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Science Writer & Exec Producer

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<td>Skydiving into Retirement</td>
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ACS Scholar Adunoluwa Obisesan
BS, Massachusetts Institute of Technology, June 2021
(Chemical-biological Engineering, Computer Science & Molecular Biology)

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Crafting Your Unique Career Path: Who says you can’t make it happen?

Dr. Karishma S Kaushik, MBBS, MD, PhD
Department of Biotechnology, Savitribai Phule Pune University (SPPU), India

Dr. Harshita Pawar, PhD
Development Editor, ACS Publications

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Crafting YOUR unique career path:
Who says you can’t make it happen?

Dr. Karishma S Kaushik, MBBS, MD, PhD
Assistant Professor / Ramalingaswami Fellow
Savitribai Phule Pune University (SPPU)

Website: https://www.karishmakaushiklab.com/
Twitter: @KaushikLab
Email: karishmaskaushik@gmail.com

Feel free to get in touch!
What am I planning to talk about?

What we think career paths look like!

What career paths are actually like!

Each stage can bring forth new growth

Can be immensely rewarding and fulfilling

Life-changing!
Why would I be suitable to give this talk?

- Medical Doctor (MBBS) 1999-2005
- Clinical Microbiologist (MD) 2005-2008
- Research group leader 2018-2023
  - Human-Relevant Infection Biology Group
  - https://www.karishmakaushiklab.com
  - Change on the anvil!
Let’s get to know YOU!
How would you best describe your career stage?

1. Undergraduate
2. Masters’ Student
3. PhD researcher
4. Postdoctoral candidate
5. Faculty or Scientist
A Historical Blunder … ?

A drop in grade ‘forced’ me to take Biology

almost

when you failed your history test but can still understand history memes

I'm still worthy!

St. Joseph’s Convent, Bandra, Mumbai

Jai Hind College, Mumbai (PCM+B)

A Historical Blunder … ?

A drop in grade ‘forced’ me to take Biology

almost

when you failed your history test but can still understand history memes

I'm still worthy!

St. Joseph’s Convent, Bandra, Mumbai

Jai Hind College, Mumbai (PCM+B)
A Historical Blunder … or not

I never ‘planned’ to study medicine

Didn’t have a natural inclination for Maths

Fascinated by human biology illustrations
Choosing a medical college

Dr. D. Y Patil Medical College, Pune 1999-2005 (MUHS) M.B.B.S.

A relatively new, private medical college
We may not actually know what we want from our education or career!

We are not alone!

Consider it time for evaluation and information gathering

Delayed decision making

Important to keep options open

https://www.melyssagiffin.com/okay-dont-know-dream-job-yet/
Internship at a Govt. Hospital and Rural Center

Sassoon General Hospital, Pune (2004-2005)

Rural Health Centre - Alandi

Realization - I did not enjoy hard-core clinical medicine
Choosing a specialization

Armed Forces Medical College, Pune
M.D. Microbiology
2005-2008

M.D. in Microbiology was not on my choice list at all!
Recognizing what we do not want is as (maybe more) important as knowing what we want!

Recognition is the first step

Acceptance is not easy

Not ‘chickening out’ or ‘falling short’

Builds clarity of thought and intent

Dr. Smita Jain, PhD
M.D. Thesis led me to basic science

VZV Vaccination was being introduced in the army

Oka strain – Japanese

Geographic variation in VZV strains well-known

Quinlivan M, et al.
The molecular epidemiology of VZV: Evidence for geographic segregation.
J Infect Dis (2002)

VZV outbreaks among soldiers

VZV outbreaks a major problem in military barracks
First large scale genotyping of Indian VZV strains


Vesicle fluid from 100s of VZV patients across India

PCR (ORFs 38 and 54)
RFLP to differentiate clinical VZV strains in India from the vaccine Oka strain
Sequencing to confirm SNPs

Thankful to the YSS Lab (Prof. Yogesh Shouche) at NCCS
Ranbaxy Young Scientist Award (2007)

From Nobel Laureate Prof. David Baltimore
Learning to look at every opportunity like it is a ‘dream opportunity’

Staying open to surprises and new ideas

Stepping out of one’s comfort zone

Challenging but can be unexpectedly rewarding

https://www.linkedin.com/pulse/best-advice-make-every-opportunity-learning-robert-e-moritz
Major life changes

Marriage

Relocation

Moved to California, USA in 2008
I struggled to get into a PhD program for 2 years.

Top graduate programs

Voluntary researcher (1 year)
UC Berkeley
Evolutionary Biology Lab

Immigration, Funding, Recession

2 years
12 applications
No PhD admit
Howdy Texas!

Interdisciplinary Biophysics Lab!

Austin, Texas, USA

University of Texas at Austin, USA

Started a Ph.D. in Molecular Genetics and Microbiology in 2010
The journey so far

MBBS
MD Clinical Microbiology
Armed Forces Medical College, Pune

Non-traditional PhD candidate

Started my PhD at 29 years
Medical doctor

PhD Molecular Genetics and Microbiology
University of Texas at Austin, USA
It’s not you … career paths are often shaped by circumstances beyond our control

Once again, we are not alone!

The ‘behind the scenes’ considerations and challenges that no one talks about!

We work with and within situations and circumstances!

https://osumarion.osu.edu/assets/marion/uploads/What_Factors_Influence_a_Career_Choice.pdf
The fourth rotation

Rotation 1: Biofilms, Quorum sensing, Bacterial communication

Rotation 2: Bacterial Motility, Swarming, Group behaviors

Rotation 3: LPS, Endotoxin, Bacterial vaccines

I struggled to find the right Ph.D. lab
Interdisciplinary Biophysics Lab!

INTERDISCIPLINARY

PHYSICISTS, CHEMISTS, ENGINEERS, MATHEMATICIANS AND BIOLOGISTS

HIGHLY QUANTITATIVE!

Prof. Vernita Gordon
Ph.D. Physics
Post doc Biological Physics

NEW FACULTY / FIRST PH.D. CANDIDATE

Opportunity to tailor make the Ph.D. to my career goals...
Bacterial alkaline by-product enhances aminoglycoside activity

Spatial and population structure impacts antibiotic resistance.


Bacteria shown to suppress antibiotic-resistant cousins.

Physiological alkali bicarbonate promotes biofilm survival in the presence of tobramycin

Planktonic bacteria

Biofilm

Relevant in the context of inhalational replacement therapy with bicarbonate for patients with Cystic Fibrosis, who are often infected with *Pseudomonas aeruginosa*.

Laser trapping of initial bacterial cells to study biofilm structure

Initial spatial structure is preserved in biofilm development


*Staphylococcus aureus* - red
*Pseudomonas aeruginosa* - green
...and LIFE goals!

Becoming a parent in graduate school shaped my approach to work-life balance. Nature Careers, October 2019.

Who says you can’t have it all? 😊
Ph.D. (2010-2015)

Defense

Convocation

Five years and Five papers…and one child!
As cliched as it sounds, rejection does open unexpected opportunities!

It may mean leaving your comfort zone, but it also means a lot of learning.

As important as the opportunity and the people involved in the opportunity.

This is the difference between ‘a tough but enjoyable’ phase and a ‘tough and toxic’ phase.

What are the career resources that would be of most help to you?

1. Personal narratives (articles or talks)
2. Formal Workshops or Trainings or Webinars
3. Informal conference / seminar networking
4. Online interactions with colleagues (for example, Social Media)
Chose an informal post doc experience

Animal models of wound infections
Texas Tech University Health Science Center, Lubbock, Texas

Organ-on-chip approaches
Biomedical Engineering
University of Texas at Austin

Costerton Biofilm Center and Rigshospitalet, Copenhagen, Denmark
(Prof. Neils Hoiby)

Fun fact!

Learn the requisite skills towards developing my own research platform
Developing my skills as an educator

MICROBIAL GENETICS
PUBLIC HEALTH MICROBIOLOGY LABORATORY COURSE
MOLECULES TO ORGANISMS
INTRODUCTION TO GENETICS
ADVANCED HUMAN GENETICS

Outstanding Teaching Award
Biology Instructional Office

Turned out to be rewarding and provided invaluable teaching experience
Getting off the beaten track … CAN MEAN upskilling!

Choosing what phase of or skill in your career you want to build

Being convinced that you have something to gain from it

Does mean withstanding ‘peer pressure

https://www.linkedin.com/pulse/off-beaten-path-my-thoughts-career-trajectory-why-i-ramesh-ph-d-
Deciding to return to India

As an independent research group leader

Ramalingaswami Re-entry Fellowship

Department of Biotechnology
Ministry of Science & Technology, Government of India
Return to India (2018)

Private Research Institute
- Clinical Diagnostic Lab
- Biotech Start up
- DSIR recognized

June 2018

Unexpected administrative and financial changes

Nov-March 2018

NCL Innovation Park, Pune
- Rent Lab space
- Rent storage

Not quite a smooth transition
Big career changes may require re-calibration

When it comes to big changes ….

Reality and expectations collide when the ‘rubber hits the road’

Expect periods of turmoil

Plan to have to re-calibrate

https://hbr.org/2021/07/the-right-way-to-make-a-big-career-transition
Established my research group at a state university in India

Institute of Bioinformatics and Biotechnology
Savitribai Phule Pune University

https://www.karishmakaushiklab.com

Joined SPPU (April 2019)
Human-Relevant Infection Biology Group Vision

We aim to build human-relevant infection platforms, understand complex infection environments with a focus on biofilms, and develop and test composite infection therapeutics. To accomplish this, we have three broad thematic areas of research:

- **Build Human-Relevant Infection Platforms**
  - A ‘wound infection on a chip’ platform to recapitulate relevant host and microbial factors
  - A high-throughput, bioengineered pre-clinical testing platform to evaluate antimicrobial approaches
  - Co-develop an ex vivo human skin model with a simulant wound fluid milieu

- **Develop Precision-Based Infection Therapeutics**
  - A point-of-injury burn wound bandage reduce infection, pain and scarring
  - ‘Ancientbiotics’ for biofilms, by mining ancient Indian medical treatise to identify and evaluate historical remedies

- **Understand Host-Pathogen Interactions**
  - An in-house simulant wound fluid milieu for human-relevant biofilm studies
  - Effects of smokeless tobacco use on oral multispecies biofilms, and explore the oral biofilm microbiome as a tool in the management of oral precancerous lesions

---

Why infection research in India must become relevant to humans
Surat Parvatam and Karishma Kaushik
Nature India (2019)
There is no ideal, instead we work with ‘imperfect’ job opportunities

Not a permanent / tenured position

A state university with limited resources and infrastructure

Consider risks, benefits, challenges and options

Important to start with what we have, and believe that we take it forward!

https://www.linkedin.com/pulse/should-you-accept-not-so-perfect-job-andrew-seaman
Biofilms are the single-most important cause of delayed wound healing. 

*Pseudomonas aeruginosa* and *Staphylococcus aureus* are common co-pathogens.

Bioengineered platforms for chronic wound infection studies: How can we make them more human-relevant?

Build human-relevant infection platforms

An *in vitro* wound milieu (IVWM) based on the composition of clinical wound fluid

<table>
<thead>
<tr>
<th>Components</th>
<th>Final concentration in IVWM</th>
<th>Rationale</th>
<th>References</th>
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<tbody>
<tr>
<td>FBS</td>
<td>70%</td>
<td>Major component and base of IVWM; at this concentration, FBS accounts for several components in wound fluid</td>
<td>[29,30,38,40]</td>
</tr>
<tr>
<td>Lactic acid</td>
<td>11–12 mM</td>
<td>Host biochemical factor released in response to tissue damage; based on levels detected in wounds immediately following injury</td>
<td>[41], [42], [43]</td>
</tr>
<tr>
<td>Lactoferrin</td>
<td>20–30 µg/mL</td>
<td>Host biochemical factor increased in the presence of microbes</td>
<td>[44], [45], [46], [47], [48], [49], [50], [51], [52]</td>
</tr>
<tr>
<td>Fibrinogen</td>
<td>200–400 µg/mL</td>
<td>Host matrix protein, notably absent from serum, present in the wound milieu</td>
<td>[54], [55], [56]</td>
</tr>
<tr>
<td>Fibronecitin</td>
<td>30–60 µg/mL</td>
<td>Host matrix protein, present in lower concentrations in the wound milieu</td>
<td>[55,[57], [58], [59], [60], [61], [62]</td>
</tr>
<tr>
<td>Collagen</td>
<td>10–12 µg/mL</td>
<td>Host matrix protein, critical component of the wound bed</td>
<td>[20,21,25,28,[63], [64], [65], [66]</td>
</tr>
</tbody>
</table>

IVWM recapitulates clinical biofilm features - metabolic activity, antibiotic tolerance, 3D structure and interspecies interactions for *P. aeruginosa* and *S. aureus* biofilms
Dissect host-pathogen interactions

A 4-D wound microenvironment with fixed host cell scaffolds and the IVWM

Probe the structure of mixed-species *P. aeruginosa* and *S. aureus* biofilms across multiple levels of organization – aggregate dimensions and biomass thickness, species co-localization and organization within the biomass, overall biomass composition and interspecies interactions.

Identify targets and approaches infection therapeutics

**Biofilm-AMP**: https://b-amp.karishmakaushiklab.com

One-stop structural and functional repository of **5544 AMPs** with 3D AMP models, biofilm target docking models and annotations to existing biofilm literature

**AMPing Up the Search**: A Structural and Functional Repository of Antimicrobial Peptides for Biofilm Studies, and a Case Study of Its Application to *Corynebacterium striatum*, an Emerging Pathogen.


Whole remedies in sesame oil
- *Ocimum tenuiflorum* (Tulsi)
- *Kalanchoe pinnata* (Parnabeej)
- *Cynodon dactylon* (Durva Grass)
Working with ‘what you have’ can take one to new fields of work

Challenges you as a scientist

Staying open to broadening ones’ area of work

Changing ones’ approaches based on resources and availabilities
Expanding my professional skills beyond bench science

India Science Festival 2022

https://www.karishmakaushiklab.com/

India Biofilms Society

Talk To A Scientist

https://www.talktoascientistindia.com

STIP 2020
There is ALWAYS a next step, and planning for it can expand us as professionals

Important to keep thinking
‘What else is out there?’

‘Could there be other ways I can contribute?’

Where and what should the next step of professional growth look like?

What part of this webinar most appealed to you as a professional?

1. Career paths are never linear!
2. Rejection can open unexpected opportunities
3. Upskilling is an ongoing journey
4. There is always a next step to plan for!
Thank you very much!

Feedback and Suggestions welcome

Building the **best version of yourself, your life, your colleagues, and academia** while enjoying our work!

Dr. Karishma S Kaushik, MBBS, MD, PhD
Savitribai Phule Pune University (SPPU)

Website: https://www.karishmakaushiklab.com/
Twitter: @KaushikLab

Email: karishmaskaushik@gmail.com

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