

Ratul Chowdhury

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I am interested in computational redesign of bacterial channel proteins OmpF for applications to biomimetic membranes. I further work on *de novo* design of antibodies against important disease antigens such as Zika and Ebola. Besides, reconstruction of genome scale models of eukaryotes such as *Saccharomyces cerevisiae* and Chinese Hamster Ovary (CHO) cells and studying the combination of lethal metabolic genes is also another area of my work. Beyond chemical engineering, I am also interested in astrophysics, particularly in studying the thermodynamics of black holes.

### **Academic Information**

#### *Undergraduate Studies*

Jadavpur University. Chemical Engineering Dept. (<http://www.jaduniv.edu.in/>)

Current Cumulative Performance Index = 8.33/10.0

#### *Graduate Studies*

Penn State. Chemical Engineering Dept. ([www.psu.edu](http://www.psu.edu))

Average GPA (till now) = 3.8/ 4.0

### **Awards and Certificates**

*Kishore Vaigyanik Protsahan Yojana (KVPY). Dept of Science and Technology, India*

KVPY scholar since April 2010 for my work on “*Influence of the Gauss Bonnet coupling parameter on the thermodynamics of EGB and EYMGB black holes*” with all India rank 9 in the merit list for the award.

*Certified coursework on Chemical Biology at Indian Association for the Cultivation of Sciences (IACS), Kolkata*

*Process Modeling and Design Workshop with Honeywell using proprietary software UNISim Design.*

*Visitorship Certificate for independent research at Inter University Center for Astronomy and Astrophysics (IUCAA), Pune. India.*

I was selected for the Visitorship program for attending a summer camp on “Black hole Thermodynamics”.

### **Projects Undertaken**

#### *Before Penn State*

*Analysis of the effects of Gauss-Bonnet coupling parameter on the thermodynamics of black holes (Winter 2009- Summer 2010). Jadavpur University. Department of Mathematics advised by Dr. Subenoy Chakraborty.*

*Development of D8 algorithm for ground water distribution into an improved algorithm for efficient prediction of water distribution pattern in the Periyar river basin. (June 2011).* Indian Institute of Science. Department of Water Resources.

*Cloning of FSHbeta-HCGbeta and HCGbeta-FSHbeta as a single fragment and cloning of GST fusion proteins. (June 2011).* Indian Institute of Science. Department of Molecular Reproduction and Development Biology advised by Dr. Rajan R. Dighe.

*Correlation of sine-cosine functions with 2D projection of human Z-DNA and a theoretical analysis of various DNA coiling uncoiling events using the same. (June 2011).* Indian Institute of Science. Department of Molecular Reproduction and Development Biology advised by Dr. Rajan R. Dighe.

*Colocalization of focal adhesion proteins Paxillin and Vincullin using high resolution stochastic fluorescence microscopy. (June 2012- July 2012).* National University of Singapore. Mechanobiology Lab advised by Dr. Pakorn Kanchanawong.

*Prediction of flux through membrane-vane ensembles using adaptive neuro fuzzy inference system (October 2011- March 2012).* Jadavpur University. Department of Chemical Engineering advised by Dr. Chiranjib Bhattacharjee.

*Kinetic study of photocatalytic oxidation of chloro-hexedine digluconate using  $TiO_2$  in an attempt to treat pharmaceutical waste (October 2012-January 2013).* Jadavpur University. Department of Chemical Engineering advised by Dr. Chiranjib Bhattacharjee.

*Simulating the dynamics of focal adhesion proteins (2013 August – 2014 January).* IACS. Department of Solid State Physics advised by Dr. Raja Paul.

*Penn State, Department of Chemical Engineering*

*Essentiality analysis and reconstruction of genome scale models of Saccharomyces cerevisiae and Chinese hamster ovary cells.* Advised by Dr. Costas D. Maranas.

*De novo antibody design for a zika virus epitope using OptMAVEN computational architecture.* Advised by Dr. Costas Maranas.

*Computational redesign of bacterial channel protein, OmpF.* Advised by Dr. Manish Kumar and Dr. Costas D. Maranas.

**Publications**

Influence of Gauss-Bonnet Coupling Parameter on the Thermodynamic Properties of Einstein-Gauss-Bonnet and Einstein-Yang-Mills-Gauss-Bonnet Black Holes. R Chowdhury, R Biswas, N Mazumder, S Chakraborty. International Journal of Theoretical Physics 50 (5), 1628-1642.

Interacting generalized cosmic Chaplygin gas in loop quantum cosmology: A singularity free universe. R Chowdhury, P Rudra. International Journal of Theoretical Physics 52 (2), 489-503.

Application of ANFIS model to optimise the photocatalytic degradation of chlorhexidine digluconate. S Sarkar, R Chowdhury, R Das, S Chakraborty, H Choi, C Bhattacharjee. RSC Advances 4 (40), 21141-21150.

Conversion of slaughterhouse and poultry farm animal fats and wastes to biodiesel: Parametric sensitivity and fuel quality assessment. R Chakraborty, AK Gupta, R Chowdhury. Renewable and Sustainable Energy Reviews 29, 120-134.

Using gene essentiality and synthetic lethality information to correct yeast and CHO cell genome-scale models. R Chowdhury, A Chowdhury, CD Maranas. Metabolites 5 (4), 536-570.

## **Conferences**

Thirteenth Marcel Grossmann Meeting, Stockholm, Sweden. July 2012. *Interacting Generalised Cosmic Chaplygin Gas In Loop Quantum Cosmology: A Singularity Free Universe.*

CHEMCON 2012, Organised by IChE in collaboration with AIChE. *Prediction of flux in a rotating disc membrane module equipped with vanes using adaptive neuro fuzzy inference system. Abstract no. P-868.*

American Institute of Chemical Engineers Conference. November 2016. *Computational redesign of bacterial channel protein, OmpF.*

## **Skills**

### Wet Lab.

Polymerase Chain Reaction(PCR)

Bacterial cell transformation

Extraction of Plasmid DNA( Maxi-prep, Mini-prep)

Gel Elution technique(GE-health care illustra plasmid prep mini spin kit)

Spectrophotometer (NANODROP) handling

Transfection

Coulter Analysis

Protein purification

SDS-PAGE

Western Blot

ELISA

FRET techniques,

Immunofluorescence using STORM, PALM, TIRF, confocal and iPALM microscopes.

### Computation Languages known

Python 2.7, GAMS, MATLAB, C/C++, Mathematica, HTML.

Expertise in linear programming and mixed integer linear optimization techniques developed in the Costas Maranas lab at Penn State such as: OptKnock, GrowMatch, SL Finder, OptMAVEN, IPRO.

## **Other Interests**

Painting, Sports (Cricket, Soccer, Badminton).