Improvisations in phototrophy. Protein engineering and functional investigation of rhodopsin proton-pumps

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Publications

S. Ganapathy, O. Bécheau, H. Venselaar, S. Frölich, J. B. van der Steen, Q. Chen, S. Radwan, J. Lugtenburg, K. J. Hellingwerf, H. J. M. de Groot, W. J. de Grip (2015) "Modulation of spectral properties and pump activity of proteorhodopsins by retinal analogs" *Biochemical Journal* 467: 333-343

Q. Chen, J. B. Van der Steen, H. L. Dekker, **S. Ganapathy**, W. J. De Grip, K. J. Hellingwerf (2016) "Expression of holo-proteorhodopsin in Synechocystis sp. PCC 6803" *Metabolic Engineering* 35:83-94

S. Ganapathy, H. Venselaar, Q. Chen, H. J. M. de Groot, K. J. Hellingwerf, W. J. de Grip (2017) "Retinal-based proton pumping in the near infrared" *Journal of the American Chemical Society* 139 (6): 2338-2344

Q. Chen, J. Arents, **S. Ganapathy**, W. J. de Grip, K. J. Hellingwerf (2017) "Functional expression of Gloeobacter rhodopsin in *Synechocystis* sp. PCC6803" *Photochemistry and Photobiology* 93 (3) :772-781

F. Buda, T. Keijer, **S. Ganapathy**, W.J. de Grip "A quantum-mechanical study of the Binding Pocket of Proteorhodopsin: absorption and vibrational Spectra Modulated by Analogue Chromophores" *Photochemistry and Photobiology* (in press)

Q. Chen, J. Arents, J. M. Schuurmans, **S. Ganapathy**, W. J. de Grip, O. Cheregi, C. Funk, F. B. dos Santos, K. J. Hellingwerf "Proteorhodopsin expression increases growth rate and fitness of a ΔPSI strain of *Synechocystis* sp. PCC6803" (submitted)

Y. Hontani, **S. Ganapathy**, S. Frehan, W. J. de Grip, J. T. M. Kennis "Photoreaction dynamics of near-infrared driven proteorhodopsin with retinal analogues" (submitted)

Q. Chen, J.B. van der Steen, J. Arents, A.F. Hartog, **S. Ganapathy**, W.J. de Grip, and K.J. Hellingwerf "Deletion of *sll1541* in *Synechocystis* sp. PCC6803 allows formation of a far-red shifted *holo*-proteorhodopsin *in vivo*" (submitted)

S. Ganapathy, A. Razumovski, J. B. van der Steen, Q. Chen, H.J.M de Groot, K. J. Hellingwerf and W. J. de Grip "Directed evolution of proteorhodopsin using a novel chemotaxis assay" (manuscript in preparation)

S. Ganapathy, S. Kratz, Q. Chen, K. Rothschild, K. Hellingwerf, H.J.M de Groot, W. J. de Grip "Spectral modulation of Archaearhodopsin-3 using retinal analogs" (manuscript in preparation)

S. Ganapathy, L. Opdam, K. S. Babu, H.J.M de Groot, W.J. de Grip "Solid-state NMR investigation of the retinylidene chromophore in proteorhodopsin and *Gloeobacter* rhodopsin" (manuscript in preparation)

Curriculum vitae

My full name is Srividya Ganapathy, though my friends and colleagues know me simply as Vidya. I was born on the 5th of May 1987 in Rochester, U.S.A and moved to my motherland India when I was barely 5 months old. I grew up in the peaceful and green town of Pune, Maharashtra, where I completed my schooling. I entered the Bachelor of Science Chemistry program in Fergusson College, Pune in 2004 where I graduated with Honors. Having discovered a deep love for all things biochemical, I thereby joined the University of Pune in 2007 to complete a Master's degree in Biochemistry. There I graduated with a first class and won the Prof. Arnikar Lecture competition. For my Master's thesis, I investigated "The antibacterial properties of *Adathoda vasica*, *Holarrhena antidysenterica* and *Cassia fistula*". During my Master's program, I was selected to attend the Making of Mind – a cognitive neuroscience workshop at the National Brain Research Centre, Delhi, India. Following the completion of my Master's degree in 2009, I dabbled for a while in neuroscience and studied "The spatio-temporal features of molecular mechanisms involved in stress induced plasticity" at the National Centre for Biological Sciences in Bangalore, India. After realizing that animal research was not for me, I decided to continue my love affair with the far more docile world of microorganisms. Consequently, in 2012, I started my doctoral studies in Synthetic Biology at Leiden University under the supervision of Prof. dr. Willem J. de Grip and Prof. dr. Huub J. M. de Groot on the project "A Complementary Photosystem", that participated in the large BioSolar Cells programme. During the course of my Ph.D., I had the opportunity to present oral talks about my research at various meetings, such as the BioSolar Cells annual meeting (NL; 2013, 2014), the Gordon Research Seminar in Photosynthesis (Vermont, USA; 2014) and CHAINS (Veldhoven, NL; 2014 and 2016). My research has also been presented in poster form at the BioSolar Cells meeting (2013, 2014, and 2015), the Gordon Research Conference and Seminar in Photosynthesis (2014), CHAINS (2014 and a Poster prize in 2016) and the 17th International Conference on Retinal Proteins (Potsdam, Germany; 2016).