

# CHARU G. KUMAR, PH.D.

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## POSITION

Research Assistant Professor

2013-present

## RESEARCH INTERESTS

Our two main research interests are in computational genomics characterizing microbes to understand how each species and strain have originated and evolved. That includes protein metabolism and their networks of these pathogenic bacteria/microbiome. The other interest is computational neuroscience and systems biology approaches to study complex diseases that are known to differentially affect astrocytes like glioblastoma and autism. Questions include studying how these diseases may have created molecular novelties operant in the constituent pathways and what mechanisms are at play in generating these novelties.

## EDUCATION

**Ph.D.**, Animal Sciences

2001–2008

**University of Illinois**, Urbana-Champaign, IL

Advisor: Harris A. Lewin, Ph.D.

Thesis title: *Novel lineage-specific genes expressed in cattle placenta: discovery, functional annotation and evolution.*

**M.S.**, Biochemistry, Molecular Biology and Biophysics

1990-1993

**University of Minnesota**, Minneapolis/St.Paul, MN

Advisor: Michael A. Raftery, PhD.

Thesis title: *Topographic images of metal mercaptide derivatives of alpha-Bungarotoxin, a nicotinic Acetylcholine receptor antagonist, using Scanning Tunneling Microscopy.*

**M.Phil.** Chemistry

1988-1990

**University of Delhi**, Delhi, India

Advisor: A.N. Maitra, PhD.

Thesis title: *Studies of lecithin gels in biocompatible oils.*

**M.Sc.** Chemistry

1986-1988

**Indian Institute For Technology**, Kanpur, India

Advisor: P. Gupta-Bhaiya, PhD.

Thesis title: *Study of Cardiolipin bilayer lipid membrane*

**B.Sc.** Chemistry

1983-1986

**University of Delhi**, St. Stephen's College, Delhi, India

## HONORS & AWARDS

- Sigma Delta, The Honor Society of Agriculture, UIUC chapter, IL
- Parkland College Dean's List in Computer Science, Champaign, IL 1999

## WORK AND RESEARCH EXPERIENCE

**Research Assistant Professor, Department of Bioengineering, UIUC** January 2013—present  
On Medical Leave Feb. 2014-Aug. 2017

**Carle Illinois College of Medicine, University of Illinois** June 2020- Dec. 2021  
Admission Reviewer for new Medical Student applications (15+ applications).  
Admission Reviewer for new Medical Student applications June 2022 - Dec. 2022

**Postdoctoral Research Associate** May 2010–2012  
**Institute for Genomic Biology, University of Illinois**, Research Group for Computational & Systems Biology  
Mentors: Prof. Bruce Fouke, IGB and Geography and Nathan D. Price, Ph.D., Chemical Engineering, University of Illinois at Urbana-Champaign. Presently Associate Professor, Institute for Systems Biology, Seattle, WA.  
○ Genome assembly, pathway and metabolic reconstruction in bacteria; Assembly, annotation and pathway reconstruction of deep subsurface metagenomic microbial communities; Evolution of signaling networks in astrocyte phenotypes.

**Affiliate Research Associate.** January 2009–2010  
**Institute for Genomic Biology, University of Illinois**  
○ Submitted an NRSA grant proposal to NIH; Audited medical neuroscience course and have experience in brain dissections.

**Graduate Research Assistant** August 2001–2008  
**Department of Animal Sciences, University of Illinois**, Research Group for Comparative Mammalian Biology.  
Advisor: Harris A. Lewin, Ph.D., Former Vice Chancellor of Research, University of California, Davis. (Prior position held: Director, Institute for Genomic Biology, University of Illinois)  
○ Identified novel lineage-specific genes in cattle using bioinformatics and comparative genomics; Functional characterized the novel genes using co-expression analysis of tissue-specific microarray data; and regulatory networks.

**Senior Program Analyst** December 1999–2001  
**W.M. Keck Center, Bioinformatics Unit**, University of Illinois  
○ Developed pipelines and published ESTIMA tool for automation and visualization of sequence assembly, annotation, GeneOntology-based tree querying. Processed and analyzed projects for cDNA microarray libraries.

**Graduate Research Assistant**

**Department of Biochemistry, Molecular Biology and Biophysics, University of Minnesota,**

Minneapolis/St.Paul

August 1990-1993

Advisor: Michael A. Raftery, Ph.D.

- o Taught Biochemistry courses; Study of binding of antagonist, alpha-Bungarotoxin, to acetylcholine receptor using ligand binding studies and Scanning Tunneling Microscopy.

**TEACHING**

**Research Assistant Professor, Department of Bioengineering, University of Illinois**

BioE 474/ChBE 474, Systems Biology- Metabolic Engineering

Jan. 2014-Feb. 2014

**Research Assistant Professor, Department of Bioengineering, University of Illinois**

Mayo-Illinois Alliance 2013 summer teaching workshop. Taught Systems Biology module.

**Department of Biochemistry, Molecular Biology and Biophysics, University of Minnesota,**

Minneapolis/St.Paul

August 1991-Dec. 1993

**Part-time Faculty, Parkland College, Champaign.**

Chemistry 101

Fall 1997

**PUBLICATIONS**

- 1) Dong Y, Kumar CG, Chia N, Kim PJ, Miller PA, Price ND, Cann IK, Flynn TM, Sanford RA, Krapac IG, Locke RA 2<sup>nd</sup>, Hong PY, Tamaki H, Liu WT, Mackie RI, Hernandez AG, Wright CL, Mikel MA, Walker JL, Sivaguru M, Fried G, Fouke BW. Halomonas sulfidaeris-dominated microbial community inhabits a 1.8 km-deep subsurface Cambrian Sandstone reservoir. *Environ Microbiol*. 2014 Jun; 16(6):1695-708.
- 2) Cohen-Zinder M, Donthu R, Larkin DM, Kumar CG, Rodriguez-Zas SL, Andropolis KE, Oliveira R, Lewin HA. Multisite haplotype on cattle chromosome 3 is associated with quantitative trait locus effects on lactation traits. *Physiol Genomics*. 2011, 43:1185-97.
- 3) Kumar CG, Everts RE, Looor JJ, Lewin HA. Functional inference of lineage-specific transcripts from cattle placenta using co-expression analysis, *BMC Genomics* 2010, 11:161.
- 4) Cattle genome consortium, coauthor, gene annotation. The Genome Sequence of Taurine Cattle: A window to ruminant biology and evolution. *Science* 2009, 324:522-8.
- 5) Kumar CG, Larson JH, Band MR, Lewin HA. Discovery and characterization of 91 novel transcripts expressed in cattle placenta. *BMC Genomics* 2007, 8:113.
- 6) Larson JH, Kumar CG, Everts RE, Green CA, Everts-van der Wind A, Band MR, Lewin HA. Discovery of eight novel divergent homologs expressed in cattle placenta. *Physiol Genomics* 2006, 25:405-13.

- 7) Kumar CG, LeDuc R, Gong G, Roinishivili L, Lewin HA, Liu L. ESTIMA, a Tool for EST Management in a Multi-Project Environment. *BMC Bioinformatics* 2004, **5**:176.
- 8) Everts RE, Band MR, Liu ZL, Kumar CG, Liu L, Loor JJ, Oliveira R, Lewin HA. A 7872 cDNA microarray and its use in bovine functional genomics. *Vet Immunol Immunopathol.* 2005, **105**:235-45.
- 9) Lewin HA, Larson, JH and Kumar CG. Comparative Mammalian Genomics and Adaptive Evolution: Divergent Homologs and Novel Genes in the Cattle Genome. In: *S.P. Wasser (ed.) Evolutionary Theory and Processes: Modern Horizons, Papers in Honor of Eviator Nevo, 2003*. Kluwer Academic Publishers, The Netherlands.
- 10) Whitfield CW, Band MR, Bonaldo MF, Kumar CG, Liu L, Pardinas JR, Robertson HM, Soares MB, Robinson GE. Annotated expressed sequence tags and cDNA microarrays for studies of brain and behavior in the honeybee. *Genome Res.* 2002, **12**:555-66.

## TO BE PUBLISHED

- 1) Kumar CG, Yiran Dong, Gary J. Olsen, Pan-Jun Kim, Isaac K.O. Cann, Roderick Mackie, Nathan D. Price, Bruce W. Fouke. *H. sulfidaeris*: metabolic strategy unites hydrothermal vents and subsurface arenite rocks. To be submitted.

## PRESENTATIONS

- Kumar CG, Dong Y, Kim P-J, Olsen GJ, Caan IKO, Mackie R, Fouke BW, Price ND. Comparative metabolic predictions for *Halomonas sulfidaeris* inhabiting km-deep marine hydrothermal vents and subsurface sedimentary rocks. Eleventh Cold Spring Harbor Laboratory/Wellcome Trust conference on *Genome Informatics*, November 2—5, 2011, Cold Spring Harbor, New York, NY.
- Kumar CG, Everts RE, Larson JH, Loor JJ, Band MR, Lewin HA. Novel lineage-specific genes expressed in cattle placenta: discovery, functional annotation and evolution. *The bovine genome consortium*. Cold Spring Harbor Laboratory/Wellcome Trust conference, May 9-11, 2009, Cold Spring Harbor, New York. Talk and poster.
- Kumar CG, Larson JH, Band MR, and Lewin HA. Identification and bioinformatics characterization of novel mammalian transcripts expressed in bovine placenta. Fifth Cold Spring Harbor Laboratory/Wellcome Trust conference on *Genome Informatics*, October 28-November 1, 2005, Cold Spring Harbor, New York, NY.
- Kumar C.G., Larson J.H., Band M.R., and Lewin H.A. Identification and bioinformatic characterization of novel mammalian genes expressed in bovine placenta. *7th Annual Conference in Computational Genomics*, Reston, Virginia, October 21-24, 2004.
- Kumar C.G., S.S. Davis, G. Gong, S. Natarajan, H.A. Lewin, L. Liu, ESTIMA: An EST Information Management And Annotation Tool, Computer-demo and poster presented at *Plant, Animal & Microbe Genomes X*, San Diego, California, January 12--16, 2002.

## MEETINGS AND TRAINING IN BIOINFORMATICS AND GENOMICS

- Joint CSHL/Welcome Trust conference, *Microbiome*, Tue Oct 25 - Sat Oct 29 2022, Cold Spring Harbor, New York, NY
- Joint CSHL/Welcome Trust conference, *Microbial*

- Pathogenesis & Host Response*, September 21 - 24, 2021, Virtual
- Joint CSHL/Welcome Trust conference, *Microbiome*, October 20 - 23, 2020, Virtual.
  - Joint CSHL/Welcome Trust conference, *Microbiome*, July 18 - 21, 2019, Cold Spring Harbor, New York, NY.
  - Joint CSHL/Welcome Trust conference, *Genome Informatics*, November 2--5 2011, Cold Spring Harbor, New York, NY
  - Society for Neuroscience 2011, Washington, DC, November 12--16, 2011.
  - Joint CSHL/Welcome Trust conference on Integrated approaches to Brain complexity, Hinxton, Cambridge UK, September 28—30, 2006.
  - Bioinformatics tools for comparative genomics, Berkeley, CA, November 4—8, 2002
  - Databasing the brain, EU-US workshop, Oslo, Norway, July 1—2, 2001.
  - Object-oriented programming and database algorithms, Parkland College, Champaign, IL, 1997-1999
  - DNA technology, STM, Receptor and lipid analysis

#### UNDERGRADUATE/GRADUATE STUDENT ACTIVITIES

- Wesam Ouesliti, Junior Undergraduate, Department of Bioengineering, UIUC, Fall 2023-Spring 2024.
- Praveen Vijayakumar, Freshmen Undergraduate, Department of Bioengineering and Computer Science, UIUC, Fall 2023 – Spring 2024.
- Frida Viquez, Junior Undergraduate, Department of Computer Science, UIUC, Fall 2023.
- Luke Illes, Junior Undergraduate, Department of Biochemistry, University of Illinois, Urbana-Champaign, Spring 2023, Summer 2023.
- Sanaz Agarwal, Sophomore Undergrad, Indian Institute of Technology, Delhi, Summer 2020 to Spring 2022.
- Andrew Schollmeier, Undergraduate, Freshman-Sophomore, Department of Bioengineering, UIUC, Fall 2018-Spring 2019
- Amitha Sandur, 25% Graduate Research Assistant, Department of Computer Science, UIUC, Fall 2018.
- Research supervisor since Spring 2013 for a total of eight undergraduates, and financial support for research work for Jacob Guggenheim, BioE, UIUC, Summer 2013, Spring 2014.
- Five other BioE undergraduates, Neil Bruyere, Joseph Sombeck, Howard Dabbous, Abhishek Deshpande, and Sarthak Grover who started research/independent studies in my group in 2014.

#### SCIENTIFIC JOURNAL MEMBERSHIP

- American Association for the Advancement of Science (AAAS), 2001-present
- Society for Neuroscience (SfN), 2011-present

#### ARTICLES REVIEWED FOR SCIENTIFIC JOURNALS

- BMC Systems Biology
- BMC Bioinformatics
- BMC Genomics

**MENTORING EXPERIENCE**

- Mentor to I-Promise undergraduate student Fall 2012-2014

**AFFILIATION TO OTHER DEPARTMENTS**

- Neuroscience 2017-present
  - <https://neuroscience.illinois.edu/profile/cgkumar>
- The School of Information Sciences, Informatics Programs 2018-2022
  - <https://informatics.web.illinois.edu/faculty-affiliates/>
- Carle Illinois College of Medicine 2018-2022
  - <https://medicine.illinois.edu/>