

CURRICULUM VITAE

Biplab Sanyal, Ph.D., Docent

Dimgatan 29, Apt. 913, 75431 Uppsala, Sweden.

Telephone: +46-(0)18-4713624, +46(0)739827330 (mobile)

Fax: +46-(0)18 4713524

E-mail: biplab.sanyal@fysik.uu.se , biplabsanyal@gmail.com

- Affiliation:** Docent (Associate Professor):
Condensed Matter Theory Group & Theoretical Magnetism Group,
Department of Physics and Materials Science, Uppsala University
<http://www.fysik.uu.se/theomag/>
Application expert:
Uppsala Multidisciplinary Center for Advanced Computational Science
(UPPMAX)
<http://www.uppmax.uu.se/>
- Personal:** Born on 5th of July, 1969 (690705-7712), Indian, male, married to Docent Dr. Suparna Sanyal, (<http://www.icm.uu.se/molbio/>), one son (Aalekhya Sanyal, 10 years old).
- Language:** Bengali (mother tongue), Hindi and English (excellent in reading, writing and communications), Swedish (communicable).

Education:

- 2000 **Ph.D.** in Physics (condensed matter theory), from Jadavpur University, Calcutta, INDIA under the supervision of Prof. Abhijit Mookerjee, S. N. Bose National Centre for Basic Sciences, Calcutta, India.
Title of Thesis: *Multicomponent random alloys - a theoretical study.*
- 1993 **M.Sc.** in Physics (Solid State Physics as special paper) from Presidency College, Calcutta under Calcutta University (1st class).
- 1991 **B.Sc.** (Physics Honours, Chemistry, Mathematics) from Scottish Church College under Calcutta University (1st division).
- 1988 **Higher Secondary** (Physics, Chemistry, Biology, Mathematics) from Scottish Church College under West Bengal Council of Higher Secondary Education (1st division, star marks).
- 1986 **Secondary (Madhyamik)** from Scottish Church Collegiate School, Calcutta, under West Bengal Board of Secondary Education (1st division, star marks).

Professional appointments:

- Nov 2007- April 2007- Application expert, UPPMAX
Associate Professor, Theoretical Magnetism Group, Department of Physics, Uppsala University
- Nov. 2003 to March 2007 Assistant Professor, Theoretical Magnetism Group, Department of Physics, , Uppsala University.
- July 2003 to Oct. 2003 Postdoctoral fellow, Theoretical Magnetism Group, Uppsala University with Dr. Lars Nordström.

- July 2002 to June 2003 Postdoctoral fellow in Condensed Matter Theory Group, Uppsala University with Dr. Susanne Mirbt.
- July 2001 to June 2002 Postdoctoral fellow in Max-lab, Lund University, with Prof. Olle Eriksson, Uppsala University.
- July 2000 to June 2001 Postdoctoral fellow in Condensed Matter Theory Group, Uppsala University with Dr. Susanne Mirbt.
- July 1999 to May 2000 Postdoctoral fellow with Prof. S. K. Bose in Physics Department, Brock University, Canada.

Awards/Scholarships:

1. Fellowship for short-term visit to University of Belem, Brazil from CNPq in March 2008.
2. Short term CNR (Consiglio Nazionale delle Ricerche, 'The National Research Council, Italy'; website: <http://www.cnr.it/sitocnr/home.html>) fellowship to visit CNR-INFN lab. in L'Aquila, Italy in 2006.
3. SSF (Council for Strategic Research Funding in Sweden, <http://www.stratresearch.se/>) funded postdoctoral fellowship from Uppsala University in 2000.
4. NSERC (Natural Sciences and Engineering Research Council of Canada; website: <http://www.nserc-crsng.gc.ca/>) postdoctoral fellowship from Brock University, Canada in 1999.
5. Fellowship for Ph.D. studies from the Dept. of Science and Technology, India, 1994-1999.
6. Qualified Graduate Aptitude Test in Engineering in the national level, India in 1994.
7. Qualified National Eligibility Test for Junior Research Fellowship and Lectureship conducted by Council of Scientific and Industrial Research and Univ. Grants Commission, India in 1993.
8. Qualified West Bengal Joint Entrance Examination (Medical and engineering) in 1988.
9. Awarded National Scholarship of Merit on the basis of the result of higher secondary examination, India in 1988.
10. Awarded National Scholarship of Merit on the basis of the result of secondary examination, India in 1986.

Supervision:

Doctoral Students

1. Ronny Knut on diluted magnetic semiconductors (2007-)
2. Mikael Ras nder on the elastic properties of materials (2006-).
3. Diana Iusan on the diluted magnetic semiconductors (2006-).
4. Patrik Thunstr m on the electron correlation effects in materials (2006-).
5. Oscar Gr n s on the spin transport in TMR materials (2006-).
6. Mukul Kabir (visiting Ph. D. student from India, Asia-Sweden Research Link Program, 2006) on the calculations of magnetic anisotropy energy.
7. Nirmal Ganguli (visiting Ph. D. student from India, Asia-Sweden Research Link Program, 2007) on magnetism of clusters.
8. Kartick Tarafder (visiting Ph. D. student from India, Asia-Sweden Research Link Program, 2006 & 2007) on the calculation of order-disorder transition temperature of alloys and development of a code to calculate self-consistent electronic structure of random alloys.
9. Martin Ondr chek (visiting Ph.D. student from Czech Republic, 2006) on the calculations of electronic structure and magnetism of 3d transition metals on W substrate.

Diploma Students

- Fredrik Bultmark on the magnetic phase diagram of FeAs compounds (2004).
- Christoph Ellmer on the diluted magnetic semiconductors (2004).
- Camille Aron on the Monte-Carlo simulations of diluted magnetic semiconductors (2005).
- Ronny Knut on the chemical and magnetic interactions in diluted magnetic semiconductors (2006).

Postdoctoral fellow

- Dr. Pooja Panchmatia on the electronic structure and magnetic interactions of biomolecules (2006-).

Teaching

Year	Brief description of teaching/laboratory responsibility
2006 (Feb -Mar)	50% of the Solid State Theory course for graduate and exchange students (Natural Sc.), at Uppsala University, 9 x 2 lecture hours
2006 (Apr- May)	Laboratory practicals for Quantum Physics (F2) course for undergraduate 3rd year students in Natural Science, Uppsala University
2006 (May)	Laboratory for Quantum Physics ES3 course for undergraduate 3rd year students in Natural Science, Uppsala University
2007 (Feb - Apr)	Solid State Theory Course, 20 x 2 lecture hours for Graduate and exchange students in the Physics Dept., Uppsala University
2007-2008 (Oct-Feb)	Course on materials research on spintronics for Graduate students in the Physics Dept., Uppsala University
2008 (Feb - Apr)	Solid State Theory Course, 15 x 2 lecture hours for Graduate and exchange students in the Physics Dept., Uppsala University
2008 (Mar-May)	Graduate course in 'Efficient Scientific Computing' (self study) in the Physics Dept., Uppsala University
2008 (May-June)	Laboratory for Quantum Physics ES3 course for undergraduate 3rd year students in Natural Science, Uppsala University

Research area

My main research interest is in the materials for spintronics, especially diluted magnetic semiconductors. Specifically, I study the electronic structure, magnetic properties, defects, electron correlation effects in these materials. Other topics of interest are thin film magnetism, magnetic nanostructures, magnetic anisotropy, non-collinear magnetism, multiferroic materials and simulation of biological molecules.

Publications: 70 papers (60 published and 10 submitted/in manuscript) with around 275 citations, 2 book chapters.

Collaborations in Academia and Industry

1. Dr. Charlie Olof Karis, Dr. Dimitri Arvanitis, Dr. Gabriella Andersson, Prof. Bjorgvin Hovarsson, Dr. Anders Sandell: Dept. of Physics, Uppsala University (electronic structure, magnetism, superlattices, magnetic anisotropy).
2. Prof. Peter Svedlindh, Prof. Per Nordblad: Solid State Theory Dept., Uppsala University (spin-dynamics, magnetism of materials).

3. Prof. Ulf Jansson, Materials Chemistry Dept.: Uppsala University (graphene, transition metal carbides).
4. Prof. Heiko Wende: University of Duisberg, Germany (molecule-substrate interaction).
5. Dr. Josef Kudrnovsky: Academy of Sciences, Czech Republic (diluted magnetic semiconductors).
6. Dr. Indra Dasgupta, Dr. K. G. Suresh: IIT Mumbai, India (spintronic materials).
7. Prof. Abhijit Mookerjee, Dr. Tanusri Saha-Dasgupta, Dr. Pratip Mukhopadhyay: S.N.Bose Center for Basic Sciences, Calcutta, India (electronic structure, magnetism and optical properties of random alloys).
8. Prof. Dilip Kanhere, University of Pune, India (magnetism and thermodynamics of clusters).
9. Dr. Subhradip Ghosh, IIT Guwahati, India (vibrational property of random alloys).
10. Dr. Per Arvidsson: Astra Zeneca, Sweden (protein nano-tube).
11. Dr. Silvia Picozzi, CNR-INFM, Italy (multiferroics).
12. Dr. Angela Burlamak Klautau, University of Belem, Brazil (real space recursion).

Grants obtained for research

1. Received 100,000 Swedish Kronors from Goran Gustafssons Stiftelse for collaboration with Dr. Subhradip Ghosh of IITK, India (2008).
2. Received 350,000 Swedish Kronors/yr. for three years as the sole applicant from STINT in the 'Institutional Grant for young researchers' category (2008-2010): *Theory and experiments on the understanding of interactions in molecular electronics* for collaboration with Prof. Heiko Wende of University of Duisberg, Germany.
3. Received 550,000 Swedish Kronors/yr. for three years as the sole applicant from Swedish National Research Council (VR) (2008-2010): *Theoretical modeling of advanced magnetic materials*.
4. Received fellowship from Carl Tryggers Foundation as a co-applicant (main applicant: Assoc. Prof. Peter Oppeneer) to hire a postdoctoral fellow (2008).
5. Received fellowship of USD 3600 to visit University of Belem, Brazil for collaboration with Dr. Angela Burlamak Klautau (March 2008).
6. Received 596,300 Swedish Kronors/yr. for three years as a co-applicant (main applicant: Dr. Charlie Olof Karis) from Swedish National Research Council (VR) (2006-2008): *Towards fundamental understanding of magnetic semiconductors – A joint experimental and theoretical study*.
7. Received 200,000 Swedish Kronors/yr. for three years as a co-applicant (main applicant: Prof. Olle Eriksson) from VR/SIDA, in Asian-Swedish Research Links Programme, (2006-2008): *Theoretical and experimental investigations on magnetic alloys* (collaboration with India), <http://www.sasnet.lu.se/fysikupp.html>.
8. Received 1600 Euros for a short-term visit for research and collaboration to CNR-INFM CASTI Regional Lab., L'Aquila, Italy for collaboration with Dr. Silvia Picozzi (2006).
9. Received 200,000 Swedish Kronors/yr. for three years as a co-applicant (main applicant: Dr. Lars Nordstrom) from VR/SIDA, in Asian-Swedish Research Links Programme, (2007-2009): *A joint theoretical and experimental study of diluted magnetic semiconductors* (collaboration with India), <http://www.sasnet.lu.se/fysikupp.html>.

Conferences, Symposia, Delegation

1. Attendance (talk/poster) in around 35 conferences and workshops including 10 invited talks, 1 keynote lecture and 2 session chairmanships.
2. Delegated Dept. of Physics and Materials Science, Uppsala University to promote ‘*International Masters programme in Physics*’ in different institutions in India (January 2008).
3. Organiser of Asia-Sweden Research Link school and conference on ‘Electronic structure: methods and applications’ held in Calcutta, India, January 2008.
4. Organiser of international summer school on ‘Magnetism and transport in solids’, June 2004 in Uppsala (<http://info.uu.se/press.nsf/pm/unga.fysikforskare.idB0.html>).
5. Organiser of Asia-Sweden Research Link Conference on ‘Magnetism in Materials’ held in Calcutta, India, January 2007 (http://www.fysik.uu.se/cmt/AsiaSweden_conf.html).
6. Organiser of Uppsala Graduate School for chemists and physicists, held in Uppsala University, December 2006 (<http://www.fysik.uu.se/theomag/>).
7. Organiser of Thursday seminar series on magnetism in the department.

Other activities:

1. Member of American Physical Society.
2. Referee of Physical Review B, Journal of Physics Condensed Matter, Journal of Physics D: Applied Physics, Physica, Chemistry of Materials, Journal of Magnetism and magnetic materials, Nanotechnology, New Journal of Physics, Indian Journal of pure and applied physics.
3. Reviewer of European Science Foundation, National Science Foundation, USA and Science Foundation, Ireland.
4. Webmaster of Condensed Matter Theory (<http://www.fysik.uu.se/cmt/>) and Theoretical Magnetism Group, (<http://www.fysik.uu.se/theomag/>), Uppsala University.
5. Convenor of Asian Swedish Research Link projects, <http://www.sasnet.lu.se/fysikupp.html> .

Scientific works and development

Doctoral

I started my research career as a Ph.D. student in the group of Prof. A. Mookerjee in S.N. Bose National Center, India. During my Ph.D. studies (1994-1999), I worked on the theory of disordered alloys using augmented space recursion (ASR) technique within the framework of tight-binding linearized muffin tin orbital (TB-LMTO) method. I developed theoretical and numerical techniques to calculate the spectral densities and complex band structures of random alloys. The advantage of this method is that it enables one to calculate properties of random alloys going beyond mean field theories such as coherent potential approximation (CPA) to treat satisfactorily off-diagonal disorder, local lattice distortions and short-range order. Later on, I generalized ASR for surfaces and applied it for studying surface magnetism of transition metal overlayers on noble metal substrates, e.g., Fe on Cu, Ag and Au substrates. As the surfaces are grown rough and magnetic properties depend crucially on roughness, I constructed a continuum non-linear statistical model for growth of surfaces and solved it

numerically to obtain the critical exponents. The different terms used in the growth equations were justified by the calculation of energetics through first principles techniques.

Postdoctoral

During my first postdoctoral study (1999-2000) with Prof. S.K. Bose in Brock University of Canada, I studied relativistic effects on phase stability of several Au-based alloys using TB-LMTO-CPA and generalized perturbation methods. I showed that fully relativistic description is needed to reproduce experimentally observed phase segregation behaviour in AuPt alloys. Also, I studied several binary and ternary invar alloys of Fe, Ni, Co and Pt to investigate the invar behaviour by changing the composition of the species. I developed a code based on the theory of Lichtenstein *et al.* to calculate exchange interactions in random alloys.

I started as a postdoctoral fellow in Condensed Matter Theory Group in Uppsala University since 2000 with Dr. Susanne Mirbt to work on the field of spintronics. Later on, I started collaboration with Dr. Lars Nordström and Prof. Olle Eriksson of theoretical magnetism group. My research involved structural, electronic and magnetic properties of diluted magnetic semiconductors and other half-metallic ferromagnets, ferromagnet-semiconductor interfaces for spin injection, surfaces and interfaces of magnetic multilayers.

Assistant and Associate Professorship

Since November 2003 onwards, I have been appointed as an Assistant Professor (now, Associate Professor (Docent)) in the theoretical magnetism group of Uppsala University.

I have been supervising 5 Ph.D. students since 2006 on various topics: diluted magnetic semiconductors, magnetic anisotropy at ferromagnet-semiconductor interfaces, development of theoretical tools (LDA+U, Hubbard-I) to treat strong electron correlation effects, phase stability and magnetism of hard materials (carbides, nitrides, MAX phases) etc. I have supervised 4 diploma students on magnetic phases of spintronic materials, chemical and magnetic interactions in diluted magnetic semiconductors, Monte-Carlo simulations of diluted magnetic systems etc. Since 2006, I have been supervising one postdoctoral researcher on the magnetic properties of biomolecules (porphyrin on magnetic substrate) and a paper has been published in Nature Materials within the collaboration with experimentalist Prof. Heiko Wende of University of Duisberg, Germany.

Within two projects with India coordinated by me, I am involved in the study of magnetic alloys and diluted magnetic semiconductors. Very recently, I have started a collaboration with Dr. S. Picozzi of L-Aquila University, Italy on the studies of multiferroic oxides where ferro(antiferro)magnetism and ferroelectricity are combined to exhibit switching of electric polarization by manipulation of magnetic fields. 1 paper in Phys. Rev. Lett. and another in Appl. Phys. Lett. have been published in 2007. Also, within another collaboration with Dr. Per Arvidsson of Astra Zeneca, I am investigating properties of protein nanotubes. It has resulted in a publication in Physical Review B (in press). Recently, I started a collaborative work with Prof. Mikhail Katsnelson and coworkers of Nijmegen University, Netherlands on the properties of graphene. Besides these, I have continuing collaboration with experimental groups led by Prof. Ulf Jansson, Prof. Per Norblad, Prof. Peter Svedlindh, Dr. Anders Sandell and Dr. Olof Karis of Uppsala University.