

Aryaman Jha

Contact Information

Third Year Student, B.S.
Department of Physics
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Education

- **Indian Institute of Technology (IIT) Kanpur, India**
 - Bachelor of Science, Physics, **CGPA - 9.3/10.0**(5 Semesters) (2016 – 2018)
(Expected completion in March, 2020)
 - Minor in Machine Learning and Applications
(Expected completion in March, 2020)
- **Ahlcon Public School, India**
 - 12th Grade, Central Board of Secondary Education, **Percentage – 95.0%** (2016)
- **Ahlcon Public School, India**
 - 10th Grade, Central Board of Secondary Education, **CGPA – 10.0/10.0** (2014)

Research Interests

- Molecular Machines | Programmable Matter | Biological Morphogenesis | Pattern Formation | Active Matter
Soft Matter Physics
- Statistical Mechanics | Biological Physics | Nonlinear Dynamics | Differential Equations

Research Experience

RESEARCH EXPERIENCE

- **Spatio-temporal dynamics of Cell Cytoskeleton and Extracellular matrix interaction** (Jan'19 – Present)
Mentor: *Dr. Manas Khan, Soft Matter Group, Department of Physics, IIT Kanpur*
 - Modelling the Extracellular matrix and interaction between its components to create an effective Hamiltonian
 - Working on simulating the interactions using Brownian Dynamic Simulations
 - Modelling the kinetics of actin filaments inside the cell and its anchoring to the cell periphery
- **Role of Adhesion, ECM and mechanotransduction in limb joint patterning** (Jul'18 – Present)
Mentor: *Dr. Amitabha Bandyopadhyay, Developmental Biology Lab, Dept. of Biological Sciences and Bioengineering, IIT Kanpur*
 - Performing imaging experiments of embryonic joint at various time points in developing chick
 - Performing anti-proliferative experiments to see limb size dependence in joint patterning
 - Created a computational model of mechanotransduction based on **Brownian Dynamics Simulation**
 - Experimentally verifying model using Confocal microscopy experiments
- **Construction of an Optical Single Beam Gradient Force trap(optical tweezer)** (Oct'18 – Nov'18)
As part of course on Modern Physics Laboratory(PHY315A)
 - Created an optical alignment to get an attractive gradient
 - Levelled the stage height to optimise the force on the polystyrene beads used

- **Bioengineering of SDS detergent degrading bacteria using Synthetic Biology** (Jan'18 – Oct'18)
Team Project as part of Team iGEM IIT Kanpur
 - Modelled the rate of protein synthesis inside the organism using chemical kinetics and modelled the interaction of bacteria with SDS to predict the overall protein synthesis as a function of various parameters
 - Performed transformation of James Anderson(JA) promoter into the E.Coli bacteria and cloned the resulting colonies
 - Performed 3A assembly of JA promoter with the rest of the designed plasmid to achieve a functioning vector
 - Created a CAD model of a Bio-Reactor for degrading SDS*Work Led to Silver Medal at an International Platform, iGEM 2018*
- **Measurement of Oil-Water interface surface tension using Thin film interference** (Oct'18 – Nov'18)
As part of course on Wave Optics(PHY224A) under Dr. Saikat Ghosh, IITK
 - Performed Thin film interference imaging on Turpentine oil
 - Identified areas of thin film interaction with water
 - Mapped interference pattern to a height map of the thin film by image processing on MATLAB
 - Used the height map to calculate Surface tension via force balancing numerically
- **Role of RA, FGF and Adhesion in limb joint site formation and patterning** (May'18 – Jul'18)
Mentor: Dr. Amitabha Bandyopadhyay, Developmental Biology Lab, Dept. of Biological Sciences and Bioengineering, IIT Kanpur as part of SURGE summer internship program at IITK
 - Performed whole mount RNA-insitu experiments on chick embryo for various probes
 - Created a model of joint formation based on existing literature and used Lagrangian formulation to model the adhesive interactions between cells in growing limb bud.
- **Bioinformatic tool for High-throughput seq data of RNA and ChIP seq on NCBI-GEO** (Oct'17 – Dec'17)
Mentors: Dr. Amitabha Bandyopadhyay, Developmental Biology Lab, Dept. of Biological Sciences and Bioengineering, IIT Kanpur , Dr. Nitin Gupta , Laboratory of Neural Systems, Dept. of BSBE, IIT Kanpur
 - Created a web scraper to efficiently scrape RNA seq data from NCBI-GEO database
 - Used NLP to filter for useful experimental data and built a gene alias list using genecards website

Design Projects

- **Multi-functional Microscope** (Jan'18 – Apr'18)
As Part of the Institute compulsory manufacturing course(TA202A)
 - Manufactured a multi-slide microscope with automatic slide cleaning and slide loading capabilities for cutting the slide loading and unloading time in the biology laboratory to decrease labour and cut costs in research.

Skills

- **Programming and Software:** C • C++ • Python • MATLAB • Photoshop • LATEX • HTML
- **CAD and Simulation:** MATLAB Simulink • AutoCAD Fusion 360
- **Experimental:** Immunohistochemical Staining • Gel Electrophoresis • RNA insitu hybridisation(Whole mount) • Atomic Force Microscopy(Basic operational level) • Interferometry • Confocal Fluroescence microscopy • Tissue Processing
- **Languages:** Hindi(Mother Tongue) • English(Fluent) • French(Basic Conversational)

Relevant Graduate Level Coursework

- **Physics:**
 - Nonlinear Dynamics and Chaos
 - Equilibrium Statistical Mechanics
 - Soft-Matter Physics*
 - Computational Physics
 - Optics
- **Mathematics:**
 - Abstract Algebra of Groups and Rings
 - Nonlinear Differential and Difference Equations
- **Biology:**
 - Bioinformatics
 - Molecular Cell Biology#
 - Developmental Biology*

* – Audited, # – Online Resources

Awards, Scholarships and Achievements

- Won Silver medal at **iGEM 2018** international competition for **Synthetic Biology**
- Participating in a prestigious meeting by the Indian Academy of Sciences on **Mechano-Biology** in February, 2019
- Awarded KVPY Scholarship (SA Stream) 2014 with all India rank 188. National Fellowship Program for Basic Sciences by Department of Science and Technology and Indian Institute of Science, Bangalore
- In top 3 among 3000 students in the Delhi region competing for the Shell Junior National Science Scholarship 2013 organised by Royal Dutch Shell in collaboration with the British Council for meritorious students.
- All India rank 991 out of 150,000 candidates in JEE Advanced 2016, equivalent to 99.9 percentile
- 1st position in Delhi region in National Science Talent Search Examination 2013, conducted by Unified Council

Leadership and activities

- **Group Leader, Science Coffeehouse IITK** (Aug'18 – Present)
Conducted and delivered several talks on diverse disciplines of Mathematics, Physics and Theoretical Computer Science to create an atmosphere of research and innovation among undergraduates in IIT Kanpur. Conducted science based events as part of Takneek, an Inter Hall Science and Technology competition.
- **Student Guide, Counselling Service IITK** (Aug'17 – Apr'18)
Provided emotional and academic assistance to 8 freshmens during my sophomore year at IITK which I continue to provide well past my required period.
- **Secretary, English Literary Society IITK** (Aug'17 – Apr'18)
Coordinated the poetry performance

Extra – Curricular Activities

- Sketching: Won Inter Hall Cultural Competition for Live Sketching objects presented to us
- Indian Classical Vocals: Participated in State level Singing competition (2011) and won 2nd position
- Abstract Mathematics and Puzzles: Avid puzzle solver of questions in Number Theory and Abstract Algebra