Crafting my career: from physics to healthcare research

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Using microfluidics for

- point-of-care diagnostics (e.g. TB, malaria, sickle cell disease)
- biological physics

Diagnostics

Cell sorter

Mobile phone microscope

Biological physics

Measure elastic constants of single cells

Buffer inlet
Sample inlet
Deformability measurement region
Outlet
RBC
RBC track

A

B

Figure 6.1: (A) Schematic diagram showing the SCPD geometry. It has one sample inlet and one buffer inlet for focusing the sample flow in the 40 \( \mu \)m wide main channel. The main channel expands into a 45\(^\circ\) funnel with a single semi-circular 20\( \mu \)m diameter pillar positioned at the mouth of the funnel. There are 8 outlets at the end of the funnel, separated from each other by 18\(^\circ\), to collect the sample fractions emerging at different angles. (B) An exploded view of the dotted region in panel (A) showing how RBCs deform as they pass the pillar. The red dotted line shows a typical track followed by the RBCs. (C) A schematic diagram to show the working principle of the device. The RBCs deform as they pass through the gap between the pillar and the channel wall. The more deformable cells follow a path closer to the center of the channel at an exit angle of \( \theta_1 \) and the stiffer cells tend to move away from the center at an exit angle of \( \theta_2 \). (D) Microscope image demonstrating flow focusing in the device with a dye. The focused width was 8\( \mu \)m. (E) Microscope image of the deformability measurement region showing the channel expanding into a funnel and the pillar.
A winding path through different disciplines

B. Sc. (3 years; physics)

Integrated PhD (8 years; physics, bioinstrumentation)

Postdoc (6 years; microfluidics, electronic devices & sensors, biological physics)

Industry (1 year; diagnostics and drug delivery)

Academic (since 2012; biomedical engineering)
How did I decide upon academia?

- During postdoctoral stint
- Different career workshops (media, non-profit sectors, industry, academia)
- Spoke to many people

Specific to academia

- Day-long workshop on jobs in academic sector for postdocs.
- One-on-one chats with other academics, and university’s career counsellors
- Support from advisors and mentors
What is my typical day like?

**HOW PROFESSORS SPEND THEIR TIME**

- **How they actually spend their time:**
  - Teaching 59%
  - Research 18%
  - Service 23%

- **How departments expect them to spend their time:**
  - Teaching 20%
  - Research 75%
  - “Service” 20%

- **How Professors would like to spend their time:**
  - Don’t tell me what to do

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**THE EVOLUTION OF INTELLECTUAL FREEDOM**

- **Before Grad School:** I’m going to research whatever I want!
- **Grad Student:** I’m going to research whatever my professor wants!
- **Assistant Professor:** I’m going to research whatever my tenure committee wants!
- **Tenured Professor:** I’m going to research whatever my grant committee wants!
- **Emeritus Professor:** I’m going to research whatever I want!

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What is my day really like?

No typical day. Highly flexible.

- Teach classes & lab; prepare for lectures; exams
- Outreach
- Mentor my students in their projects
- Write grant proposals, progress reports to funding bodies
- Write manuscripts with my students
- Learn, think
- Review others’ manuscripts, grant proposals
- Sit on other students’ committees
- Manage teaching and research facilities
- Serve on departmental and institutional committees
- Deal with purchase and other paperwork
- Manage lab budget and plan finances
- Interview and hire people for the lab
- Masters and PhD admissions
What do I like/dislike about my job?

- Love to teach
- New ideas
- Flexibility
- Trying to understand new data with students
- Sharing our work in talks + manuscripts
- Hands-on work in the lab

- Paperwork, long processes
- Worry about lab finances
- Too many meetings
- A never-ending to-do list
What skills and qualifications do I need?

• PhD + publications (Assistant Professor positions need three years of postdoc/post-PhD experience in IITs). Tailor your application to the institute’s advert.

• Giving good talks prepares you for classroom teaching.
• Learn to write research proposals.
• Offer to teach a tutorial.
Present academic job market in India

• 24,000 PhDs in all disciplines from about 900 institutions in 2017
• About 800 chemistry PhDs in a year
• IIX/NIT/CSIR/DAE institutes employ ~ 200 chemistry PhDs in a year. Similar numbers in other sciences.
• Many institutes have an upper age limit (35 with a little flexibility) for assistant professor positions
Lessons learnt from my journey

• Keep an open mind about different career options. There is no single correct career path.

• Not joining academia after a PhD is not a failure.

• A PhD training gives you many transferrable skills. Highlight them.

• Training in a particular discipline does not matter today. Be open to learning from other disciplines.

• What do you like to do? What are you good at? Talk to lots of people about their jobs to find out where you fit.