



Title	Dr.	First Name	Ram Kuntal	Last Name	Hazra	Photograph
Designation	Assistant Professor (2010-present)					
Address	Department of Chemistry University of Delhi, Delhi, India					
Phone No	Office	011-27666646 ext. 217/109				
	Mobile					
Email	prkhiaes@gmail.com					
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Educational Qualifications						
Degree	Institution				Year	
Ph.D.	Indian Association for the Cultivation of Science, Jadavpur University				2002-2009	
Ph.D.(Interim)	Tata Institute of Fundamental Research, Mumbai				2001-2002	
PG	Indian Institute of Technology, Roorkee, Uttaranchal				1999-2001	
UG	B Sc (Hons.), Chemistry, University of Burdwan				1998	
10+2	West Bengal Council of Higher Secondary Education				1994	
Madhyamik	West Bengal Board of Secondary Education				1992	
Extra-curricular Activities	Grade-II, Classical Guitar, Trinity College London				2013	
Career Profile						
<ul style="list-style-type: none">• Postdoctoral Fellowship in ETH-Zurich, 2008-2009• Dr. D. S. Kothari Postdoctoral Fellowship, (UGC, MHRD) September 2009• Visiting Postdoctoral Fellow, Weizmann Institute of Science, June 2008• CSIR-UGC NET, December 2000, (Junior Research Fellow) (JRF)• Within Top 20% in CSIR-UGC NET, December 2000, Called for S P M Fellowship• CSIR-UGC NET, June 2003, (LS)• GATE (IITK) 2001, 97.68 percentile, Rank 44						

- Rank-1 , Appointment for the Post of Assistant Professor, Department of Chemistry, University of Delhi, 2010.
- Madhyamik, West bengal Board of Secondary Education, Rank-121

Administrative Assignments

- Member, Department Research Committee 2015-2017
- Member, Seminar Committee 2015
- Member, High Performance Computing facility 2017-present

Areas of Interest / Specialization

- Exact AB Initio Formalism for $e-e$ correlations of quantum dots in both zero- and non-zero arbitrary magnetic field
- Exact AB Initio Formalism for exciton of semiconductor super-lattices/quantum dots in arbitrary magnetic field
- Size-extensive N -electron quantum dots ($N=3,4,\dots$) in arbitrary magnetic field: exact AB Initio Formalism via multi-pole expansion and Chu-Vandermonde Identity
- Bi-exciton and Tri-exciton of super-lattices in arbitrary magnetic field: exact formalism via multi-pole expansion and Chu-Vandermonde Identity
- Size-extensive atomic, molecular and ionic systems with H -like basis-set via exact AB Initio Formalism propped up through multi-expansion
- Finite temperature non-perturbative cluster expansion of arbitrarily large atomic, molecular, ionic and mesoscopic systems (quantum statistical mechanics) via path-integral formulations and futuristic implementation in Josephson effect, Meissner Effect and Fractional Quantum hall Effect and Mott-insulators
- Studies of Non-linear optical properties.
- Dirac Relativistic equation to study electronic structure, topological aspects of graphene and its analogues.

Subjects Taught

- Quantum Chemistry, Paper-103, (2010-2014)
- Introductory Chemistry, NSNT-103, M Tech (NSNT) 2010
- Statistical mechanics & others, Paper-203, (2016-2017)
- Lab Work of Chemistry, M Tech (NSNT), (2010-2013)
- Lab Work + Project Evaluation, Paper-4312, 2011
- Introductory Quantum Mechanics, NSNT-203, M Tech (NSNT) (2011-2014)
- Lab Work, Paper-104 & 204, Department of Chemistry, (2012-2017)

➤ **Mentored Projects of M. Tech. (NSNT) in 2012**

Research Guidance

➤ **Number of Mentoring Ph D student: 1**

1. **Dr. Priyanka Aggarwal (Thesis awarded, July 2018)**
2. **Dr. Sunny Singh (Thesis awarded, September 2018)**
3. **Ms. Harsimran Kaur (Thesis submitted, January 2019) (CSIR SRF)**
4. **Ms. Shivalika Sharma (Thesis submitted, June 2019) (CSIR SRF)**

Publications Profile

- ❖ **Linear and Non-linear response of 2-D single carrier dots: Role of impurity perturbations, Ram Kuntal Hazra, Manas Ghosh and S. P. Bhattacharyya, Chem. Phys., 333, 18 (2007).**
- ❖ **Quantum Adiabatic Switching Route to the Impurity Modulated states of 2-D Quantum Dots With different switching functions, Ram Kuntal Hazra, Manas Ghosh and S. P. Bhattacharyya, Int. J. Quant. Chem., 108, 719 (2007).**
- ❖ **Modulation of the electronic states of 2-D single carrier quantum dots due to presence of hole doped impurity perturbations, Ram Kuntal Hazra, Manas Ghosh and S. P. Bhattacharyya, Chem. Phys., 344, 61 (2008).**
- ❖ **Information entropy and level spacing distribution based signatures of quantum chaos in electron doped 2D single carrier quantum dots, Ram Kuntal Hazra, Manas Ghosh and S. P. Bhattacharyya, Chem. Phys. Lett., 460, 209 (2008).**
- ❖ **Metastable impurity perturbed states of 2-D quantum dots, Ram Kuntal Hazra, Manas Ghosh and S. P. Bhattacharyya, Chem. Phys. Lett., 468, 216 (2009).**
- ❖ **A linear variational route to the polarizability of 2-D artificial atoms: effects of anharmonicity in the confinement potential, Manas Ghosh, Ram Kuntal Hazra and S. P. Bhattacharyya, Chem. Phys. Lett., 388, 337 (2004).**
- ❖ **Non-linear optical response of single carrier 2-D anharmonic Quantum dots, Manas Ghosh, Ram Kuntal Hazra and S. P. Bhattacharyya, Chem. Phys. Lett., 397, 258 (2004).**
- ❖ **Maximizing second hyperpolarizability of single carrier 2D quantum dots: Interplay of strengths of confining potential, magnetic field and anharmonicity, Manas Ghosh, Ram Kuntal Hazra and S. P.**

Bhattacharyya, Chem. Phys. Lett., 405, 410 (2005).

- ❖ **Response of Energy Levels and Wavefunctions of 2-D Artificial Atoms to Changes in Parameters in the Hamiltonian**, Manas Ghosh, Ram Kuntal Hazra and S. P. Bhattacharyya, J. Theo. Comp. Chem, 5, 25 (2006).
- ❖ **Linear and Non-linear optical response properties of singlet 2-electron quantum dots**, Manas Ghosh, Ram Kuntal Hazra and S. P. Bhattacharyya, Chem. Phys. Lett., 434, 56 (2007).
- ❖ **Response Properties of 2-electron 2-D Quantum Dots : Triplet versus Singlet**, Manas Ghosh, Ram Kuntal Hazra and S. P. Bhattacharyya, Computing Letters, 3, 183 (2007).
- ❖ **Response Dynamics of 2-D Quantum Dots in the presence of time-varying Fields: Anharmonicity and Pulse shape effects**, Manas Ghosh, Ram Kuntal Hazra and S. P. Bhattacharyya, Chem. Phys., 345, 103 (2008).
- ❖ **Rabi Type oscillations in damped two-dimensional single electron quantum dots**”, Madhuri Mukhopadhyay, Ram Kuntal Hazra, Manas Ghosh, Samaresh Mukherjee and Shankar P. Bhattacharyya, Cent. Eur. J. Phys., 10(4), 983 (2012).

Publications in the Last three years (FROM RESEARCH GROUP ONLY)

- **“Exact spectra of strong coulomb correlations of 3-D 2-e harmonic dots in magnetic field”**, P. Aggarwal, S. Sharma, H. Kaur, S. Singh, and R. K. Hazra, Physica E: Low- dimensional Systems and Nano-structures 85, 56 (2017).
- **“Exact e-e (exchange) correlations of 2-D quantum dots in magnetic field: Size extensive N =3, 4,, n-electron systems via multi-pole expansion”**, P. Aggarwal, S. Sharma, S. Singh, H. Kaur and R. K. Hazra, Physica E: Low-dimensional Systems and Nano-structures 88, 26 (2017).
- **“Multi-excitonic (N=1,2 and 3) quantum dots in magnetic field: Analytical mapping of correlations (exchange) by multipole expansion”** S. Singh, H. Kaur, S. Sharma, P. Aggarwal and R. K. Hazra, Physica E: Low-dimensional Systems and Nano-structures 88, 289 (2017).
- **“Strongly Correlated Excitons of Regular/irregular Planar Quantum Dots in Magnetic Field: Size Extensive Bi- and Tri-Exciton (e-h-e-h and e-e-h/e-h-h) Systems by Multipole Expansion”**, H. Kaur, S. Singh, P. Aggarwal, S. Sharma, S. Yadav and R. K. Hazra, Am. Chem. Soc. Omega 2, 7410-7423 (2017).
- **“Shell structure and paramagnetism of 3-D N-e anisotropic (ellipsoidal) quantum dots: Exact multi-pole expansion of coulomb interaction under fermionic exchange symmetry”**, S. Sharma, P. Aggarwal, H. Kaur, S. Yadav and R. K. Hazra, AIP Advances, 8, 095116 (2018).
- **“Addition energy and magnetization of 3-D multicarrier anisotropic quantum dots in magnetic field by exact multi-pole expansion of coulomb correlations”**, S. Sharma, P. Aggarwal, H. Kaur and R. K. Hazra, Physica E: Low dimensional Systems and Nano-structures, 104, 206 (2018).

- “Binding energies and chemical potential of neutral and charged exciton-complexes of transition metal dichalcogenides/anisotropic 2-D quantum dots in magnetic field by exact multi-pole expansion of coulomb correlations”, H. Kaur, S. Sharma, P. Aggarwal and R. K. Hazra, *Physica E: Low dimensional Systems and Nano-structures*, 108, (2019).
- “Exact formalism of strongly coulomb correlated 2-D N-e (N=2,3,4,5,6,...) quantum dots via multi-pole expansions: chemical potential and addition energy vs magnetic field”, P. Aggarwal, S. Sharma, H. Kaur, S. Yadav and R. K. Hazra, *Journal of Physics Communication*, 3, 035011 (2019).
- “Analytical treatment to Helium isoelectronic ions via Green function expansion of Coulomb interactions: perturbation calculations of ground-state energies with Hydrogenic orbitals”, S. Sharma, P. Aggarwal, H. Kaur and R. K. Hazra, *Journal of Indian Chemical Society*, 96, 775 (2019) (**Invited article special issue**).

Conference Organization/ Presentations (in the last three years)

National Conferences:

- ❖ “Multi-carrier systems in Lateral (Electrical) and Transverse (Magnetic) Confinements by Multi-pole Expansion: Atoms, Molecules to Superlattices.”, 16th Theoretical Chemistry Symposium, BITS Pilani, 14-17 February 2019.
- ❖ Progress of Academics and Industry In the Development of Nanotechnology, University of Delhi, March 18, 2013.
- ❖ Chemistry in Interdisciplinary Applications, Hansraj College, University of Delhi, March 19, 2013.

Poster presentations (National):

- ❖ H. Kaur and R.K. Hazra, “Binding Energies And Chemical Potential Of Neutral And Charged Exciton-Complexes Of Transition Metal Dichalcogenides/Anisotropic 2-D Quantum Dots In Magnetic Field By Exact Multi-Pole Expansion Of Coulomb Correlations”, 16th Theoretical Chemistry Symposium, BITS Pilani, 14-17 February 2019 (**Best Poster award**).
- ❖ S. Sharma and R.K. Hazra, “Shell structure and paramagnetism of 3-D N-e anisotropic (ellipsoidal) quantum dots: exact multi-pole expansion of coulomb interaction under fermionic exchange symmetry”, 16th Theoretical Chemistry Symposium, BITS Pilani, 14-17 February 2019.

- ❖ P. Aggarwal and R.K. Hazra, “Exact Formalism of Strongly Correlated of 2-D N-e (N=2,3,4,5..) Superlattices via multipole expansion” in the 16th Theoretical Chemistry Symposium held at BITS Pilani, Pilani campus, 14-17 February 2019. **(Best Poster Award)**
- ❖ H. Kaur and R.K. Hazra, ‘Strongly correlated excitons of anisotropic 2-D quantum dots in magnetic field: Size extensive bi- and tri-exciton(e-h-e-h & e-e-h, e-h-h) systems by multipole expansion’ at the ACS Campus Road Show, 2018 at University of Delhi.
- ❖ H. Kaur and R.K. Hazra, ‘Strongly correlated excitons of regular/irregular planar quantum dots in magnetic field: Size extensive bi- and tri-exciton(e-h-e-h & e-e-h, e-h-h) systems by multipole expansion’ at the National Conference for Emerging Trends in Applied Sciences, 2017 at Galgotias University, UP.
- ❖ S. Singh and R.K. Hazra, ‘Multi Excitonic Quantum Dots in Magnetic Field: Analytical Mapping of Correlations by Multipole Expansion’ at National Conference on Emerging Trends in Applied Sciences, 2017 at Galgotias University, UP
- ❖ S. Sharma and R.K. Hazra, “Exact formalism of coulomb correlations via multipole expansion: 3-D N-e (N≥3) anisotropic systems in magnetic field”, APCTCC8 2017
- ❖ P. Aggarwal and R.K. Hazra, “Exact formalism of strongly correlated 2-D N-e (N=2,3,4,5...) Superlattices via multipole expansion”, APCTCC8 2017
- ❖ P. Aggarwal and R.K. Hazra, “Exact e-e (exchange) correlations of 2-D quantum dots in magnetic field Size Extensive N=3,4,...., n-electrons via multipole expansion”, TCS 2016, **(Prof. Charusita Chakravarty Memorial Best poster award)**.
- ❖ S. Sharma and R.K. Hazra, “Exact spectra of strong coulomb correlations of 3-D 2-e harmonic dots in magnetic field”, TCS 2016 **(Prof. Charusita Chakravarty Memorial Best poster award)**
- ❖ P. Aggarwal, H. Kaur, S. Singh and R.K. Hazra, “An exact variation to condensed Fock-Darwin states at low temperature: Effect of magnetic field”, National symposium on Non-equilibrium statistical physics and Nonlinear Dynamics, IACS Kolkatta, 2014

International Conferences/Poster Presentations:

- ❖ “Exact e–e (exchange) correlations of 2-D quantum dots in magnetic field: Size extensive N=3,4,...., 'n'-electron systems via multi-pole expansion”, 4th Annual World Congress of Smart Materials-2018, Osaka, Japan, 6-8 March 2018.
- ❖ P. Aggarwal and R.K. Hazra, “Electronic spectra and chemical potential of 2-D multi-electron quantum dots in magnetic field: exact multi-pole expansion of coulomb correlation” in the 9th Molecular Quantum Mechanics Conference held at Heidelberg, Germany, July 2019 **(Best Poster Award)**.
- ❖ S. Sharma and R.K. Hazra, “Shell structure and paramagnetism of 3-D N-e anisotropic (ellipsoidal) quantum dots: exact multi-pole expansion of coulomb interaction under fermionic exchange symmetry”, in the 9th Molecular Quantum Mechanics Conference held at Heidelberg, Germany, July 2019.

Research Projects (Major Grants/Research Collaboration)
<ul style="list-style-type: none"> • “Novel Approaches to Multicarrier Phenomena of Quantum Dots”SR/S1/PC-47/2012 by SERB (DST) (2013-2017). • “Experimental studies and elucidation of tunneling mechanism of oxidative DNA mutation” DU-DST PURSE GRANT (2015-2018)
Awards and Distinctions
<ul style="list-style-type: none"> • Dr. D. S. Kothari Postdoctoral Fellowship, (UGC, MHRD) September • Rank-1, Appointment for the Post of Assistant Professor, Department of Chemistry, University of Delhi, 2010. • Grade-II, Classical Guitar, Trinity College London, 94% (Distinction)
Association With Professional Bodies
<ul style="list-style-type: none"> • Member, Department Research Committee. • Member, Seminar Committee.
Other Activities
<ul style="list-style-type: none"> • Workshop on “Development of Training Package in Chemistry at Higher Secondary Stage”, National Council of Educational Research and Training”, 2014 • “Field Trial and finalization of Training Package in Chemistry at Hr. Secondary Stage”, NCERT, 2014

Signature of Faculty Member