

# Curriculum vitae

**Dr. Sumit Biswas, Ph.D.**

Assistant Professor,  
Department of Biological Sciences,  
Birla Institute Of Technology & Sciences, Pilani  
K.K. Birla Goa Campus



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## Research Areas:

- Structure of macromolecules (especially proteins), Crystallography of proteins and complexes, Biophysical studies on the structure-function relationship in protein domains.
- Bioinformatics of protein-nucleic acid interactions, Signatures in microRNA associated with cancers, Machine Learning Approaches, Simulation of protein interfaces in hyperthermophiles.
- Life cycle switching in *Vibrio cholerae*, Environmental sensing, Effect of natural plant products on cancers.

## About me:

BITS, Pilani – K K Birla Goa Campus is my first job assignment. Having joined as an Assistant Professor in Biological Sciences in late 2009, it has provided me a platform and an opportunity to grow both as an individual and an academic. I had previously been occupied as a Research Associate for about a year, after completing my Ph.D. under Prof. Pinak Chakrabarti at Bose Institute. My Ph.D. thesis involved work on structure determination of cAMP Receptor Proteins from various hosts and a theoretical dissection of protein-nucleic acid interfaces.

After joining BITS, apart from shouldering a major chunk of teaching assignments, I have devoted myself to the quest for finding an alternative method for tackling cholera – an interest I picked up during my post doctoral stint. Likewise, the development of an algorithm and eventually a web-based server for the identification and validation of microRNAs associated with cancer, has been a project very close to my heart. Generous and multiple resources from a number of funding agencies have helped my cause.

At the moment, I mentor and lead the VISTA (Vibrio and Structural Analysis)

Laboratory in BITS, which has both Ph.D. scholars and M.E./M.Sc. students working on various projects relevant to the above subjects.

### **Personal Information:**

**Date & Place of Birth** : 9<sup>th</sup> October, 1978 (09/10/1978); Kolkata

**Nationality** : Indian

**Present position** : Assistant Professor

**Institution with address:** Department of Biological Sciences,  
Birla Institute Of Technology & Sciences, Pilani  
K.K. Birla Goa Campus  
Near NH17B, Bye pass Road,  
Zuarinagar - 403 726, GOA, INDIA.

### **Educational Qualifications:**

Degree	University	Major subject	Year
B.Sc. (Hons.)	Calcutta University	Zoology	2000
M.Sc.	Calcutta University	Biophysics, Molecular Biology and Genetics	2002
Ph.D.	Bose Institute	Structural Biology and Biochemistry	2008

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**Ph.D. Thesis Title:** “An Analysis of Protein-Nucleic Acid Interactions and Crystallization studies on Proteins” **Mentor:** Prof. Pinak Chakrabarti, Dept. of Biochemistry, Bose Institute, Kolkata.

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### **Experience:**

#### **A. Details of professional training and research experience, specifying period.**

- **2001:** Masters degree project under Dr. K.V. Radhakishan at the Institute of Microbial Technology, Chandigarh in a project titled “Correlation Analysis of Flexible Regions in Protein Structures Derived by X-Ray and NMR Methods”.

- **2002-2008:** Ph.D. thesis titled “An Analysis of Protein-Nucleic Acid Interactions and Crystallization studies on Proteins” under Prof. Pinak Chakrabarti, Dept. of Biochemistry, Bose Institute, Kolkata. (The work covers both theoretical and experimental aspects. The physicochemical features that characterize protein-nucleic acid interfaces have been analyzed, the cAMP Receptor Proteins (CRP) from *E.coli*, *V.cholerae* and *A.tumefaciens* have been expressed, purified, characterized and crystallization experiments set up. Finally, the 1-L *myo*-inositol 1-phosphate synthases from *Porteresia coarctata* and *O.sativa* were expressed, purified and crystallization attempts were made to understand the structural differences that result in the salt-tolerance properties of *P.coarctata*.)
- **2008-2009:** Post-doctoral researcher (Research Associate) under Prof. Pinak Chakrabarti, Dept. of Biochemistry, Bose Institute, Kolkata. (A cyto-cardiotoxin from *Naja kaouthia* having anti-cancerial activity has been sequenced, biophysically characterized, crystallized and diffracted to optimal resolution and the structure solution is in process).
- **2009-2013:** Involved in three-pronged research:
  - **Lifestyle switching in *Vibrio cholerae* :** Involves the lifestyle switching of *Vibrio cholerae* and induction of virulence. Present research in this area involves investigation into a GGEEF domain protein from *V. cholerae* and characterization of a primary sigma factor from the same source. While structural studies involving X-ray crystallography is a major tool for these studies, molecular biology of *V. cholerae* and other biophysical methods are also being dealt with. Efforts will be made for the induction of a mutant GGEEF strain into the environment.
  - (ii) **Oncomeric microRNAs:** The second area is a computational biology project concerned with the prediction and validation of oncogenicity of microRNAs. While experimental methods to determine the involvement of microRNAs in oncogenic pathways is a time-consuming and extensive process, my lab has struck upon an innovative tool to predict and validate oncomeric microRNAs.
  - (iii) **Pharmacologically active proteins in *Moringa oleifera* leaf:** Complete screening of the leaf extract of *Moringa oleifera* and separation of proteinaceous components are being undertaken. While some have been found to have profound effects on serum creatinine, others are indicative of reversal of damage in melanomas.

### **B. Details of employment (past & present).**

- **2009-Present:** Employed as an Assistant Professor at BITS-Pilani, K K Birla Goa Campus.
- **2008-2009:** Research Associate under Dr. Pinak Chakrabarti at Bose Institute, Kolkata.
- **2002-2008:** CSIR-JRF and CSIR-SRF under Dr. Pinak Chakrabarti at Bose Institute, Kolkata.
- **2002-2003:** Taught Zoology as an honorary Lecturer at Bidhannagar College, Kolkata at both graduate and post-graduate level.
- **2004-2007:** Taught Microbiology in an honorary capacity at Bidhannagar College, Kolkata at both graduate and post-graduate level.

### **C. Sponsored projects running or completed.**

#### **i. As Principal Investigator: FOUR**

<b>Funding agency</b>	<b>Project Title</b>	<b>Duration</b>	<b>Amount in INR (lakhs)</b>
1. BRNS, DAE	Structure elucidation of VC0395_300 protein from <i>Vibrio cholerae</i> (leading to an alternate method of checking Cholera epidemics).	03/2011–03/2014	22
2. DBT-NER	Physicochemical characterization of the Primary Sigma Factor of <i>Vibrio cholerae</i> .	01/2012–01/2015	31.75
3. DST-FASTTRACK	Studies on putative GGEEF/Sensory box domain of <i>Vibrio cholerae</i> .	07/2012–07/2015	21.8
4. RIG, BITS	Expression and purification of GGEEF protein of <i>Vibrio cholerae</i>	11/2011–11/2013	2
<b>Total Ongoing Projects, Range and Amount</b>	<b>FOUR</b>	<b>03/2011-07/2015</b>	<b>77.55</b>

#### **ii. As co Investigator: ONE**

UGC Funded project “Biochemical and genetic characterization of antimicrobial (candidacidal) peptides produced by the Antarctic strain *Enterococcus faecalis* APR 210” worth INR 7.65 Lakhs.

#### **D. Awards & Fellowships.**

- (a) National Scholarship (2000-2001) for Graduation studies, by Ministry of Human Resource Development, Govt. of India.
- (b) Awarded CSIR Junior Research Fellowship by Human Resource Development Group, Government of India, after qualification of CSIR-NET for JRF and eligibility of Lectureship (December 2001).
- (c) Awarded CSIR Senior Research Fellowship by Human Resource Development Group, Government of India (2004).
- (d) Selected for prestigious CCP4 Crystallography workshop at IISc, Bangalore mentored by Prof. Eleanor Dodson (2005).
- (e) DBT Research Associate (2008).
- (f) Awarded Young Scientist Project from Dept. of Science and Technology, Govt. of India (2012)
- (g) Best Poster Award at 3rd World Congress of Biotechnology, 2012.
- (h) Best Poster Award at Biofest, 2012.

#### **E. Publications during the last 5 years:**

##### **i. Journal Publications:**

- **Biswas S**, Guharoy M, Chakrabarti P. Dissection, residue conservation, and structural classification of protein-DNA interfaces. *Proteins* 74(3), 643-654 (2009).
- **Biswas S**, Guharoy M, Chakrabarti P. Structural segments and residue propensities in protein-RNA interfaces: Comparison with protein-protein and protein-DNA complexes. *Bioinformatics* 2(10), 422-427 (2008).
- Jha R, Jha HC, **Biswas S**, Mittal A. Prediction of three-dimensional structure of *Chlamydia trachomatis* heat shock protein 60: An immunodominant antigen. *The Internet Journal of Genomics and Proteomics* 4(2), (2009).

- Debnath A, Gomes A, Saha A, **Biswas S**, Chakrabarti P, Giri B, Biswas AK, Dasgupta S, Gomes A. A lethal cardiotoxic-cytotoxic protein from the Indian monocellate cobra (*Naja kaouthia*) venom. *Toxicon*. 2010 Sep 15;56(4):569-79.
- Sharma S, **Biswas S**. Sequence trademarks in oncogene associated microRNAs, *Bioinformation* 6(9):364-5.(2011).
- Rastogi A, **Biswas S**, Sarkar A, Chakrabarty D. Anticoagulant activity of Moon jellyfish (*Aurelia aurita*) tentacle extract. *Toxicon*. 60(5):719-723. (2012).
- Manjuri K. Koley, Seshadri C. Sivasubramanian, **Sumit Biswas**, Periakaruppan T. Manoharan & Aditya P. Koley. Dioxygen binding and activation by a highly reactive Cr(II) compound containing S,N-donors derived from oaminothiophenol, *Journal of Coordination Chemistry*, 65, 3329 - 3351 (2012).
- Subhasish Sahoo and **Sumit Biswas**. Complete screening of *Moringa oleifera* leaf for therapeutic applications. *Journal of Biotechnology and Biomaterials*. Vol. 2. Issue 6. (2012).
- Bandekar Divya R, Dhirendra Singh, **Sumit Biswas**. GGD(/E)EF Domain: A Ubiquitous Eubacterial domain confers toxicity. *International Journal of Biotechnology and Research*. Vol. 3, Issue 1. 73-80 (2013).
- Ram K and **Sumit Biswas**. Search for Signatures in microRNAs Associated with Cancer. *Bioinformation*. Vol. 9. Issue 10 (2013).
- **Biswas S**, Chakrabarti P. Residue conservation and secondary structural classification at protein-RNA interfaces. *PLOS Comp Biol*(*under submission*).
- Sahoo S, **Biswas S**. Identification Of A Proteinaceous Component In The Leaf Of *Moringa oleifera*, Lam. With Effects On High Serum Creatinine. *I J Pharm. Sci*. Revised manuscript submitted.
- Ram K, **Biswas S**. Novel signatures in microRNAs associated with tumor suppressors. *Bioinformatics*. Under review.

## **ii. Conference Publications:**

- Ram K, Sumit Sharma and **Sumit Biswas**. MICROON – A Tool for Identification and Validation of Oncomirs. Conference on Informatics & Integrative Biology CIIB-2011. 63 (2011)
- Subhasish Sahoo and **Sumit Biswas**. Complete screening of *Moringa oleifera* leaf for therapeutic applications. 3rd World Congress on Biotechnology. (2012)
- Ram K and **Sumit Biswas**. Oncogenic signatures in microRNA. Biofest 2012. (2012)
- Akriti Rastogi, **Sumit Biswas**, Angshuman Sarkar, Dibakar Chakrabarty. Anticoagulant activity of Moon jellyfish (*Aurelia aurita*) tentacle extract. 17th World Congress of International Society on Toxinology, held at Honolulu, Hawaii from 8th -13th July, 2012. Toxicon, Volume 60, Issue 2,133-134, August 2012.

## **F. Some Invited talks.**

- Invited talk at Dept.of Biotechnology, IIT Kharagpur on 10th-11th June, 2013, on "Signatures in microRNAs associated with cancer"
- Invited talk at the Certificate Course in Global Health, organized by Albert Einstein College of Medicine and BITS, Hyderabad, on "The Cholera Enigma", 2nd July, 2013
- Invited session talk at the First International and Third National Conference on Biotechnology, Bioinformatics and Bioengineering, organised by Society of Applied Biotechnology on 28th June, 2013 at Tirupati.
- Invited as mentor for Young Scientist Research Awardees' Meet, Bhabha Atomic and Research Centre, Trombay, from November 26-28, 2012 as special invitee to mentor Young Scientists.
- Invited talk on "Frontiers in Structural Biology: Innovations and Challenges" at Nagaland University, Dept. of Biotechnology, September 24, 2012.
- Dissection of the protein-DNA interfaces. Indian Biophysical Society. 2006
- The ambiguities in the double helix. DM Symposium on Golden Jubilee of the double helix. 2004

## **Research guidance**

### **A. PhD Thesis under Supervision.**

**Ram Kothandan.** MICROON - A Tool for Identification and Validation of OncomiRs. In Progress

**Bandekar Divya Ramesh.** Structural Studies on the VC0395\_300 Protein from *Vibrio cholerae*. In Progress

**Om Prakash Chauhan.** Physicochemical Studies on the Mutants of the VC0395\_300 gene of *Vibrio cholerae*. In Progress

### **B. Project Scholar - DBT-JRF.**

**Poonam Sain.** Physicochemical characterization of primary sigma factor of *Vibrio cholerae*. In Progress

### **C. ME Thesis Supervised.**

**Subhasish Sahoo.** Purification and Identification of Therapeutic Components of Leaf extract of *Moringa oleifera*. 2012.

### **D. M.Sc. Thesis Supervised.**

**Abhijeet Gautam.** Development of Human Behavior and Applications. 2012.

**Amit Dhanda.** Isolation of SeBox protein mutants from *Vibrio cholerae*. 2013.

### **E. M.E. Projects.**

**Sowmya Gangadharan.** 2009H129002G. 2010

**Subhasish Sahoo.** 2010H129408G. 2010.

**Subhasish Sahoo.** 2010H129408G. 2011

**Tanvi Parekar.** 2011H129008G. 2011

**Malvika Sudhakar.** 2012H129007G. 2012-13

**Malvika Sudhakar.** 2012H129007G. 2013-14

### **F. First Degree Projects (M.Sc./B.Tech Projects).**

1. "DEPLOYMENT OF YEAST AND DROSOPHILA GENOME DATABASES IN THE LOCAL NETWORK" By **SHARAT CHANDRA RACHA** 2006A7PS113G April 2010
2. "INTERNAL MIRROR SERVER FOR PROTIEN DATA BANK AND PRODOM" By **Mohan Varma Gottumukkala** 2006A7PS022G April



2010

3. "FAST INTRANET ACCESS TO HUMAN GENOME PROJECT" By **S.N.Venkat Kantha Rao** 2006A7PS119G April 2010
4. "EXPRESSION, PURIFICATION AND CHARACTERIZATION OF *Vibrio cholerae* DUF<sub>1</sub> DOMAIN PROTEINS" by **PANKAJ S. VAIDYA** 2007B1A4454G 28/4/2010
5. "Mutagenesis of *Vibrio cholerae* DUF<sub>1</sub> Domain Protein" By, **AKSHAY WALIA** 2007B1A7526 28/4/2010
6. "An Insight into the Structural Features of Hyperthermophilic Proteins" By **PULKIT BUDHIRAJA** 2007B1A7475G. April 2010
7. "SEQUENCE CONSERVATION VIS-À-VIS DOMAIN CONSERVATION IN FAB HEAVY CHAINS OF IgG" By **Neeraja.M.R** 2008B1A5822 July 2010
8. "STUDY OF MICRO-RNAs AND ITS RELATION WITH ONCOGENESIS" by **Sumit Sharma** 2008A7PS114G 19/11/2010
9. "DISSECTION OF THE INTERFACE OF HYPERTHERMOPHILE PROTEINS – AN INTRICATE STUDY". By **PULKIT BUDHIRAJA** 2007B1A7475G. Nov. 2010.
10. "STUDIES OF THE FLEXIBLE REGIONS OF AMINOACYL TRNA SYNTHETASES" BY **HARISH NARAYANAM** 2007B1A1507G. Nov. 2010
11. "DISTORTION IN NUCLEIC ACID STRUCTURE VIS-À-VIS PROTEIN BINDING TO STUDY AND ANALYSE THE INTERFACE REGION OF DNA BINDING PROTEIN SUBUNITS AFTER IT BINDS TO DNA." **YESHWANTH.T** 2007B1A3504G. Nov. 2010
12. "Cloning and overexpression of virulent gene from *Vibrio cholerae*". **Ankita Pal.** 2008B1A3689G
13. "Smart Identification Card for BITS, Pilani Goa Campus". By **Sarthak Pal.** 2008A8PS330G
14. "To Study The Topography of Extremophilic Proteins using CASTP Server" by **SHARMA SUPRIYA VIJAY** 2008B1PS683G. Nov. 2010.
15. "STRUCTURAL AND FUNCTIONAL ANALYSIS OF ANIMAL TOXINS". By **RAGHAVAN RAJASHEKARAN.** 2008B1A3704G. April 2011.
16. "COMPARATIVE STUDY OF BIOINFORMATICS TOOLS FOR THE DETECTION OF CANCER". By **SHARMA SUPRIYA VIJAY** 2008B1PS683G. April 2011.
17. "DISSECTION OF STRUCTURAL FEATURES OF EXTREMOPHILIC PROTEINS" BY **Apoorva Verlekar** 2009A7PS115G Nov. 2011.
18. "Mutagenesis of Wild Type *V. cholerae* GGEEF protein". By **Sudeep Gupta.** 2009B1A3663G. Nov. 2011.
19. "SPECIFICITY OF BINDING IN PHAGE-HOST INTERACTIONS" By **Nandkishore Prakash** 2008B1A7262G. April 2012.
20. "DESIGN OF THE MICROON GUI". By **CHIRAYU GARG** 2009B1A7589G. April 2012.
21. "IMPROVING THE EFFECTIVENESS OF SCINTILLATION

- COUNTERS”, By Neha Aggarwal 2009B1A8357G. Nov. 2012.
22. Specification of protein ligand interaction in hyperthermophilic proteins BY CHIRAYU GARG 2009B1A7589G 25/4/2013

## **Teaching and pedagogy**

### **A.Courses Taught in BITS.**

#### **ME Courses:**

- Molecular Mechanism Of Gene Expression (BIO G512)
- Protein And Enzyme Bioengineering (BIO G651)
- Advanced Cell And Molecular Biology (BIO G542)
- Experimental Techniques (BIO G642)

#### **M.Sc. Courses:**

- Biophysics (BIO C331)
- Genetics (BIO C332)
- Molecular Biology Of The Cell (BIO C413)
- Genetic Engineering Technology (BIO C418)
- Integrated Biology (BIO F214)
- Instrumentation Methods And Analysis (BIO C391 And BIO F244)
- Biology Project Laboratory (BIO C231)
- General Biology (BIO C111)

#### **Project Courses:**

- Higher Degree Thesis (For ME) (BITS G629T)
- First Degree Thesis (For MSc) (BITS C421T)
- Research Practice (For ME) (BITS G540)
- Professional Practice I (BITS G620)
- Professional Practice Ii (BITS G621)
- Computer Projects (BITS C331 And BITS C335)
- Lab Oriented Projects (BITS C313 And BITS C314)
- Study Oriented Projects (BITS C323 And BITS C324)
- Special Projects (BIO C491)

#### **Practice School:**

- Mentor For Practice School II At Lupin Ltd., Goa

Pre-Ph.D. courses:

Instructor for several pre-PhD courses taken as course work.

### **B. Courses Taught in Bidhannagar College.**

- Evolutionary Biology and Taxonomy, as part of B.Sc. Zoology Hons. And M.Sc. Zoology
- Virology and Molecular Biology to M.Sc. Microbiology students.

### **C. Year-wise and semester wise breakup of teaching experience.**

<b>Year</b>	<b>Semester I</b>	<b>Semester II</b>
2002-03	Evolutionary Biology	Taxonomy
2004-05	Virology	Molecular Biology
2005-06	Virology	Molecular Biology
2006-07	Virology	-----
2009-10	BIO C331(IC); BIO C111	BIO C391; BIO C111; BIO C231
2010-11	BIO G542; BIO C331(IC); BIO C111	BIO C413 (IC); BIO C231 (IC); BIO C391; BIO C111
2011-12	BIO G542; BIO C331(IC); BIO C418	BIO G651 (IC); BIO C332 (IC); BIO C391 ; BITS C421T
2012-13	BIO G512 (IC); BIO C331(IC); BIO F214 (IC); BITS G629T	BIO G651 (IC); BIO C391; BIO F244; BITS C421T
2013-14	BIO G512 (IC); BIO F214 (IC); BIO G642	-----

§Besides, each semester from 2009-10 2<sup>nd</sup> sem has seen a number of project based courses being supervised under me.

### **Administrative/Institutional Contributions**

#### **A. Contribution to the Institute.**

1. Development of Proteomics laboratory and crystallography setup (first of its kind in Goa) with own funds.
2. Coordinator for BITSAT questions from Biology Dept.
3. Involved in the designing of new course structures of Biophysics, Genetics and

Integrated Biology.

4. Guiding as Practice School II faculty mentor from 2011-12, at Lupin Ltd. Goa.
5. Secretary of BITS Football Club, which advanced from 3rd to 2nd div. of GFA league.

### **B. Professional Contributions.**

1. Hosted as Organizing Secretary and Instructor (major resource person) the national-level 'From RNA to Protein: A Comprehensive Workshop' from 3rd to 9th June. Involved in planning, PROCURING FUNDS TOTALING RS. 5.45 LAKHS FROM GOA SCIENCE, TECHNOLOGY & ENVIRONMENT, BRNS, etc.
2. Question setter for Dept. of Biotechnology, Govt. of India.
3. Reviewer of projects from funding agencies (names withheld).
4. Reviewer of reputed journals from Oxford University Press, Elsevier, etc.

### **C. Membership of Professional Bodies.**

1. Life Member of Indian Crystallographic Association.
2. Participating member of Global Network of Cholera and other Diarrhoeal Infections, a WHO initiative.