, R.N., Partch, C.L. (2016) Animal cryptochromes: Divergent roles in light perception, circadian timekeeping and beyond. *Photochemistry and Photobiology* – Special Issue in honor of 2015 Nobel Laureate in Chemistry Aziz Sancar, 93: 128-140
11. Michael, A.K., Asimgil, H., Partch, C.L. (2015) Cytoplasmic BMAL1 moonlights as a translation factor. *Trends in Biochemical Sciences* 40: 489-90
10. Gustafson, C.L. and Partch, C.L. (2015) Emerging models for the molecular basis of mammalian circadian timing. *Biochemistry* 54: 134-49
9. Huynh, K. and Partch, C.L. (2015) Analysis of protein stability and ligand interactions by thermal shift assay. *Current Protocols in Protein Science* 79:28.9
8. Kopalle, H.M. and Partch, C.L. (2014) An ImPERfect link to cancer? *Cell Cycle* 13:507

7. Partch, C.L., Green, C.B., Takahashi, J.S. (2014) Molecular architecture of the mammalian circadian clock. *Trends in Current Biology* 24: 90-9
6. Motta-Mena, L.B., Partch, C.L., Gardner, K.H. (2010) The three Rs of transcription: recruit, retain, recycle. *Molecular Cell* 40: 855-58
5. Partch, C.L. and Gardner, K.H. Coactivator recruitment: a new role for PAS domains in transcriptional regulation by the bHLH-PAS family (2010) *J Cell Physiology* 223: 553-7
4. Öztürk, N., Song, S., Özgür, S., Selby, C.P., Morrison, L., Partch, C.L., Zhong, D., Sancar, A. (2007) Structure and function of animal cryptochromes. *Cold Spring Harbor Symposium on Clocks and Rhythms* 72: 119-131
3. Partch, C.L. and Sancar, A. (2005) Photochemistry and photobiology of cryptochrome blue-light photopigments: The search for a photocycle. *Photochemistry and Photobiology* 81: 1291-1304
  - Cover Article
2. Partch, C.L. and Sancar, A. (2005) Cryptochromes and circadian photoreception in animals. *Methods in Enzymology, Circadian Rhythms*, Young, M.W. ed., Elsevier Science, Vol. 393, p. 724-743
1. Partch, C.L. and Sancar, A. (2004) DNA Photolyase, *Encyclopedia of Biological Chemistry*, Lennarz, W. and Lane, M.D., eds., Elsevier Science

### Lay publications

2. "Nobel winners identified molecular 'cogs' in the biological clocks that control our circadian rhythms." *The Conversation*, Oct. 2, 2017. <http://bit.ly/2xOsTZW>
1. "Scientists are unraveling the mystery of your body's clock – and soon may be able to reset it." *The Conversation*, Sept. 17, 2017. <http://bit.ly/2xcw1v3>

### Patents pending

Partch, C.L., Michael, A.K., Fribourgh, J., Parico, G.C. "CRY1-Clock-BMAL1 Complex-Disrupting Agents and Methods of Identifying and Using Same" U.S. Application Serial No. US2018/012976, International Application Serial No. PCT/US2018/012976, filed 5/17/2018

### Teaching

BIOC 100B: Advanced Biochemistry: undergraduate course in protein biochemistry covering ligand binding and allostery, enzyme kinetics and regulation, principles of intracellular signaling, and transport through membranes. (Winter Quarter 2014 – 2020)

CHEM 230: Grant Writing: graduate course on grant writing that focuses on principles of science writing and data presentation. Students write and peer edit nearly all of the written materials for the NIH Ruth L. Kirschstein F31 fellowship in the 10-week course. (Spring Quarter 2013 – current)

CHEM 200A: Biophysical Methods: graduate course in modern biophysical methods, including surface plasmon resonance, fluorescence spectroscopy, x-ray crystallography, and nuclear magnetic resonance spectroscopy. (Fall Quarter 2011 – 2013)

### Lay audience talks and outreach activities

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|------|---|
| 2019 | UCSC Emeriti Faculty Group, "Morning larks and night owls: how circadian timing influences your life" |
| 2019 | UCSC Women's Club, "Morning larks and night owls: how circadian timing influences your life"          |

- 2018 UCSC 21<sup>st</sup> Century Club, “Morning larks and night owls: how circadian timing influences your life”
- 2018 UCSC Original Thinkers series: “Earth Night: The human and environmental costs of artificial light at night” [Co-organized symposium with Architect Lisa Heschong and UCSC Dev. Office]
- 2018, 2019 “Circadian rhythms: a look at how the clock controls your physiology”, Aptos High School AP Biology Class
- 2017 “Circadian rhythms: a look at how the clock controls your physiology” Kraw Lecture, UC Santa Cruz Silicon Valley Extension Campus
- 2017 “Workshop on the NSF Graduate Research Fellowship Program”, UC Santa Cruz
- 2017 “Mentoring—how to give it and how to get it” Session Co-Chair, UC Presidential Postdoctoral Fellowship Annual Meeting
- 2017 “Circadian rhythms: when biological clocks for bad”, UCSC Cancer in the Crosshairs Event
- 2017 “Tenure and the Hierarchy of Academic Science” Summer Research Internship Social Presentation, NIH IMSD program
- 2017 “How to find the right funding agency for your grant” UCSC STEM Postdoc Grant Workshop
- 2016, 2017 Faculty Panelist, UCSC STEM Scholars Transfer Day
- 2016, 2017 Protein Crystallography Workshop, MARC (Maximizing Access to Research Careers) Summer Research Institute; week-long lecture and hands-on lab focused on x-ray crystallography for underrepresented STEM undergraduates at UCSC
- 2016–2019 “Circadian rhythms: a look at how the clock controls your physiology”, UCSC COSMOS (California State Summer School for Mathematics and Science) seminar series
- 2015 “How do we measure time with biological clocks?”, Westlake Elementary Science Club
- 2015 “Circadian rhythms”, UCSC Women in Science and Engineering Jr. Scientists, Pacific Collegiate School
- 2014 “Tick tock: how a molecular clock controls your physiology”, UCSC Undergraduate Research Association
- 2014 “Circadian rhythms”, SF Brightworks K-8 Charter School
- 2014 – Director, UCSC Career-Life Balance Resource Center; work with Women in Science and Engineering (WiSE) to coordinate resource lists, panel discussions, and interviews with faculty and trainees that balance career-life issues.
- 2013 “Circadian rhythms: a look at how the clock controls your physiology”, Scott’s Valley Science and Technology Club
- 2013 “Circadian rhythms: how a daily molecular clock controls your physiology”, UCSC Lifelong Learners
- 2012 “Circadian rhythms: a look at how the clock controls your physiology”, UCSC WiSE Science on Tap (open to the public)
- 2011–2013 Director, UCSC ACS Undergraduate Chemistry Club
- 2011 – Trainee mentor for NIH-funded ACCESS (providing intensive summer research experiences to underrepresented minorities from local community colleges), MARC (Maximizing access to research careers), IMSD (Initiative for maximizing student diversity), and PREP (post-baccalaureate program) students.

## **Professional and Other Activities**

### Memberships

- 2015 – Member, Biophysical Society
- 2014 – Member, The Protein Society
- 2013 – Member, American Society for Biochemistry and Molecular Biology
- 2011 – Affiliate member, UC San Diego Center for Circadian Biology
- 2011 – Member, Society for Research on Biological Rhythms (SRBR)
- 2011 – Member, American Chemical Society

### Society work and conference organizing



2020–2023 Council member, The Protein Society  
 2020–2022 Secretary, Board of Directors, SRBR  
 2019 Planning Committee, 2023 International Society of Magnetic Resonance (ISMAR) Meeting  
 2019 Co-organizer, 2019 Bay Area Sleep and Circadian Research Meeting, NASA Ames  
 2018 – 2019 Co-organizer, 2019 West Coast Structural Biology Workshop (WCSBW) Meeting  
 2018 – 2020 Member-at-large, Executive Committee, SRBR  
 2018 – 2021 Member, Public Affairs Committee, Biophysical Society  
 2017 – 2018 Program Committee, SRBR 2018 Symposium  
 2017 – 2018 Junior Faculty Workshop Committee, SRBR 2018 Symposium  
 2017 Group Discussion Leader, Gordon Research Seminar on Chronobiology  
 2015 – 2020 Chair, SRBR Logo Committee for 2016, 18, 20 Meeting  
 2015 – 2017 Member, SRBR Membership Committee

#### Reviewing

#### **Grants and fellowships:**

Knut and Alice Wallenburg Foundation  
 Standing member of NIH Study Section MSFB (Oct. 2020 – Oct. 2026)  
 Ad hoc NIH Study Section MFSB (Macromolecular Structure/Function B)  
 Ad hoc NIH Study Section EBIT (Enabling Bioanalytical and Imaging Technologies)  
 Wellcome Trust Senior Investigator Award, Clinical Research Career Development Award  
 Ad hoc NIH Study Section ZCA1 SRB-C (J3)R, NCI Provocative Questions  
 International Center for Genetic Engineering and Biotechnology (ICGEB)  
 Biotechnology and Biological Sciences Research Council (BBSRC)  
 European Research Council (ERC)  
 Kay Kendall Leukemia Fund  
 UC Presidential Postdoctoral Fellowship Program  
 Ad hoc NIH Study Section NDPR (Neural differentiation, plasticity, regeneration and rhythmicity)  
 Deutsche Forschungsgemeinschaft (DFG)  
 Worldwide Cancer Research Foundation  
 Czech Office of Science  
 US Air Force Research Program

#### **Manuscripts:**

Biochemistry, BMC Biochemistry, Cell Reports, eLife, Genes & Development, FEBS Letters, Journal of Biological Rhythms, Journal of Molecular Biology, Journal of Physical Chemistry B, Nature Chemical Biology, Nature Communications, PNAS, PLoS Biology, PLoS Genetics, Science, Science Advances, Science Signaling, Science Translational Medicine, Scientific Reports

#### **Research Personnel**

##### Current Participants

Isabella Aldama – Undergraduate Research Assistant, NIH MARC Fellow  
 Dr. Priya Cosby – EMBO Long-Term Postdoctoral Fellow  
 Alfred Freeberg – Jr. Specialist, 2020 Dean's Undergraduate Thesis Award, 2019 Douglas Drexler Award, 2018 Fink Research Award  
 Crystal Garcia – Undergraduate Research Assistant, NIH IMSD Fellow  
 Moriah Godes – Undergraduate Research Assistant, NIH MARC Fellow  
 Adriana Gracia – Undergraduate Research Assistant, NIH IMSD Fellow  
 Rachel Harold – Ph.D. Candidate  
 Gian Carlo Parico – Ph.D. Candidate, HHMI Gilliam Predoctoral Fellow  
 Andrea Ramos – Undergraduate Research Assistant  
 Jon Philpott – Ph.D. Candidate  
 Diksha Sharma – Ph.D. Candidate  
 Becca Spangler – Ph.D. Candidate

Jeff Swan – Ph.D. Candidate

Megan Torgrimson – Ph.D. Candidate, 2018 Undergraduate Research Award winner

Previous Postdoctoral Research Associates and Project Scientists (current position)

Dr. Jennifer Fribourgh, UCSC Chancellor's Postdoctoral Fellow (Scientist, Unnatural Products)

Dr. Sabrina Hunt (Staff Scientist, Codexis, Inc.)

Dr. Efraín Ceh Pavia (Research Scientist, Grifols Pharmaceuticals)

Dr. Hande Asimgil (Research Scientist, LMU Munich)

Dr. Stacy Harvey (Staff Scientist, Ontera)

Previous Ph.D. and M.S. Graduate Students (current position)

Alicia Michael, Ph.D. 2017, NIH Ruth L. Kirschstein Predoctoral Fellow (EMBO Long-term Postdoctoral Fellow/HFSP Postdoctoral Fellow, Nico Thomä Lab, FMI, Basel, Switzerland)

Chelsea Gustafson, Ph.D. 2016 (Assistant Professor, Dept. of Natural Sciences, Oregon Institute of Technology)

Ashley Kern, M.S. 2016 (Staff Scientist, Wellnext)

Jaclyn Schmitt, M.S. 2013 (Lecturer, California State University Monterey Bay)

Previous Undergraduate and Postbaccalaureate Research Students (position after lab)

Diana Etwaru – B.S. UC Santa Cruz (UCSF Global Health graduate program)

Maria Ayala Hernandez – B.S. UC Santa Cruz (UC Davis Biochemistry and Molecular Biology graduate program)

Joseph Palacios – B.S. UC Santa Cruz (UC San Diego Biochemistry graduate program)

Taylor Holt – B.S. UC Santa Cruz

Britney Hernandez – B.S. UC Santa Cruz (Jr. Specialist, UCSC Chemical Screening Center)

Lauren Yee – B.S. UC Santa Cruz

Sara Ponce – Monterey Peninsula Community College Student, 2019 NIH ACCESS Summer Research Fellow

Beckett Whittier – B.S. UC Santa Cruz, 2019 NSF GRFP Awardee

Ivette Perez – B.S. UC Santa Cruz, Koret Scholar, IMSD Scholar, UC LEADS Special Merit Prize in Biological Sciences (Biochemistry graduate program, Vanderbilt University; 2019 NSF Predoctoral fellow)

Ali Yousefi – B.S. UC Santa Cruz

Courtney Dailley – B.S. UC Santa Cruz (University of Utah Dept. of Biochemistry graduate program)

Kiernan Kringen – B.S. UC Santa Cruz (Protein Engineer, Biomarin)

Priyanka Panchal, 2017 NIH ACCESS Student (Monterey Peninsula Community College)

Riley Mahn – B.S. UC Santa Cruz, 2016 UCSC iGEM Team

Francisco Mendez Diaz, NIH PREP Scholar – B.S. UC San Diego (MCD Biology graduate program, UCSC)

Nicolette Goularte – B.S. UC Santa Cruz, Drexler Award, Dean's Award for senior thesis (Structural Biology graduate program, Stanford University, 2017 NSF predoctoral fellow)

Kyle Franks – B.S. UC Santa Cruz, Dean's and Chancellor's Awards for senior thesis (Inside Sales, Thermo Fisher)

Jansen Luu – B.S. UC Santa Cruz (Production Assistant, Biomarin)

Leslee Nguyen – B.S. UC Santa Cruz, Undergraduate Research Award (Stanford Microbiology graduate program))

Chris Ahlback – B.S. UC Santa Cruz, Dean's and Chancellor's Awards for senior thesis (M.D. program, UCSF)

Marisol Sanchez, 2015 NIH ACCESS (B.S. UC Davis)

Nicole Parsley – B.S. UC Santa Cruz (Chemistry graduate program, University of North Carolina Chapel Hill)

Colby Sandate – B.S. UC Santa Cruz, Drexler Award; Thimann Scholarship; Dean's Award for senior thesis (Chemistry graduate program, Scripps Research Institute, 2016 NSF predoctoral fellow)

Michael Sanchez, 2014 NIH ACCESS (B.S. UC Santa Cruz)

Hema Kopalle – B.S. UC Santa Cruz (M.S. program, UCSD)

Kathy Huynh – B.S. UC San Diego (City of Oakland)

Mariah Heller, 2012 NIH ACCESS (B.A., UC Davis)

River Charles – B.S. UC Santa Cruz (M.D. program, U. of Minnesota Medical School)

Jessica Macias, NIH MARC 2012 – B.A. UC Santa Cruz (Marine Science graduate program, California State University Monterey Bay)

Patrick Sammons – B.S. UC Santa Cruz; Dean's and Chancellor's Awards for senior thesis (M.D. program, USC)

Matthew Chung – B.S. UC Santa Cruz (Research Associate, Stanford University Medical Center)

Paul Wang – B.S. UC Santa Cruz (Research Assistant, UCSF Memory and Aging Center)

## **Funding**

NIH / NIGMS R01 GM107069

8/1/2013 – 7/31/2022

Title: Exploring the structural basis for 24-hour timekeeping in mammals

The major goal of this project is to determine how dynamic structural changes regulate protein interactions that are critical for establishing the molecular feedback loop that drives 24-hour circadian rhythmicity in mammals

- 2015 supplement: FPLC and SEC-MALS instrumentation
- 2016 supplement: HPLC and mass spectrometry instrumentation (joint with G. Millhauser and M. Stone)
- 2019 supplement: ALLIGATOR high-throughput bioluminescence imaging system
- 2020 supplement: computing infrastructure for cryo-electron microscopy

## **Recently Completed Funding**

NIH / NIGMS R01 GM121507

2/1/2017 – 1/31/2021

Title: Atomic resolution analysis of timekeeping by a protein-based circadian clock

The project aims to understand the molecular basis for the oscillating behavior of the cyanobacterial clock and its ability to synchronize with the environmental light/dark cycle using x-ray crystallography and solution biophysical methods including light scattering, SAXS and fluorescence polarization.

- 2018 supplement: BLI instrumentation

NSF IOS 1656647

4/1/2017 – 3/31/2020

Title: Collaborative Research: Biochemical Basis of Cellular Circadian Behavior

The major goal of this project is to dissect the biochemical determinants of cycling encoded by the CLOCK C-terminus using an integrative cell biological and biochemical approach.

Co-PI with PI Andrew Liu, University of Memphis

Santa Cruz Cancer Benefit Group

9/1/2016 – 8/31/2017

Title: New strategies for understanding and inhibiting tumor growth

The major goal of this project is to develop an assay for targeting the clock-suppressing activity of the cancer/testis antigen PASD1.

University of California Cancer Research Coordinating Committee

7/1/2015 – 6/30/2016

Title: Circadian control of the tumor suppressor E3 ubiquitin ligase COP1

The goal of this project is to define the biochemical basis by which the circadian clock protein cryptochrome regulates COP1 activity.

University of California Santa Cruz Committee on Research

7/1/2015 – 6/30/2016

Title: Identifying new strategies to improve molecular timekeeping and prevent disease

The goal of this project is to identify target peptidyl prolyl isomerases that regulate a slow conformational exchange in the transactivation domain of circadian transcription factor BMAL1.