

BIBUDHANANDA BISWAL

Professor in Physics

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PROFESSION/ACADEMICS

10.2011 onwards	Faculty	Cluster Innovation Centre, University of Delhi
08.1994 – 10.2011	Faculty in Physics	Sri Venkateswara College, University of Delhi
07.1988 – 02.1994	Ph.D.	School of Physical Sciences, Jawaharlal Nehru University, New Delhi, Thesis on " <i>Relaxation and Growth Kinetics in Disordered Magnets</i> "
07.1985 – 12.1987	M.Sc. (Physics)	PG Department of Physics, Utkal University, Bhubaneswar, India
07.1983 – 07.1985	B.Sc. Honors (Physics)	B. J. B. College, Utkal University

TECHNICAL SKILLS & PROFESSIONAL EXPERIENCE

Mentoring	Innovation projects, Design projects, Start-ups
Teaching:	Application of mathematics & IT in solving problems, Physics
Research:	Design, Innovation, Multiscale porous medium, Fluid flow, Neural Networks, Nonlinear time series analysis, Monte Carlo Simulation
Programming:	Fortran 90, C, Pascal, MPI parallel programming, MATLAB
Graphics/Software:	Gnuplot, XMGR, maple, MATLAB, PovRay, ImageJ etc.
Operating Systems:	Unix, Linux, Windows

RESEARCH INTERESTS

Design & Innovation:	IT Applications, Business processes & Analytics, Product conceptualizations
Porous Media:	Pore scale modeling of sandstones and carbonates, Quantitative microstructure characterization, Physical parameters from low resolution images, Modeling of synthetic microCT digital images of multiscale porous media. Simulation of fluid flow inside porous rock
Complex Systems:	Neural network modeling of focal epilepsy, Social network modeling
Nonlinear Dynamics:	Interpretation of chaos control experiments, Time series analysis for Unstable Periodic Orbits, Surrogate analysis
Magnetic Systems:	Ising Model, Critical Dynamics, Dynamic Scaling, Domain Growth

LIST OF PUBLICATIONS

Porous Media:

1. *Continuum based rock model of a reservoir dolostone with four orders of magnitude in pore sizes*, S. Roth, **B. Biswal**, G. Afshar, R. J. Held, P.-E. Oren, L. I. Berge, R. Hilfer, **AAPG Bulletin** 95: 925 (2011)
2. *Continuum reconstruction of the pore scale microstructure for Fontainebleau sandstone*, F. D. E. Latief, **B. Biswal**, U. Fauzi, R. Hilfer, **Physica A** 389: 1607 (2010)
3. *Towards precise prediction of transport properties from synthetic computer tomography of reconstructed porous media*, **B. Biswal**, R. J. Held, V. Khanna, J. Wang, R. Hilfer, **Physical Review E** 80: 041301 (2009)
4. *Modeling of multiscale porous media*, **B. Biswal**, P.-E. Oren, R. J. Held, S. Bakke, R. Hilfer, **Image Analysis & Stereology** 28: 23 (2009)
5. *A stochastic multiscale model for carbonate rocks*, **B. Biswal**, P.-E. Oren, R. J. Held, S. Bakke, R. Hilfer, **Physical Review E** 75: 061303 (2007)
6. *Quantitative comparison of mean field mixing laws for conductivity and dielectric constants of porous media*, J. Widjajakusuma, **B. Biswal**, R. Hilfer, **Physica A**, 318:319 (2003)
7. *Macroscopic Dielectric Constant for Microstructures of Sedimentary Rocks*, R. Hilfer, J. Widjajakusuma, **B. Biswal**, **Granular Matter**, 2:137 (2000)
8. *Quantitative Prediction of Effective Material Properties of Heterogeneous Media*, J. Widjajakusuma, **B. Biswal**, R. Hilfer, **Journal of Computational Material Science**, 16:70 (1999)
9. *Quantitative Analysis of Experimental and Synthetic Microstructures for Sedimentary Rock*, **B. Biswal**, C. Manwart, R. Hilfer, S. Bakke, P. E. Oren, **Physica A**, 273:452(1999)
10. *Exact and approximate calculations for the conductivity of sandstones*, J. Widjajakusuma, C. Manwart, **B. Biswal**, R. Hilfer, **Physica A**, 270:325 (1999)
11. *Microstructure analysis of reconstructed porous media*, B. Biswal, R. Hilfer, **Physica A**, 266:307 (1999)
12. *Threedimensional Local Porosity Analysis of Porous Media*, **B. Biswal**, C. Manwart and R. Hilfer, **Physica A**, 255:221 (1998)

Ising Model:

13. *Multicanonical Simulation of the tails of the order parameter distribution of the two dimensional Ising model*, R. Hilfer, **B. Biswal**, H. G. Mattutis, W. Janke, **Computer Physics Communications**, 169:230 (2005)
14. *Multicanonical Monte Carlo study and analysis of tails for the order parameter distribution of the two dimensional Ising model*, R. Hilfer, **B. Biswal**, H. G. Mattutis and W. Janke, **Physical Review E**, 68:046123 (2003)
15. *Domain Growth in Weakly Disordered Random Magnets*, **B. Biswal**, S Puri, D Chowdhury, **Physica A**, 229:72 (1996)
16. *Interfacial Dynamics in Disordered magnets: Relaxation, Critical Dynamics and Domain Growth*, D. Chowdhury, **B. Biswal**, in **Annual Reviews on Computational Physics, Vol. 1**, (Ed.) D. Stauffer (World Scientific, 1994)
17. *Novel Domain Growth in Weakly Disordered Random Magnets*, D. Chowdhury, **B. Biswal**, **Physica A**, 180:253 (1992)

18. *Dimensionality Dependence in the Singular Dynamic Scaling in the Dilute Ising Model*, **B. Biswal**, D. Chowdhury, **Physical Review A**, 43:4179 (1991)

Complex Systems, Nonlinear Dynamics & Chaos:

19. *Reliability of Unstable Periodic Orbit based control strategies in biological systems*. Nagender Mishra, Maria Hasse, **B. Biswal**, H. P. Singh, **Chaos**, 25:043104 (2015)
20. *Adaptive targeting of chaotic response in periodically stimulated neural systems*, K. Gupta, H. P. Singh, **B. Biswal**, R. Ramaswamy, **Chaos** 16:023116 (2006)
21. *Computational modeling of the dependence of kindling rate on network properties*, **B. Biswal**, B. R. Niranjana, G. Ullal, C. Dasgupta, **Physica A** 364:565 (2006)
22. *Strange nonchaotic attractors in driven excitable systems*, A. Prasad, **B. Biswal**, R. Ramaswamy, **Physical Review E**, 68:037201 (2003)
23. *Stochastic Neural Network Model for Spontaneous Bursting in Hippocampal Slices*, **B. Biswal**, C. Dasgupta, **Physical Review E**, 66:051908 (2002)
24. *Neural Network Model for Apparent Deterministic Chaos in Spontaneously Bursting Hippocampal Slice*, **B. Biswal**, C. Dasgupta, **Physical Review Letters**, 88:88102 (2002)
25. *Auto Search for Nonlinear Behaviour in Light Curves of Variable Stars*, M. K. Das, Harinder P. Singh, B. Ramachandran, E. Saikia, P. Narang, **B. Biswal**, S. K. Gupta, S. Joshi, in **Automated Data Analysis in Astronomy**, (Ed): R. Gupta, et al., (Narosa Publishers, New Delhi, 2002)
26. *Predicting Dynamics through Artificial Neural Networks*, **B. Biswal**, H. P. Singh, Ranjan Gupta, in **Automated Data Analysis in Astronomy**, (Ed): R. Gupta, et al., (Narosa Publishers, New Delhi, 2002)
27. *Controlling "Chaos" in a Stochastic Neural Network Model for Epileptic Brain Activity*, **B. Biswal**, C. Dasgupta, G. R. Ullal, in **Nonlinear Dynamics and Brain Functioning**, (Ed) N. Pradhan, Paul. E. Rapp and R. Sreenivasan (Nova Science Publishers,1999)

CONFERENCES

Invited talks in international conferences:

1. Establishing Determinism in Biological Time Series ((nonlinear dynamics interpretation of brain slice experiments), Workshop on Nonlinear Physics and Applications NOLPA 2011, Joao Pessoa, BRAZIL, September 05-09, 2011 (**Website**))
2. Characterizing complex microstructures using local porosity theory: Case studies from sandstones and carbonate rocks, International Conference on Challenges of Porous Media, Faraunhofer ITWM, Kaiserslautern, Germany, March 11-14, 2009 (**no link is active anymore**).

Invited talks in National conferences:

1. "Workshop on Computational Science", 01-07 July, 2010, Department of Physics & Astrophysics and DUCC, North Campus, University of Delhi, Delhi 110007. *Obtaining petrophysical parameters from digital models of reservoir rock*, 4:5pm, 1.7.2010 (**email**)

Contributed talks in international conferences:

1. Detection of unstable periodic orbits in biological time series, Perspectives in Nonlinear Dynamics PNLD 2010, IISc, Bangalore, India, July 21, 2010 (**weblink**)
2. Modeling of multiscale porous media, 2008 APS March Meeting, New Orleans, USA, March 14, 2008 (**weblink**)
3. Three dimensional model reconstruction from two dimensional micrographs, DPG Spring Meeting of the Condensed Matter Division, Berlin, Germany, February 28, 2007 (**Weblink, programme**)
4. Unstable periodic orbits and chaos control in a stochastic neural network model for epileptic brain activity, International Seminar on Statistical Physics of Neural Network, Dresden, Germany, March 23, 1999 (**weblink**)

Posters presented in international conferences:

1. Synthetic micro-computer-tomography of a laboratory scale sandstone core with authigenic clay, DPG-Spring Meeting of the Condensed Matter Division, Berlin, Germany, 25-29 February, 2008 (**Weblink**)
2. Pore scale model for carbonate rocks, DPG-Spring Meeting of the Condensed Matter Division, Regensburg, Germany, 26-30 March 2007 (**archive**)
3. Size dependence in kindling: A computational study in a Neural Network model for brain slices , Workshop on Nonlinear Dynamics in Biophysics, Dresden, Germany, June 27 -July 15, 2005 (**weblink**)
4. Bistable Dynamics in Stochastic Neural Network Model for Epilepsy, Traffic and Granular Flow, Stuttgart, Germany, September 27 - 29, 1999 (**link not active**)
5. Exact and approximate calculations for the conductivity of sandstones, STATPHYS Calcutta - III, S. N. Bose National Center for Basic Sciences, Calcutta, India, 4-9 January, 1999 (**Proceedings**)
6. Chaos control in stochastic neural network model for epilepsy, STATPHYS 20, Paris, France, 20-24 July, 1998 (**no link available**)
7. Local porosity analysis of porous media ; study of pore space geometry of natural sandstones and reconstructed models, STATPHYS 20, Paris, France, 20-24 July, 1998 (**no link available**)
8. Microstructure analysis of reconstructed porous media, International workshop on Percolation and Disordered System, Giessen, Germany, 14-17 July, 1998 (**link not available, proceedings**)

International Workshops/Training schools attended:

1. Workshop on Models and Images for Porous Media, Universite Paris Descartes, Paris, January 12-16, 2009 (**photo on the website of the conference**)
2. 3D Image Analysis and Modeling of Microstructure, Fraunhofer ITWM, Kaiserslautern, Germany 25-26 April 2007 (**Book of Abstracts**)
3. Workshop on "Parallel Programming" at HLRS, University of Stuttgart, Germany, 06-09 October 1998 (**Certificate of participation**)
4. Workshop on Computational Methods in Material Science and Engineering, ICTP, Trieste, Italy, 12 June - 23 June, 1995 (**Certificate of participation**)
5. College on Computational Physics ICTP, Trieste, Italy, 15 May - 9 June, 1995 (**Certificate of participation**)
6. SERC school on superconductivity, IIT, Bombay, India, 3-21 December 1990 (**no info on net, no certificate**)
7. SERC school on chemical application of statistical mechanics, IIT, Bombay, India, 12 December – 31 December, 1988 (**Certificate of participation**)

Lectures in National Workshops/Training Schools

2. DST Inspire Lecture, 7th November 2013, Hi-Tech Institute of Engineering & Technology, Ghaziabad (**email**)
3. DST Inspire Lecture, 10th July 2013, Raj Kumar Goel Institute of Technology for Women, Gaziabad (**email**)
4. Orientation Programmes for FYUP, University of Delhi, 2013 – 5 IT, 3 Mathematics (**CPDHE**)
5. DPS Dwarka Camp, “Computational Physics”, May 29, 2013 (**Letter**)
6. Refresher course for college teachers, CPDHE, 2013 (**CPDHE**)
7. C/C++ Programming course for college teachers, DU, 6 Lectures, July 2011 (**Resource person**)
8. Refresher Course in Physics for college teachers, JNU, Two lectures, 10 Feb 2011 (**email**)
9. DST Inspire Lecture, Amity University Noida, 10th and 11th November, 2010 (**email**)
10. Refresher Course in Physics for college teachers, DU, 2010 (**??**)
11. SERC School on NLD, DU, 2009 (**co-organiser**)

Projects

1. DU Innovation Project on “Digital Reconstruction of lost art”, 7.5 lakhs, 15-Nov-13 to 14-NOV-14.
2. *Understanding the dynamics in counter-rotating coupled oscillators*, DST Major Research Project, 2013, 27 lakhs, Co-PI with Awadhesh Prasad
3. DU Innovation Project on “24x7 Water Supply in villages and small towns of India”, May-15-2012 to Jul-15-2013.
4. DU Innovation Project on “Solutions for road management form modeling and simulation of traffic flow on selected roads of Delhi”, May-15-2012 to Jul-15-2013
5. DU Innovation Project on “IT Model for parking space management: Optimal and Efficient parking-retrieval of vehicles”, May-15-2012 to Jul-15-2013
6. UGC Major Research Project MRP F. No. 10/11/2002 (SR): “Kindling Model of Focal Epilepsy”, 2005 to 2008, 3.87 lakhs

SUPERVISION OF STUDENTS

Ph.D. students:

1. Nagender Mishra (cosupervisor, October 2010 – April 2016), Thesis title: Dynamics of neuronal networks
2. Kopal Gupta (cosupervisor, June 2004 - April 2006) Thesis title: Complexity Measures of Chaotic Time Series and their Applications, Department of Physics & Astrophysics, University of Delhi
3. Fourier Dzar Eljabbar Latief (partial supervision, May-July 2008), Institute: Physics of Complex Systems, Faculty of Mathematics and Natural Sciences, Bandung Institute of Technology, 40132 Bandung, Indonesia
4. Christian Manwart (partial supervision, Oct 97 - Dec 98) Thesis title: Geometrical Modeling and Transport Properties of Porous Media, Institute for Computational Physics, University of Stuttgart, Germany
5. Jack Widjajakusuma (partial supervision, Mar 98 - July 99) Thesis title: Quantitative Prediction of Effective Material Institute: Institute for Mechanics, Lehrstuhl II, University of Stuttgart, Germany

Internships:

1. Rituraj Karan (M.Tech, Engineering Physics), IP University, New Delhi, Project: Evolution of overlapping modular networks, Host institute: Cluster Innovation Centre, University of Delhi, January – July 2012.
 2. Juhi Kulshrestha (M.Sc.), Institute of Informatics & Communication, University of Delhi, South Campus, New Delhi, Project: Computer models of porous rock: Crystallite definitions and Synthetic micro-CT, Host institute: May-July 2008, Institute: ICP, University of Stuttgart, Germany
 3. Prashant Bhardwaj (B. Tech), Department of Mechanical Engineering, IIT Kharagpur, India, Project: Algorithm for polydisperse sphere packing with overlap restrictions, Host institute: May-July 2008, Institute: ICP, University of Stuttgart, Germany
 4. Ashutosh Dimri (B. Tech), Department of Mathematics, IIT Kharagpur, India Project: Computer model of laboratory scale clay-filled sandstone, Host institute: May-July 2008, Institute: ICP, University of Stuttgart, Germany
 5. Ajit Kumar (B. Tech.), Department of Mathematics, IIT Kharagpur, India, Project: Computer models of primordial fossils in carbonate rocks, Host institute: May-July 2008, Institute: ICP, University of Stuttgart, Germany
 6. Someshwar Roy (B. Tech.), Department of Metallurgical & Materials Engineering, IIT Kharagpur, India Project: Modeling Carbonate Rocks with specified crystallite size distribution Host institute: May-July 2007, Institute: ICP, University of Stuttgart, Germany
 7. Shanideep Tewari (B. Tech.), Department of Metallurgical & Materials Engineering, IIT Kharagpur, India, Project: Synthetic micro-CT models of sandstone with authigenic clay Host institute: May-July 2007, Institute: ICP, University of Stuttgart, Germany
 8. Bipul Jeet (integrated M. Tech.), Department of Metallurgical & Materials Engineering, IIT Kharagpur, India, Project: Pore Scale Modeling of Carbonate Rocks from Grid-based Primordial Host institute: May-July 2007, Institute: ICP, University of Stuttgart, Germany
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ADMINISTRATIVE

1. Coordinator, Design Innovation Center, University of Delhi
2. Manager, Technology Business Incubator, CIC
3. Programme Coordinator, B.Tech Innovation with Mathematics & IT
4. Member, Empowered committees on formulation of courses for FYUP foundation courses in “Building Mathematical Abilities”, “Information Technology”.
5. Coordinator, College with Potential for Excellence Funds Utilization, Sri Venkateswara College, University of Delhi, 2004-2005
6. Teacher-in-charge, Department of Physics, Sri Venkateswara College, University of Delhi, 2004-2005
7. Coordinator, Training Program in C & C++ Programming Language, Department of Physics & Astrophysics, University of Delhi, 08 – 15 June 2011
8. Member, Organizing Committee, SERC school on Nonlinear Dynamics, Department of Physics & Astrophysics, University of Delhi, December 2009,

9. Convener, Development Funds Committee, Sri Venkateswara College Staff Council, 2011. Presented a master plan for construction & repair-rnovation for OBC infrastructure expansion
 10. ICT Coordinator, Sri Venkateswara College, University of Delhi, 2003-2005, 2009-2011. Leading role in conceiving and managing IT infrastructure, establishing a modern computer centre
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EXTRA-CURRICULAR

1. Best Sports Convener, Jawaharlal University, 1992
 2. Represented Utkal University in Basketball, 1985-1988
 3. Represented Utkal University in Handball, 1988
 4. Represented Bhabaneswar in State Championship, 1985-1988
 5. President's scout, 1981
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Personal Details: Born on 21.06.1965, Married, Indian citizen