R A M A N A T H A N G U R U N A T H

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PRESENT POSITION : Professor, Department of Chemistry, IIT Kanpur.

EDUCATION : ***Indian Institute of Science***, Bangalore, India. Ph.D. (1994).
"Thesis - Non protein amino acids in *de novo* design : An evaluation."

University of Delhi, Delhi, India. M.Sc. Chemistry 1988

University of Delhi, Delhi, India. B.Sc (H) Chemistry 1986

Post doctoral / teaching appointments

Professor, Chemistry , IIT Kanpur since 2012

Associate Professor, Chemistry, IIT Kanpur since 2007

Assistant Professor**,** , IIT Kanpur 2000-2007 (Joint appointment with the Biological sciences and Bioengineering department 2003-2006)

Forskare, Sveriges Lantbruks Universitet, Uppsala 1999-2000 (Prof. Hans Eklund/ Ulla Ulhin).

Gästforskare, Biochemistry I, Karolinska Institutet, Stockholm, Sweden 1996-1999 (Prof. Arne Holmgren).

Researcher, Department of Chemistry, Massachusetts Institute of Technology, Cambridge, MA USA 1995-1996 (Prof. JoAnne Stubbe)

Researcher/Project Assistant, Molecular Biophysics Unit, Indian Institute of Science, Bangalore, India. 1994-1995 (Prof. P. Balaram)

RESEARCH EXPERIENCE :

Department of Chemistry, Indian Institute of Technology Kanpur, India (Joint appointment with Biological Sciences and Bioengineering since January 2004). Research has been initiated in three different topics- Selenocysteine containing peptide models of mammalian selenoproteins,

Design and synthesis of biodegradable electronic devices and biodegradation of environmental pollutants. I have developed an undergraduate course BSE 216 (Molecules of life) and a new postgraduate course BSE 615(Instrumentation methods in Biology). I have also revised existing UG and PG courses to include recent developments in the subject.

Department of Structural Biology, Sveriges Lantbruks Universitet, Uppsala Sweden. I was working here as a forskare till february 2000. I worked on thermostable thioredoxins.

Medical nobel Institute for Biochemistry, Karolinska Institute, Stockholm, Sweden. This is a premier biochemistry department with principle research interests centering on the thiol-disulfide metabolism. Studies focus on the thioredoxins, glutaredoxins, thioredoxin reductase, glutaredoxin reductase. I worked here since 1996 as a gästforskare (guest researcher) with **Prof. Arne Holmgren**. The research focuses on thioredoxins as cell signal molecules. I have purified and characterized a cloned thioerdoxin fragment that acts as a mitogenic cytokine specific for T-cells. I learnt here several immunological and molecular biological techniques.

Department of Chemistry, MIT, Cambridge MA, USA : I was working here (1995-96) as a post doctoral associate with **Prof. JoAnne Stubbe**. The research interests of this group center on enzyme mechanisms, nucleotide metabolism and drug-DNA interactions. Here I acquired training in the use of enzymatic and chemical synthetic routes to the synthesis of the substrate analogues of the DNA repair enzyme, Endonuclease III.

Molecular Biophysics Unit, Indian Institute of Science, Bangalore, India : It is to this place that I owe, my fundamental skills in research. I worked here as a project assistant first and as a post-doctoral researcher (1994-1995) on peptides of conformational and biological interest under the supervision of **Prof. P. Balaram**. I utilized solid and solution phase peptide synthesis, to design peptides with ability to fold into predetermined secondary structures. These peptides evaluated the utility of various non-protein amino acids in tailoring peptide folds which were probed using spectroscopic techniques in solution like NMR, CD and infrared spectroscopy. Several of these peptides were successfully crystallized permitting their structure to be determined by X-ray crystallography.

RESEARCH INTERESTS

Gene Expression, Protein folding and design, Oxidative stress and stress proteins, Enzymology, Protein-DNA interactions, DNA repair, Biosynthetic pathways, Protein data analysis, Macromolecular structures and biophysical techniques.

HONORS : Awarded **merit certificate** by the Center for Scientific and Industrial research (CSIR), India in 1989 for obtaining a position in the top 5% of the candidates in the joint CSIR-UGC national entrance test in Chemistry.

Indian Institute of Science junior research fellowship August 88-June 89.

CSIR **Junior/Senior research fellowship** July89-June 94.

Wenner-Gren guest research fellowship (Sweden) 1998.

TEACHING INTERESTS: All organic chemistry , general chemistry, biochemistry and spectroscopy courses have been taught by me since 2000 at IIT Kanpur. I have received 5 letters of commendation from the director IIT Kanpur based on student surveys appreciating my teaching. I have also developed and am currently maintaining a Wikipedia type website (http://ictwiki.iitk.ernet.in/wiki/index.php/Main_Page) for MHRD, India. Course notes for post graduate students in Physics and Chemistry are being maintained at this web site.

This project is funded by the ministry of human resources development, India and aims at evolving benchmarking of postgraduate courses in Chemistry and Physics in India.

CURRENT PROJECTS: Towards benchmarking of post graduate courses in Physics and Chemistry from the ministry of human resources development - 2.1 Crores under the national mission for Information and communication technology in education.

Unilever consultancy project 2013-2014.

Annexure I

List of Ph. D. Thesis guided at IIT Kanpur

1.	From Molecules To Materials: Design, Synthesis, Characterization and Possible Applications Of Imidazoline-5- ones	Gitalee Bhattacharjya	Department of Chemistry, IIT Kanpur	September 2006
2.	Studies On Selinum Containing Peptides And Proteins: Semisynthesis Of C. Elegans Thioredoxin Reductase By Expressed Protein Ligation	KNK. Hare Krishnan	Department of Chemistry, IIT Kanpur	October 2007
3.	Photophyisical, Crystallographic and Photovoltaic Studies on Imidazolin-5-ones	B. K. Rajbhongshi	Department of Chemistry, IIT Kanpur	July 2011
4.	Biomineralization of N,N-dimethylformamide by Paracoccus species: Cloning, Expression and Characterization of dimethylformamidase	Shiv Swaroop	Department of Biological Sciences and Bioengineering, IIT Kanpur	August 2011
5.	Biomineralization of Nitroarenes: Cloning, Overexpression, Purification and Homology Modeling of 3-Nitrotoluene dioxygenase enzyme From *Diaphorobacter* sp. strain DS2	Deepak Singh	Department of Chemistry, IIT Kanpur	December 2011
6.	Design, synthesis and conformational studies on peptides containing non-protein aminoacids	Anju Duley	Department of Chemistry, IIT Kanpur	June 2013

There are nine more students who are also under my guidence currently.

List of Masters (M. Tech.) Thesis guided

S.No.	Thesis Title	Author	Department	Year of Submission
1	Isolation and characterisation of a p-Cresol metabolising *pseudomonas* species from activated sludge	Kamalesh Kumar Yadav	Environmental Engineering & Management Programme Department of Civil Engineering, IIT Kanpur	July 2003
2	Characterization of methylotrophs isolated from depth of 23- meters from Indo-Gangetic plains	Vartika Singh	Environmental Engineering & Management Programme Department of Civil Engineering, IIT Kanpur	July 2005
3	Biomineralization of *N*,*N*,-dimethylformamide: Isolation, identification and degradation of pathway characterization of a *Paracoccus* species	Sughosh.P	Environmental Engineering & Management Programme Department of Civil Engineering, IIT Kanpur	July 2006
4	Cloning, expression and purification of non-fluroscent mutants of green fluorescent protein	Kishore Babu Chemuri	Biological Sciences and Bioengineering, IIT Kanpur	November 2007
5	An empirical study on the plasmid curing potential of curing agents on *paracoccus* species strain DMF-1	Alokmay Behera	Environmental engineering & Management Programme Department of Civil Engineering, IIT Kanpur	December 2007

Besides these 21 M.Sc. projects (12 from IIT Kanpur; 9 from other universities in india) and B.Tech projects (2 from IIT Kanpur – one from computer sciences and engineering (co-guided with Prof. Somenath Biswas); and one from BSBE have also been supervised.

Annexure II

List of papers published (1-21 are from IIT Kanpur).

1. Deepak Singh, Archana Kumari, Subramaniam Ramaswamy, **Gurunath Ramanathan** (2014)
Expression, Purification and substrate specificities of 3-nitrotoluene dioxygenase from Diaphorobacter sp. strain DS2
Biochem. Biophys. Res. Commun. (in press)

2. Deepak Singh, Archana Kumari, **Gurunath Ramanathan** (2014)
3-Nitrotoluene dioxygenase from Diaphorobacter sp. strains: cloning, sequencing and evolutionary studies
Biodegradation (in press)

3. Deepak Singh and **Gurunath Ramanathan** (2013)
Biomineralization of 3-nitrotoluene by diaphorobacter species
Biodegradation, **24**(5), 645-655.

4. **Gurunath Ramanathan** and Anju Duley, A. (2013)
Cyclic beta aminoacids as conformational constraints
Biomolecular forms and function - A celebration of 50 years of the Ramachandran Map. IISc Press-WSPC publication Pages: 282-295 Published: January 2013.

5. Monalisha Nayak, Deepak Singh, Himanshu Singh, Rishi Kant, Ankur Gupta, Shashank Shekhar Pandey, Swarnasri Mandal, **Gurunath Ramanathan*** and Shantanu Bhattacharya* (2013)
Integrated sorting, concentration and real time PCR based detection system for sensitive detection of microorganisms
Scientific Reports, **3**, Art. 3266

6. Basanta K. Rajbongshi, N. Nair, M. Nethaji and **Gurunath Ramanathan** (2012)
Segregation into chiral enantiomeric conformations of an achiral molecule by concomitant polymorphism.
Cryst. Growth and Design, **12**, 1823-1829.

7. ShahnawazRafiq, B. K. Rajbonghshi, N. N. Nair, P. Sen and **Gurunath Ramanathan** (2011)
Excited state relaxation dynamics of model green fluorescent protein chromophore analogs: evidence for *cis-trans* isomerism.
J. Phys. Chem. (A) **115**, 13733-13742.

8. Anju Duley, M. Nethaji and **Gurunath Ramanathan** (2011)
A change in the 310- to α- helical transition point in the heptapeptides containing sulfur and selenium
Cryst. Growth and Design, **11,** 2238-2240.

9. Rajbhongshi, B.K. P. Sen and **Gurunath R** (2010)
Twisted intramolecular charge transfer in a model green fluorescent protein luminophore analog
Chem. Phys. Lett. **494,** 295-300.

10. Mondal S., Shivswaroop, Verma S. and **Gurunath R** (2010)
A synthetic ditryptophan conjugate that rescues bacteria from mercury toxicity through complexation.
Tetrahedron Letters, **51**, 6111-6115.

11. Shivswaroop, Sughosh P and **Gurunath R** (2009)
Biomineralization of N,N-Dimethylformamide by paracoccus so. Strain DMF
J. Hazardous materials. **171**, 268-272.

12. B. K. Rajbhongshi and **Gurunath R** (2009)

Designed modulation of interactions in the crystal structures of a series of 4-benzylidene imidazolin-5-ones.

J. Chemical Sciences **121**, 973-982.

13. Vibhor Jain, Basanta Kumar Rajbongshi, Arun Tej Mallajosyula, Gitalee Bhattacharjya, S Sundar Kumar Iyer and **Gurunath R** (2008)
Photovoltaic effect in single layer organic solar cell devices fabricated with two new imidazolin-5-one molecules.
Solar energy materials and solar cells **92**, 1043-1046.

14. Jassi, M.; **Gurunath, R**.; Sundar Kumar Iyer, S (2008)
Degradation Study of Organic Semiconductor Devices Under Electrical and Optical Stresses
Electron Display Letters **29**, 442-444.

15. Bhattacharjya G.,Arun Tej, S.S.K. Iyer and **Gurunath R** (2006)
Imidazolin-5-ones in organic semiconducting diodes
Molecules to materials- Proceedings of the international conference on molecules to materials 2006 at at Sant Longowal Institue of Engineering and Technology. Longowal, Punjab. pp 8-12.

16. Bhattacharjya G., Agasti S.S., Savitha G. and **Gurunath R** (2006)

A solvent free lewis acid catalyzed vinylogous condensation

ARKIVOC **6**, 152-161.

17. Vibhor Jain , Gitalee Bhattacharjya , Arun Tej 2, CK Suman , **R**

Gurunath, B Mazhari and SSK Iyer (2006)
Study of Optical and Electrical Properties of Imidazolin-5-one Molecules for Optoelectronic Applications",
Proceedings Asian Symposium on Information Display(ASID), **2006**, 244-247.

18. Singh, P, Iyengar, L., Birkeland, N. and **Gurunath R** (2006)
Mineralization of Sulphanilic acid by Agrobacterium sp. Strain PNS -1
Biodegradation, Feb 2006, 1 – 8.

19. Bhattacharjya G, Savitha G and **Gurunath R** (2005)
C-H....O interactions are favoured over C=O....C interactions in the crystal packing of imidazolin-5-one analogues
J. Molecular Structure **752**, 101-106.

20. Yadav, K., Iyengar, L., Birkeland, N. and **Gurunath R** (2005)

Accumulation of metabolic intermediates of p-Cresol in the culture medium by a *Pseudomonas sp.* strain A isolated from the activated sludge of a domestic waste water treatment plant.
World J. Microbiology and biotechnology **21**(8-9), 1529-1534.

21. Bhattacharjya G, Savitha G and **Gurunath R** (2004)
Short C=O•••C intermolecular contacts for molecular assembly
CrytEngComm, **6**(40), 233-235.

22. Pekkari K, Javier Avila-Cariño, **Gurunath R**, Åsa Bengtsson Annika Scheynius and Arne Holmgren(2003)
Truncated thioredoxin (Trx80) exerts unique mitogenic cytokine effects via a mechanism independent of thiol oxido-reductase activity,
FEBS Letters, **539**(1-3), 143-148.

23. Pekkari K, Javier Avila-Cariño, Åsa Bengtsson, **Gurunath R**, Annika Scheynius and Arne Holmgren (2001)
Truncated thioredoxin (Trx80) activates human resting monocytes and induces Interleukin 12 production
Blood, **97**(10):3184-3190.

24. Pekkari K, **Gurunath R**, Arnér ESJ & Holmgren A (2000)
Truncated Thioredoxin Is a Mitogenic Cytokine for Resting Human Peripheral Blood Mononuclear Cells and Is Present in Human Plasma
J. Biol. Chem., 2000 **275**: 37474-37480.

25. Bertini R, Howard ZOM, dong H-F, Oppenheim JJ, Bizzari C, Sergi R, Caselli G, Pagiliei S, Romines B, Wilshire JA, Mengozzi M, Nakamura H, Yodoi J, Pekkari K, **Gurunath R**, Holmgren A, Herzenberg LA, Herzenberg LA and Ghezzi P. (1999)
Thioredoxin a redox enzyme released in infection and inflammation, is a unique chemoattractant for neutrophils, monocytes and T cells.
J. Experimental Medicine, (1999) **189** (7), 1783-1789.

26. Karle IL, **Gurunath R**, Prasad S, Rao RB, Balaram P (1996)
Crystal structures of a nonapeptide helix containing α,α-di-n-butylglycine (Dbg), Boc-Gly-Dbg-Ala-Val-Ala-Leu-Aib-Val-Leu-OMe
Int. J. Peptide. Protein Res., **47**, 376-382.

27. Datta S, Shamala N, **Gurunath R** & Balaram P (1996)
Observation of a mixed antiparallel and parallel β- sheet motif in the crystal structure of Boc-Ala-Ile-Aib-OMe.
Int. J. Peptide. Protein Res., **48**, 209-214.

28. **Gurunath R** & Balaram P (1995)
A nonhelical, multiple β-turn conformation in a glycine-rich heptapeptide fragment of Trichogin A IV containing a single central α -aminoisobutyric acid residue.
Biopolymers, **35**(1), 21-9.

29. Karle IL, **Gurunath R**, Prasad S, Kaul R, Rao B, Balaram P (1995)
Peptide design. Structural evaluation of potential non-helical segments attached to helical modules.
J. Am. Chem. Soc., **117**, 9632-9637.

30. **Gurunath R**, Beena TK, Adiga PR & Balaram P (1995)
Enhancing peptide antigenicity by helix stabilization.
FEBS Lett., **361**(2-3), 176-178.

31. Karle IL, Flippen-Anderson JL, **Gurunath R** & Balaram P (1994)
Facile transition between 3_{10}- and α-helix: structures of 8-, 9-, and 10-residue peptides containing the -(Leu-Aib-Ala)$_2$-Phe-Aib- fragment.
Protein Science, **3**(9), 1547-1555.

32. **Gurunath R** & Balaram P (1994)
Incorporation of a potentially helix breaking D-Phe-Pro sequence into the center of a right handed 16 residue peptide helix.
Biochem Biophys Res Commun., **202**(1) 241-245.

Patents filed from IIT Kanpur

1. 'An improved organic optoelectronic device' has been filed at Delhi. Reference number 3263/ RQ – DEL 2007

2. 'A new technique for counting and characterizing bacteria' patent pending in Delhi 2012.

Other Publications from IIT Kanpur

3. Other problems with Nobel Prizes as a letters to the editor in C & E news **87 (7),** February 2009.

Annexure III

List of papers published in conference proceedings and other newsletters

1. Chidvilas, K.A.K., Mani, P., Lyer, S.S.K. , Rajbongshi, B.K. , **Gurunath, R.** (2009)
Bilayer organic solar cells based on imidazolin-5-one molecules
Conference record of the IEEE photovoltaic specialists conference Art. No. 5411205; 1069-72.

2. Shantanu Bhattacharya, Arnab Ghosh, Deepak Singh, Tarak Kr. Patra, J. K. Singh, **R. Gurunath** (2009)
Electrophoretic transport of Nucleic acids through nano-structured surfaces.
Proceedings- AICHE 2009, 306C, Annual Meeting of American electrophoresis society, Nashville, Tenessee, USA. 510-524.

3. Shantanu Bhattacharya, Swarnasri Mandal, Deepak Kr. Singh, **R. Gurunath**, (2009)
Dielectrophoretic separation of nanoparticles conjugated bacterial cells within micro scale architecture",
Proceedings- AICHE 2009, 72H, Electrokinetic behaviour of micro/nano particles: Fundamentals and applications, Nashville, Tenessee, USA; 208-215

4. Anil B.Ghubade, Swarnasri Mandal, Shreya Ghoshdostidar, Rajeev Kumar Singh, Deepak Singh, R. Gurunath, Shantanu Bhattacharya (2009)
Bio-chip for fluorescence based quantitation of fluorescent microbeads", Indian Institte of Technology-Kanpur, ICMEMS-2009.

5. Vibhor Jain , Gitalee Bhattacharjya , Arun Tej , CK Suman , **R Gurunath**, B Mazhari and SSK Iyer (2006)Study of Optical and Electrical Properties of Imidazolin-5-one Molecules for Optoelectronic Applications", Proceedings Asian Symposium on Information Display(ASID), **2006**, 244-247.

6. Studies on Selenocysteine containing active site peptides of thioredoxin reductase
K. N. K. Hare krishnan and R. Gurunath (2005)
In phosphorous, sulfur and silicon and other related elements **180**, 1088.

7. Other problems with Nobel Prizes as a letters to the editor in C & E news **87 (7)**, February 2009.