

## CURRICULUM VITAE

- **NAME:** SANDIP KAR
- **MAILING ADDRESS:** Department of Chemistry,  
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- **DATE OF BIRTH:** MARCH 5, 1977

- **NATIONALITY:** Indian

- **EDUCATION:**

**B. Sc in Chemistry**, University of Calcutta, INDIA, 1999.

**M. Sc in Chemistry (Physical Chemistry major)**, University of Calcutta, INDIA, 2001.

**Ph. D in Chemistry**, Jadavpur University, Kolkata, INDIA, 2006.

- **PROFESSIONAL EMPLOYMENT:**

1. **Assistant Professor, Department of Chemistry, IIT Bombay** (Since May 23<sup>rd</sup>, 2013)
2. Senior Postdoctoral Research Associate, (worked with **Prof. Thomas Höfer**) **German Cancer Research Center (DKFZ), Heidelberg, GERMANY** (August, 2010 – April, 2013).
3. NIH Postdoctoral Research Associate, (worked with **Prof. John J. Tyson**) **Virginia Polytechnic and State University, USA** (March, 2007 - July, 2010).
4. Lecturer in Chemistry, Bhairab Ganguly College, Calcutta, INDIA (June, 2005-March, 2007).

- **THESIS TITLE:**

**APPLICATIONS OF NONLINEAR DYNAMICS TO SOME MODEL BIOPHYSICAL SYSTEMS**

- **THESIS SUPERVISOR:**

**Prof. Deb Shankar Ray,**  
**Indian Association for the Cultivation of Science,**  
**Jadavpur, Kolkata-700032, INDIA.**

**RESEARCH INTEREST:**

Systems biology of signal transduction, computational Biology, Cell cycle modeling, Stem cell differentiation dynamics, Stochastic modeling, Nonlinear dynamics, Bifurcation theory, and Pattern formation in chemical and biological systems.

**Sponsored Research Projects:**

<b>Project Title</b>	<b>Sponsored Agency</b>	<b>Grant</b>	<b>From</b>	<b>To</b>
Investigating Restriction Point Control in Mammalian Cell by Signal Transduction Pathways	IRCC, IIT Bombay (Seed grant)	20 Lakhs (Completed)	11/06/2013	10/06/2016
Deciphering the Role of Noise in Mammalian Cell Cycle Regulation Under the Influence of Signaling Pathways	DST SERB, India	47.68 Lakhs (On going)	28/08/2015	27/08/2018
A quantitative approach to understand the effect of p38 signaling pathway on cell cycle regulation	DBT, India	50.86 Lakhs (On going)	27/01/2016	26/01/2019

**AWARD / FELLOWSHIP:**

**Professor Sadhan Basu Memorial Award (2001)** (University of Calcutta, INDIA)

**CSIR fellowship** (JRF and SRF from 2001-2005) (qualified on Dec, 2000 NET exam)

**Served as Peer Reviewer for the following Journals:**

*Plos One, Cell Systems, Systems and Synthetic biology, Journal of Chemical Sciences, BMC Systems Biology, Biocnjugate Chemistry, and Computational and applied mathematics.*

## **PUBLICATIONS:**

### **After joining IITB:**

1. Alteration in microRNA-17-92 dynamics accounts for differential nature of cellular proliferation  
D. Sengupta and **S. Kar**, *FEBS Letters*, (2018), **(Accepted, in Press)**.
2. Deciphering the dynamical origin of mixed population during neural stem cell developmental lineage commitment  
D. Sengupta and **S. Kar**, *Biophysical Journal*, (2018), **(Accepted, in Press)**.
3. Alteration in microRNA expression governs the nature and timing of cellular fate commitment  
D. Sengupta and **S. Kar**, *ACS Chemical Neuroscience*, (2017), **Article ASAP**.  
DOI: 10.1021/acchemneuro.7b00423.
4. Decoding the regulatory mechanism of Glucose and Insulin induced Phosphatidylinositol 3,4,5-Trisphosphate dynamics in  $\beta$ -cells  
T. Samanta\*, P. Sharma\*, D. Kukri and **S. Kar**, *Molecular Biosystems*, 13, 1512-1523, (2017).  
(\* Equal contribution 1<sup>st</sup> author)
5. Protein abundance of AKT and ERK pathway components governs cell-type-specific regulation of proliferation  
L. Adlung\*, **S. Kar**\*, M. C. Wagner\*, B. She\*, S. Chakroborty, J. Bao, S. Lattermann, M. Boerries, H. Busch, J. Timmer, M. Schilling, T. Hoefler and U. Klingmueller, *Molecular Systems Biology*, 13, 904, (2017). (\* Equal contribution 1<sup>st</sup> author)
6. Unraveling the differential dynamics of developmental fate in central and peripheral nervous systems?  
D. Sengupta and **S. Kar**, *Scientific Reports*, 6: 36397, (2016).  
DOI: 10.1038/srep36397
7. Unraveling Cell-Cycle Dynamics in Cancer  
**S. Kar**, *Cell Systems*, 2, issue 1, p8-10, (2015).
8. Are Quasi-Steady-State Approximated Models Suitable for Quantifying Intrinsic Noise Accurately?  
D. Sengupta and **S. Kar**, *Plos One*, 10(9): e0136668, (2015).  
DOI: 10.1371/journal.pone.0136668

### **Before joining IITB:**

1. Heterogeneous kinetics of AKT signaling in individual cells are accounted for by variable protein concentration  
R. Meyer\*, L. A. D'Alessandro\*, **S. Kar**\*, B. Kramer, S. Bin, D. Kaschek, B. Hahn, D. Wrangborg, J. Karlsson, M. Kvarnstrom, M. Jirstrand, W. D. Lehmann, J. Timmer, T. Höfer and U. Klingmüller, *Frontiers in Physiology*, 3, 451, (2012). (\* Equal contribution 1<sup>st</sup> author)
2. Exploring the Roles of Noise in the Eukaryotic Cell Cycle  
**S. Kar**, W. Baumann, M. R. Paul and J. J. Tyson, *Proc. Natl. Acad. Sci. (USA)*, 106, 6471, (2009).
3. Antagonism and bistability in protein interaction networks  
M. Sabouri-ghomi, A. Ciliberto, **S. Kar**, B. Novak and J. J. Tyson, *J. Theo. Biol.*, 250, 209, (2008).
4. Pattern formation in reaction-diffusion system in crossed electric and magnetic fields

- S.S. Riaz, S. Banerjee, **S. Kar** and D.S. Ray, *Euro. Phys. J. B*, **53**, 509, (2006).
5. Pattern formation induced by additive noise : a moment based analysis  
S. S. Riaz, S. Dutta, **S. Kar**, D. S. Ray, *Euro. Phys. J. B*, **47**, 255, (2005)
  6. Differential flow induced transition of Hopf instability to Turing instability and pattern Formation  
S.S. Riaz, **S. Kar** and D.S. Ray, *Physica D*, **203**, 224, (2005).
  7. Sustained simultaneous Glycolytic and Insulin oscillations in  $\beta$ -cells  
**S. Kar** and D.S. Ray, *J. Theo. Biol.*, **237**, 58, (2005).
  8. A model reaction diffusion system under spatial perturbation: theoretical and numerical investigation  
**S. Kar**, J.K. Bhattacharyya and D.S. Ray, *Euro. Phys. J. B*, **43**, 109, (2005).
  9. Mobility induced instability and pattern formation in a reaction-diffusion system  
S.S. Riaz, **S. Kar** and D.S. Ray, *Journal of Chemical Physics*, **121**, No-11, 5395, (2004).
  10. Nonlinear Dynamics of Glycolysis (*Invited Review*)  
**S. Kar** and D.S. Ray, *Modern Physics Letters B*, **18**, 653, (2004).
  11. Large Fluctuations and Nonlinear Dynamics of Birhythmicity  
**S. Kar** and D.S. Ray, *Euro. Phys. Lett.*, **67**, 137, (2004).
  12. Collapse and Revival of Glycolytic oscillation  
**S. Kar** and D.S. Ray, *Physical Review Letters*, **90**, 238102, (2003).
  13. Exact solutions of Fisher and Burgers equations with finite transport memory  
**S. Kar**, S.K. Banik and D.S. Ray, *Journal of Physics A: Math. Gen.*, **36**, 2771, (2003).
  14. Class of self-limiting growth model in the presence of nonlinear diffusion  
**S. Kar**, S.K. Banik and D.S. Ray, *Physical Review E*, **65**, 061909, (2002).

## **LECTURE / ORAL PRESENTATION:**

### **After joining IITB:**

- Invited Lecture: ‘Information flow defines code converting PI3K and MAPK signaling to Proliferation’ – in ‘International Conference on Computational Cell Biology’ held at Virginia Tech Polytechnic and State University, Virginia, USA (Organized to felicitate Prof. John J. Tyson on his 65<sup>th</sup> birthday), 16<sup>th</sup> – 18<sup>th</sup> August 2013.
- Invited Lecture: ‘Modeling Epo induced Cell Type-specific Proliferation Response’ – in ‘Non-equilibrium Statistical Physics and Nonlinear Dynamics’ held at Indian Association for the Cultivation of Science, Kolkata, India (Organized to felicitate Prof. D. S. Ray on his 60<sup>th</sup> birthday), 3<sup>rd</sup> - 4<sup>th</sup> January 2014.
- Invited Lecture: ‘Mathematical and Computational Modeling of Neuronal Differentiation Regulation by Hes1 Protein’ – in ‘9<sup>th</sup> Conference on Nonlinear Systems and Dynamics’ held at IISER, Mohali, India, 3<sup>rd</sup> March 2015.
- Invited Lecture: ‘Unraveling the Control Mechanism of BMP2 Driven Developmental Fates in Central and Peripheral Nervous System’ – in ‘Physical and Biophysical Chemistry: Theory and Experiment’ held at IIT, Bombay, India, (Organized to felicitate Prof. K. L. Sebastian on his 60<sup>th</sup> birthday), 4<sup>th</sup> December 2015.
- Invited Lecture: ‘Unraveling the Control Mechanism of BMP2 Driven Developmental Fates in Central and Peripheral Nervous System’ – in ‘Biophysics pashchim 9’ held at NCL, Pune, India, 3<sup>rd</sup> October 2015.
- Invited Lecture: ‘Are Quasi-Steady-State Approximated Models Suitable for Quantifying Intrinsic Noise Accurately?’ – in ‘New Frontiers in Chemistry – From Fundamentals to Applications’ held at BITS Pilani, Goa, India, 18<sup>th</sup> December 2015.
- Invited Lecture: ‘Unraveling the Control Mechanism of BMP2 Driven Developmental Fates in Central and Peripheral Nervous System’ – in Bose Institute, Kolkata, India, 22<sup>nd</sup> December 2015.
- Invited Lecture: ‘Unraveling the Control Mechanism of BMP2 Driven Developmental Fates in Central and Peripheral Nervous System’ – in ‘National Network for Mathematical and Computational Biology’ held at NCL, Pune and IISER, Pune, India, 28<sup>th</sup> December 2015.
- Invited Lecture: ‘Are Quasi-Steady-State Approximated Models Suitable for Quantifying Intrinsic Noise Accurately?’ – in ‘In House Symposium’ held at Chemistry department IIT, Bombay, India, 3<sup>rd</sup> April 2016.
- Invited Lecture: ‘Understanding the influence of intrinsic and extrinsic noise in Nanog dynamics’ – in Theoretical Chemistry Symposium (TCS), University of Hyderabad, Hyderabad, India, 15<sup>th</sup> December 2016.
- Invited Lecture: ‘Deciphering the dynamical origin of mixed population during neural stem cell development’ – in department of physical chemistry, Indian association for the cultivation of science, Kolkata, India, 23<sup>rd</sup> December 2016.
- Invited Lecture: ‘Deciphering the dynamical origin of mixed population during neural stem

cell development' – in department of Chemical Engineering, Indian Institute of Technology Bombay, Mumbai, India, 19<sup>th</sup> January 2017.

- Invited Lecture: 'Deciphering the dynamical origin of mixed population during neural stem cell developmental lineage commitment' – in Recent advances in many electron theory (RAMET), Goa, India, 10<sup>th</sup> February 2017.
- Invited Lecture: 'Deciphering the dynamical origin of mixed population during neural stem cell developmental lineage commitment' – Bioscience Bioengineering Department, IIT Kanpur, India, 24<sup>th</sup> February 2017.
- Invited Lecture: 'Deciphering the dynamical origin of mixed population during neural stem cell developmental lineage commitment' – National network on mathematical and computational biology (NNMCB), Pune node, Karla Caves near Lonavala, Pune, India, 18<sup>th</sup> March 2017.
- Invited Lecture: 'Controlling cellular proliferation by adjusting microRNA dynamics' – APCTCC-8, IIT Bombay, India, 17<sup>th</sup> December 2017.
- Oral Presentation: "Large fluctuation and non-linear dynamics of birhythmicity" at the National Conference on Nonlinear Systems and Dynamics, IIT Kharagpur, December 28-30, 2003.

#### **Before joining IITB:**

- Invited Lecture: "Sustained simultaneous Glycolytic and Insulin oscillations in  $\beta$ -cells" in the One day Symposium in memory of Professor C.K. Majumdar at Indian Association for the Cultivation of Science, August 11, 2004.
- Invited Lecture: "Sustained simultaneous Glycolytic and Insulin oscillation in  $\beta$ -cells" in the under the programme "TPSC" in Theoretical Physics department of Kharagpur IIT, December 1-3, 2004.
- Lecture on: "Distinct cell fate decisions triggered by cell-specific response of the PI3K/Akt signaling pathway" under the programme "Bioquant Modeling Club" in BIOQUANT, Heidelberg, Germany, 5<sup>th</sup> April, 2011.
- Lecture on: "Distinct cell fate decisions triggered by cell-specific response of the PI3K/Akt signaling pathway" (Selected from submitted abstract) – 12<sup>th</sup> International Conference on Systems Biology (ICSB), Heidelberg/Mannheim, Germany, 28<sup>th</sup> August – 1<sup>st</sup> September 2011.
- Lecture on: "Modeling cell type-specific proliferation responses mediated by the PI3K/Akt pathway" (Selected from submitted abstract) – 15<sup>th</sup> Meeting of the Signal Transduction Society, Weimar, Germany, 7<sup>th</sup> – 9<sup>th</sup> November 2011.
- Invited Lecture: 'Phenomenological modeling Versus Data driven modeling in biology: Prospects and concerns?'- at department of computational medicine, Karolinska Institute, Stockholm, Sweden, 16<sup>th</sup> February, 2012.
- Invited Lecture: 'Modeling Signaling Pathways' – at Spring school on Systems Biology, Kloster Seeon, Germany (Organized by Helmholtz Association), 28<sup>th</sup> – 30<sup>th</sup> March, 2012.

## **SYMPOSIUM / CONFERENCE ATTENDED:**

### **After joining IITB:**

- ‘Non-equilibrium Statistical Physics and Nonlinear Dynamics’ held at Indian Association for the Cultivation of Science, Kolkata, India (Organized to felicitate Prof. D. S. Ray on his 60<sup>th</sup> birthday), 3<sup>rd</sup> - 4<sup>th</sup> January 2014.
- Presented a poster in the “Mathematical and Computational Modeling of Neuronal Differentiation Regulation by Hes1 Protein” in 14<sup>th</sup> Theoretical Chemistry Symposium held at NCL, Pune, India, 18<sup>th</sup> – 21<sup>st</sup> December 2014.
- ‘9<sup>th</sup> Conference on Nonlinear Systems and Dynamics’ held at IISER, Mohali, India, 3<sup>rd</sup> March 2015.
- Presented a poster in the “Biological Oscillators: Design, Mechanism, Function” conference held at European Molecular biology Laboratory, EMBL, Heidelberg, Germany, 12<sup>th</sup> – 14<sup>th</sup> November, 2015.
- ‘Physical and Biophysical Chemistry: Theory and Experiment’ held at IIT, Bombay, India, (Organized to felicitate Prof. K. L. Sebastian on his 60<sup>th</sup> birthday), 4<sup>th</sup> December 2015.
- ‘Biophysics pashchim 9’ held at NCL, Pune, India, 3<sup>rd</sup> October 2015.
- ‘New Frontiers in Chemistry – From Fundamentals to Applications’ held at BITS Pilani, Goa, India, 18<sup>th</sup> December 2015.
- ‘National Network for Mathematical and Computational Biology’ held at NCL, Pune and IISER, Pune, India, 28<sup>th</sup> December 2015.
- ‘In House Symposium’ held at Chemistry department IIT, Bombay, India, 3<sup>rd</sup> April 2016.
- Theoretical Chemistry Symposium (TCS), University of Hyderabad, Hyderabad, India, 15<sup>th</sup> December 2016.
- Recent advances in many electrons theory (RAMET), Goa, India, 10<sup>th</sup> February 2017.
- National network on mathematical and computational biology (NNMCB), Pune node, Karla Caves near Lonavala, Pune, India, 18<sup>th</sup> March 2017.

### **Before joining IITB:**

- [International Symposium on Spectroscopy, Structure and Dynamics, Indian Association for The Cultivation of Science, Kolkata,, December 12<sup>th</sup> -13<sup>th</sup>, 2002.](#)
- [Trends in Theoretical Chemistry-2002, Indian Association for The Cultivation of Science, Kolkata, January 17<sup>th</sup> -19<sup>th</sup>, 2003.](#)
- [National Conference on Nonlinear Systems and Dynamics, IIT Kharagpur, December 28<sup>th</sup> -](#)

30<sup>th</sup>, 2003.

- National Conference on Recent Trends in BIOLOGY INSPIRED PHYSICS, S. N. Bose National Centre For Basic Sciences, Kolkata, March 18<sup>th</sup> -21<sup>th</sup>, 2002.
- DAE-BRNS Symposium on Theoretical Chemistry (TCS-2004), Bhabha Atomic Research Centre, Mumbai, December 9<sup>th</sup> -11<sup>th</sup>, 2004.
- 7<sup>th</sup> CRSI, National Symposium in Chemistry, Indian Association for The Cultivation of Science, Kolkata, February 4<sup>th</sup> -6<sup>th</sup>, 2005.
- International workshop on ‘Biological Switches and Clocks’, KITP, University of Santa Barbara, USA, from 2<sup>nd</sup> July to 10<sup>th</sup> August, 2007.
- Presented a poster in the “Research Day of Biological Sciences”, Virginia Tech, Blacksburg, USA on 23<sup>rd</sup> February, 2008.
- Presented a poster in the “Computational Cell Biology” meeting at CSHL, NY, USA, 24<sup>th</sup> - 27<sup>th</sup> March, 2009.
- Presented a poster in the “Dynamics of signal transduction and of gene-protein regulatory networks” workshop at Mathematical Bioscience institute, Ohio state university, USA, 2<sup>nd</sup> - 6<sup>th</sup> November, 2009.