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Atul Singh Arora
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Objective

..for now | To get a PhD position to explore Quantum Physics.

..in general | To contribute to expanding our knowledge of nature.

Education

Present **BS-MS Dual Degree**, *Indian Institute of Science Education and Research*, Mohali, CPI: *9.3/10.*

Semester I: (8.5/10) Mechanics, Chemistry of elements and chemical transformations, Cellular basis of life, Symmetry, Language Skills B, Introduction to Computers, Physics Lab I, Chem Lab I, Bio Lab I

Semester II: (8.6/10) Electromagnetism, Atoms Molecules and Symmetry, Gene expression and development, Analysis in one variable, Hands-on electronics, History of science, Physics Lab II, Chemistry Lab II, Biology Lab II

Semester III: (8.8/10) Waves and optics, Spectroscopic and other physical methods, Genetics and evolution, Curves and surfaces, Introduction to Astrophysics, Workshop Training, Physics Lab III, Chemistry Lab III, Biology Lab III

Semester IV: (9.7/10) Thermodynamics and statistical physics, Energetics and dynamics of chemical reactions, Behaviour and ecology, Probability and statistics, Introduction to Quantum Physics, Philosophy of science, Physics Lab IV, Chemistry Lab IV, Biology Lab IV

Semester V: (10/10) Classical Mechanics, Quantum Mechanics, Electrodynamics, Advanced Optics Lab, Reason and Rationality

Semester VI: (9.6/10) Statistical Mechanics, Atomic and Molecular Physics, Quantum Computation, Advanced Electronics and Instrumentation Lab, Quantum Field Theory

Semester VII: (9.4/10) Solid State Physics, Nuclear and Particle Physics, Nuclear Physics Lab, Physics of Fluids, Quantum Principles and Quantum Optics, Radiative Effects and Renormalization Group in Relativistic Quantum Field Theory

Semester VIII: (9.5/10) Nonlinear Dynamics, Chaos and Complex Systems, Condensed matter Physics Lab, Computational Methods in Physics, Standard Model and beyond, Selected topics in classical and quantum mechanics

Semester IX (current): Ethics, MS Thesis - Research Project I

2010 **CBSE 10+2**, *Sardar Patel Vidyalaya*, New Delhi, *80%.*
Physics, Chemistry, Math, Computer Science, English

2008 **CBSE X**, *Sardar Patel Vidyalaya*, New Delhi, *93%.*
Science, Maths, Social Science, English, Hindi, Information Technology

Experience (Academic)

Summer 2015 **Intern**, *University of Siegen*, Siegen, Germany.
We proposed a test of local realism based on correlation measurements of continuum valued functions of positions and momenta, known as modular variables. The Wigner representations of these observables are bounded in phase space and therefore, the associated inequality holds for any state described by a non-negative Wigner function. This agrees with Bell's remark that positive Wigner functions, serving as a valid probability distribution over local (hidden) phase space coordinates, do not reveal non-locality. We constructed a class of entangled states resulting in a violation of the inequality and thus truly demonstrate non-locality in phase space. The states can be realized through grating techniques in space-like separated interferometric setups. The non-locality is verified from the spatial correlation data that is collected from the screens. `http://arxiv.org/abs/1508.04588`

Summer **Intern**, *Indian Institute of Science Education and Research*, Mohali,

Winter 2012	**Intern**, *Indian Institute of Science Education and Research*, Mohali. Studied Quantum Mechanics from J.J. Sakurai, under the guidance of Prof. Jasjeet Bagla and created a corresponding report.
Summer 2012	**Intern**, *Indian Institute of Science Education and Research*, Mohali. Studied Group Theory and Linear Algebra for understanding Symmetry, under Prof. Kapil Hari Paranjape. A brief introductory understanding of the Knot Theory was also undertaken. LaTeX was learnt during this period, to be able to efficiently communicate via the internet.
Summer 2011	**Intern**, *Indian Institute of Technology*, Bombay. Worked on Image Recognition techniques using OpenCV, for Yarn Fault detection under the supervision of Prof. Anirban Guha. This was an extension to an IIT alumni's Masters thesis. The work was done using Visual Studio, C++ and involved understanding of OpenCV and the idea behind various algorithms, to be able to solve the problem at hand.

Publication (Academic)

2015	A. S. Arora, A. Asadian. "Towards a macroscopic test of local realism". In: *arXiv*. Submitted to: *Physical Review A*

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Projects

Sem VI 2014	**Drawdio**, What is Drawdio: "Imagine you could draw musical instruments on normal paper with any pencil (cheap circuit thumb-tacked on) and then play them with your finger. The Drawdio circuit-craft lets you MacGuyver your everyday objects into musical instruments: paintbrushes, macaroni, trees, grandpa, even the kitchen sink... ". This project was originally created at the MIT Media Lab; I simply reproduced a version of this for the National Science Day, 2014.
Summer 2013	**Nazar Band**, A face recognition system built using OpenCV with the aim of automating the locking and unlocking of doors, eliminating the need of keys.
Sem III 2012	**Opportunity Cell Website**, Team Project, A centralized web portal for the Opportunity Cell of IISER Mohali.
Sem III 2012	**Fly Count Assister**, For easing the task of counting flies (Biology experiment), this application was written in Python and used extensively. With just two buttons on the keyboard, and the voice support, the counting process was made much more efficient.
Sem III 2012	**NaveenTantra**, Team Project, An Online Election system, based on a novel fraud prevention technique, created using Javascript, PHP and mySQL.
Summer 2012	**Telescope**, Team Project, Newtonian Reflection Telescope for observing Transit of Venus.
Sem II 2012	**Capacitive Touch Sensor**, Sensitive enough to measure changes in PicoFarads, developed for the Science Day.
2010-11	**Chatur Chaalak**, Developed with the aim of application in robotics, this project was designed to control the torque and speed of stepper motors, with precision, independently. This was implemented using C as the language and Atmel AVR as the platform.
2010	**Live GSM**, This was an attempt at controlling a phone using a microcontroller, to be able to remotely control devices, using DTMF communication protocol over voice calls.

Class XII 2010	**3D Modelling and Animation**, Imitated the '21st Century FOX' animation and customized it to read 'XII class presents', for a class presentation, using the popular 3D cinema creation software, Maya.
Class XI-XII 2009-10	**Space Race**, This game was developed using OpenGL to ensure cross-platform support and as a transition to the open world. Apart from the 3D-graphics, this game had Newtonian physics implemented using a point particle approach, derived from an open-source game.
Class XI 2009	**Robotic Rescue Vehicle (RRV)**, It was designed using auto-mobile parts such as bicycle chains and sprockets, wiper motors, car batteries, a web-camera, and an ordinary PC, which gave it a unique look. It could be moved around wirelessly using a laptop which gave a live video feed from the robot, ideal for rescue operations.
Class X 2008	**Math Project**, A calculator built using micro-controllers, to verify the property $(a+b)(a-b) = a^2 - b^2$. It was a battery operated device, with an LCD screen and used an 89S52 to process.
Class IX 2006	**ALive City 2 - DirectX 9.0**, My second attempt at game making; this was developed without using any game engines, while the game itself was controlled using a USB steering wheel, built by me, based on an open-source application.
Class VIII 2005	**Motion Detection - Image Processing**, This program was developed to save frames of a video feed, only when motion is detected, ideal for surveillance.
Class VIII 2005	**ALive City - DirectX 8.0**, My first computer graphics 3D project, a simple racing game where the player could put his/her own picture, right on the car.
Class VII 2004	**Edge Detecting Robot**, Built using stepper motors and a microprocessor, this vehicle was programmed to detect edges of a table using infra red sensors and turn to avoid falling.
Class VII 2004	**AT Keyboard Interface**, Built using the 8051 series of Microcontrollers and an LCD, this device was developed to serve as a low cost portable typing tutor for kids. It was programmed using Bascom, a basic compiler.
Class VII 2004	**School Bell Scheduler 2**, This application was re-written in Visual Basic.NET to automate ringing of school bells, given the schedule, like it's first version. It used UART for securer communication and was installed in Srijan School, Model Town, New Delhi.
Class VI 2003	**School Bell Scheduler**, A program, written in Visual Basic 6, for automating the ringing of school bells. The user simply needs to specify the schedule.

Recognition

2015	Awarded a Certificate of Merit for the best academic performance in the second semester of the academic session 2014-15
2015	Amongst the highest scorers in the first semester of the academic session 2014-15
2014	Amongst the highest scorers in the second semester of the academic session 2013-14
2014	Awarded a Certificate of Merit for the best academic performance in the first semester of the academic session 2013-14
2012	Capacitive touch won the Best Physics Demonstration, at the Science Day 2012, organized by IISER Mohali
2011	Was awarded the KVPY fellowship, for my work on Stepper Motor control, Chatur Chaalak

2010	Was awarded the First position in Senior programming, with my Team member, in an inter-school programming competition, a part of Access, an annual Computer Symposium, Access, organized by Modern School
2010	I was selected as one of the participants for attending the Bright Green Youth, Denmark, an international climate summit for the youth, on the basis of my performance in the National Science Fair and a personal interview. In DK, our team made it to the top 14 projects
2009	The Robotic Rescue Vehicle was awarded the first position in the Delhi region and second position in the Northern region, at the National Science Fair, held at the National Science Centre, New Delhi
2005	ALive City won the first place in the open Software Display, at an inter-school Computer Symposium, Access, an annual event organized by Modern School, Barakhamba Road, New Delhi
2004	ALive City qualified the open Software Display, at the inter-school Computer Symposium, Access
2004	Displayed the Robotic Rescue Vehicle at an interschool competition and secured the third position, even though due to a component failure, the robot failed to work when it was judged
2003	Displayed the School Bell Scheduler at the National Convention 2003, Computer Society of India, IIT-Delhi

Languages

Native	**Punjabi**	
Fluent	**English**	*Formally studied till Sem I, BS-MS*
Fluent	**Hindi**	*Formally studied till class X*

Computer Skills

Familiar OSs	Windows: XP, Vista, 7, 8; Linux: Ubuntu, OpenSuse, Slackware
Languages	Basic, C, C++, C#, Fortran, Python, Javascript, SQL, HTML, PHP, LaTeX, Octave/Matlab
Applications	Visual Studio, Emacs, Sublime Text, Microsoft Office (Word, Powerpoint, Outlook, OneNote, Excel), CorelDraw, Inkscape, Git, Sony Vegas, Autodesk Maya, GNU plot, SolidWorks, FL Studio, Sony Sound Forge, Cinelerra

Extra-Curricular Activities

Playing the Guitar

Programming and Electronics

Playing the Tabla

Red I in Taekwondo