



# Dharm Singh Yadav

## SUMMARY

---

### Profile and Interests

Interdisciplinary researcher specializing in biophysics and optics, with expertise in designing and building force spectroscopy setups for cell manipulation, characterization, and separation. Skilled in developing optical systems and integrating them with biophysical techniques for studying single-cells.

## EDUCATION AND TRAINING

---

### Doctor of Philosophy (PhD)/ Marie Curie ITN Fellow

*Carol Davila University of Medicine and Pharmacy (UMFCD)* [ 12/05/2021 – Current ]

City: Bucharest | Country: Romania | Field(s) of study: Biophysics | Thesis: Use of optical tweezers and dielectrophoresis for retinal pigment epithelial cells characterization and separation toward cell replacement and transplantation therapy

### Master of Science (MS)

*Indian Institute of Science Education and Research (IISER)* [ 01/05/2019 – 30/09/2020 ]

City: Mohali | Country: India | Field(s) of study: Physics | Final grade: CPI 9.4/10 | Thesis: Beam shaping using spatial light modulators: towards their applications in optical tweezers

### Bachelor of Science (BS)

*Indian Institute of Science Education and Research (IISER)* [ 01/09/2015 – 30/04/2019 ]

City: Mohali | Country: India | Field(s) of study: Science ; Chemistry Majors | Final grade: CPI 6.8/10

## LANGUAGE SKILLS

---

**Mother tongue(s):** Hindi

**Other language(s):**

English

LISTENING C2 READING C2 WRITING C2

SPOKEN PRODUCTION C2 SPOKEN INTERACTION C2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

## HOBBIES AND INTERESTS

---

Cricket, Hiking, Cycling, Badminton, Photography

## SKILLS

---

### Biophysical techniques

Optical tweezers, dielectrophoresis (DEP), microfluidics, microscopy, and spectroscopy.

### Setup design and built

Single-cell opto-electric trap (optical tweezers + DEP), digital holography using SLMs (for laser beam shaping), interferometry, and digital holography microscopy (ongoing project for measuring cell refractive index).

### Cell Biology

Cell culture (primary and cell lines), co-culture, cell viability and proliferation assays (fluorescence, MTS, RTCA).

### Imaging

Light microscopy, fluorescence microscopy, immunofluorescence, single-cell tracking, and image processing.

### Computational/Software

Python in PyCharm, ImageJ, COMSOL Multiphysics, MATLAB®, LaTeX, Autodesk Fusion 360 (3D CAD), SciDavis, Microsoft Word, Excel, and PowerPoint.

## WORK EXPERIENCE

---

### Marie Curie ITN Fellow (ESR)

**Carol Davila University of Medicine and Pharmacy (UMFCD)** [ 12/05/2021 – 30/09/2024 ]

City: Bucharest    Country: Romania

**Mentors:** Prof. Dr. Tudor Savopol, Prof. Dr. Mihaela Moisescu

Designed and built a dual-trapping system combining optical tweezers and dielectrophoresis on an inverted microscope, integrated with a 3D-printed microfluidic lab-on-chip for precise single-cell manipulation. This system enabled direct calibration of optical trapping force on single eukaryotic cells and can reveal optical and electrical properties of the trapped cell. Also developed an in vitro age-related macular degeneration model for characterization (experiment) and separation (COMSOL simulation) of healthy RPE cells using population dielectrophoresis.

### Research Internship (secondment)

**Vision Institute, Sorbonne University** [ 01/01/2023 – 31/01/2023 ]

City: Paris    Country: France

**Mentor:** Prof. Serge Picaud, Valérie Fradot

Developed an in vitro co-culture model with primary pig RPE cells and retinal tissue to study symbiotic effects and degeneration. Performed pig eye dissections, RPE cell isolation, and co-culturing with retina pieces. Designed experiments to expose co-cultures to degenerative conditions and conducted detailed analysis using fixation, immunostaining, and cryostat sectioning.

### Master's Thesis

**Indian Institute of Science Education and Research (IISER)** [ 01/05/2019 – 30/09/2020 ]

City: Mohali    Country: India

**Mentor:** Associate Prof. Dr. Arijit K. De.

Focused on laser beam shaping for optical tweezers applications, using phase-only liquid crystal spatial light modulators (LC-SLM) to precisely manipulate laser beam profiles. Successfully generated and validated Laguerre Gaussian and Bessel beams using complex phase mapping on LC-SLM using computer-generated holograms. Applied wave optics principles to predict beam transformations and analyzed results using MATLAB, COMSOL Multiphysics, and Wolfram Mathematica.

## HONOURS AND AWARDS

---

[ 12/05/2021 ] European Commission

### **MSCA-ITN Doctoral Fellowship**

Prestigious, fully funded European research grant for early-stage researchers, awarded as part of the Marie Skłodowska-Curie Actions Innovative Training Network.

[ 01/09/2015 ] Department of Science and Technology India

### **INSPIRE-SHE Fellowship**

Scholarship for Higher Education, awarded by the Department of Science and Technology (DST), Government of India, for ranking among the top 1% of students in national high school examinations.

[ 2022 ] National Conference of Biophysics

### **Best Poster Award**

Recognized for presenting outstanding research at the annual conference held in Târgu Mureș, Romania.

## PUBLICATIONS

---

[2025]

### **Estimation of optical trapping force on eukaryotic cells using dielectrophoresis**

Accepted in Romanian Reports in Physics

Dharm S. Yadav, Ioan Tivig, Tudor Savopol, Mihaela Moisescu

[2024]

### **Optical tweezers in biomedical research - progress and techniques**

Published in Journal of Medicine and Life

Dharm S. Yadav, Tudor Savopol

[2024]

### **Dielectrophoretic characterization of peroxidized retinal pigment epithelial cells as a model of age - related macular degeneration**

Published in BMC Ophthalmology

Dharm S. Yadav, Ioan Tivig, Tudor Savopol, Mihaela Moisescu

## PROJECTS

---

[ 01/05/2018 – 31/07/2018 ]

### **Optical tweezers: Theory and experiments:**

Learned the fundamentals of optical tweezers, including their theoretical principles and experimental applications.

**Mentor:** Associate Prof. Dr. Arijit K. De., IISER Mohali

[ 01/05/2017 – 31/07/2017 ]

### **Computational chemistry:**

Investigated quantum tunneling phenomena using a particle in a finite box model.

**Mentor:** Associate Prof. Dr. Balanarayan P., IISER Mohali

[ 01/05/2016 – 31/07/2016 ]

### **Nonlinear Dynamics:**

Explored the chaotic motion of a double pendulum to understand complex dynamical systems.

**Mentor:** Prof. Dr. Sudeshna Sinha, IISER Mohali

## **CONFERENCES AND SEMINARS**

---

[ 2024 ] Bucharest, Romania

### **National Neuroscience Society of Romania (SNN) conference 2024**

**Oral presentation:** Peroxidized retinal pigment epithelial cells as a model of age-related macular degeneration: A dielectrophoretic study

[ 2024 ] Iasi, Romania

### **National Conference of Biophysics 2024**

**Oral Presentation:** Estimation of optical trapping force on eukaryotic cells

[ 2023 ] Bucharest, Romania

### **UMFCD Congress 2023**

**Oral Presentation:** In Vitro Study of Age-Related Macular Degeneration (AMD) by Dielectrophoresis

[ 2023 ] Tübingen, Germany

### **ERM conference 2023**

**Poster presentation:** Dielectrophoretic characterization of a hydrogen-peroxide-induced in vitro AMD model of rat RPE cells

[ 2023 ] Sendai, Japan

### **JNS conference 2023**

**Poster presentation:** Setup for electrical characterization of Retinal Pigment Epithelial cells

[ 2023 ] Elche, Spain

### **Entrain Vision summer school and consortium meeting**

**Poster presentation:** Analysis of dielectrophoretic behavior of retinal pigment epithelial cells in view of their manipulation in opto-electric trap

[ 2022 ] California, USA

### **SFN conference 2022 and Stanford university**

**Oral/Poster presentation:** Single-cell opto-electric manipulation for characterisation and separation of Retinal Pigment Epithelial cells

[ 2022 ] Târgu Mures, Romania

### **National Conference of Biophysics**

**Poster presentation:** Single-cell opto-electric manipulation for characterization and separation of retinal pigment epithelial cells

[ 2022 ] Helsinki, Finland

### **Entrain Vision summer school and consortium meeting**

